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A SYSTEMATIC REGIONAL GEOGRAPHY

A POST-MATRICULATION COURSE

VOLUME II

EUROPE

BY

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(UNIVERSITY OF LONDON

WITH NUMEROUS MAPS AND
DIAGRAMS SPECIALLY PREPARED
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PREFACE

THIS study of the lands and peoples of Europe is written primarily for the use of students taking " Intermediate " or " General " courses towards a University degree, " Higher School " examinations, or courses in Training Colleges.

It aims at providing a twofold training : in the first place it not only presents facts but points out their significance and how they may be correlated ; in the second place, it shows the interaction between the facts of geography and those human affairs, economic and political, which are the concern of all.

From both points of view a study of Europe is important. To the geographer, this continent offers a great variety of conditions within an area small enough to be studied in some detail and with some approach to actuality. To every man, the economic and political affairs of Europe influence his own life whether he lives within the borders of the continent or beyond the seas.

Yet a study of Europe involves considerable difficulties, for it is scarcely too much to say that it confronts one with a mosaic of geographical units, a jig-saw puzzle of nationalities and a kaleidoscopic picture of States ; one has to work out a method of recognizing order and causation in this complexity, for the three factors cited above overlap and conflict in a most confusing manner. In many cases, the natural unit of the geographer, e.g. the Rhine Rift Valley, the Alpine Highland or the Lower Hungarian Plain, is inhabited by people of more than one nationality and divided among two or more States ; again, the fact that the limits of the nationalities by no means correspond with those of the political divisions is the origin of some of the most serious problems of Europe.

Because the various States bear so little relationship to geographical regions, and also are liable to sudden and catastrophic changes, it seems to the writer impracticable to arrange a study of Europe according to the political divisions ; hence this book has three parts.

Part I makes a general survey of the continent as a whole—its relief and structure, its climates, soils and vegetation, the

types of land-utilization and production and, by combining these factors, the major geographical regions; at this stage, also, a general survey of the peoples and States of Europe is given. The broad pattern of the distribution of the physical and human elements is thus brought out.

Part II presents a more detailed study on the basis of the natural or geographical regions which comprise the continent : the major and minor regions and, except in eastern Europe, the sub-regions. These are treated as units, and in each the interrelations of the physical and human factors are considered. This is the longest section of the book, and in it the economic conditions are given special attention.

In Part III each of the States is dealt with in turn. Their physical and economic foundations are reviewed, the peoples who form their populations are considered, and an examination is made of the boundary changes of recent years and of those international problems which are either influenced by geographical factors or have geographical effects. In this section, facts are stated without prejudice, causes and consequences are pointed out, but judgments are deliberately withheld as unsuitable to a geographical text-book.

The relative space allotted to the various parts of the continent has been determined partly according to their importance as the homes and work-places of large populations or of characteristic groups of people, and partly according to the nearness to Britain.

A large number of maps have been specially drawn to illustrate the text. These deal with all aspects of the geography, but the available space has been used to supplement, not to duplicate, the maps to be found in atlases; it is assumed that an atlas will be constantly used with this book.

Questions have been added, in many cases designed to require a reconsideration of the facts and ideas already given and to promote individual thought.

The writer cordially thanks Mr. L. Brooks, M.A., Mr. G. J. Cons, M.A., Professor C. B. Fawcett, Dr. H. A. Matthews and Dr. S. W. Wooldridge, who have each read the draft of parts of the book and have given advice which has been gratefully accepted.

J. F. U.

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NOTE

IN March, 1939, while this book was being printed, the State of Czecho-Slovakia was dismembered ; Germany established one Protectorate over Bohemia and Moravia and another over Slovakia, while Hungary annexed Ruthenia (Carpatho-Ukraine). The political boundaries on the end-paper maps have been altered to conform with these changes, and on pages 344 and 345 the geographical consequences are described in such a way as to bring Part III of the book up to date. The statements made in Chapter XIX regarding the States of Germany and Hungary must therefore be modified by the facts given on pages 344 and 345.

The account in Chapter XIX of the conditions of Czecho-slovakia, as it was just before March, 1939, explains the fundamental political and economic factors in the problems and relationships of the three States ; many of these factors, though modified in certain respects, still remain and are still important in the human geography of Central Europe. Similarly, the map of the earlier boundary changes in Czecho-Slovakia (Fig. 80) is still useful in showing important features of the areas which have now passed into the possession of Germany and Hungary.

In April, 1939, following disagreement between the governments of Italy and Albania, Italian troops overran Albania. The King fled, a group of Albanians offered the Crown to the King of Italy, and the two States were thus united.

April, 1939.

PART I

EUROPE AS A WHOLE

CHAPTER I

RELIEF AND STRUCTURE

Introduction.—If we want to understand the nature of any region and the manner of life of its people, and we trace back to the reasons for the facts, we find that the most fundamental consideration is the position of the region in the world—its situation on the globe.

That position has, in the past, determined the way in which the region has shared in the great earth movements which have, for example, raised some areas to broad highlands, subjected some to foldings producing mountain systems, or lowered others, in some cases even below sea-level; in other words, the position has determined the broad features of the relief and structure of the region.

The main characteristics of the climate are similarly due to its position on the globe, which exposes the area to the influence of the sun and to that of one or more great wind-systems, while the relief also influences the climatic conditions.

Climate and relief together are directly or indirectly the chief factors conditioning the type of vegetation which can live in the region, and this in turn has a great influence on the agricultural and pastoral work by which many of the people get their living.

Of course, the environment of a people does not *determine* their work, nor their particular manner of life, for different peoples are at different stages of development and have different traditions and habits. Yet the position of a region in relation to other regions, either near at hand or far away, has been one of the main factors in aiding the immigration of peoples and ideas, and so affecting the character of the population and their mode of life. Moreover, the incentives and opportunities which their environment may offer influence their further development.

The position of regions may therefore be regarded from several points of view, and in each of the earlier chapters of this book, which deal with the general characteristics of Europe and its peoples, we shall examine the position of the continent from the particular aspect with which we are concerned. Accordingly, we will now consider how the varied relief and structure of the continent are related to the situation of its constituent regions.

A relief map of Europe shows at once a marked contrast between the relatively level and unbroken east, and the remaining part of the continent which is diversified by many uplands and lowlands and, moreover, is divided by invasions of the Atlantic waters and by inland seas. This fundamental distinction as to relief and outline affects practically all aspects of the physical and human geography of the two contrasted regions, known sometimes as "Trunk Europe" (because it forms part of the great trunk of the Euro-Asiatic land-mass) and "Peninsular Europe" respectively. The cause of the contrast lies in the fact that whereas eastern Europe is situated in a part of the globe which has been relatively stable through much of its geological history, the rest of the continent has been involved in repeated disturbances and dislocations of the crust of the earth.

In Peninsular Europe, on the north-west margin of the continent, one group of highlands stands out clearly and will be first considered.

The North-western Highlands.—The Highlands of Scotland-and-the north of Ireland resemble in many ways, though on a smaller scale, the Highlands of Scandinavia because they have shared the same geological history."

Some of the rocks comprising these regions were formed before the Palaeozoic Era, i.e. before any life appeared upon the earth ; even at that time the surface was contorted, and these earliest rocks were folded into great mountain ranges, but of these denudation has by now removed all but the deepest roots.¹

During the Palaeozoic Era other rocks were formed, and in the Devonian Period there occurred a series of dislocations of the earth's crust which were called the " Caledonian " earth-movements because their effects were studied in the structure of Scotland. At this period the rocks were subjected to great

¹ A time-sequence of the geological periods and the great earth-movements is given in Appendix I.

foldings in a general south-west to north-east direction. As a result the Caledonian mountain system arose, which extended over all the region now forming the north-western margins of Europe (see Fig. 1), including Spitsbergen far to the north of Scandinavia. In the course of these disturbances much of the rock was metamorphosed into crystalline forms, including schists and gneisses, while there are also large areas of granite, gabbro and other resistant igneous rocks.

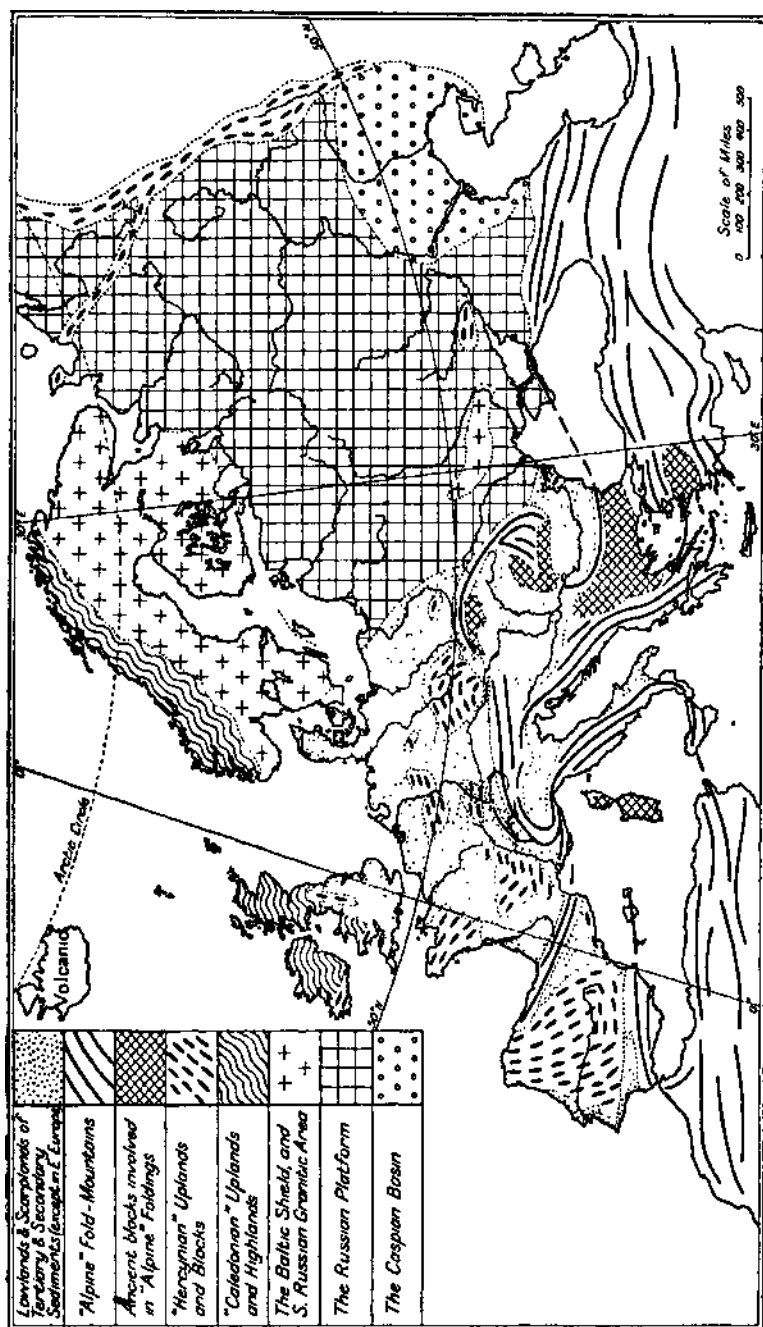
From this period onward through the Secondary Era the great mountain system was worn down to the condition of a peneplain, and only its stumps remained. Then, in the "Alpine" earth-movements of the Tertiary Era, the region again suffered disturbance, this time by faulting and the uplift of some of the resultant dislocated blocks and the subsidence of others. At this time, too, that part of the earth's surface now under the Atlantic waters was detached from the continental platform from which the lands of Europe rise, and the present shape of this margin of Europe was determined.

On the continental side, the blocks were raised probably in more than one stage, so that a low terrace-like step was formed between the sea and the great plateaus which in the Dovre Fjeld now reach over 7,500 feet and in the Jotun Fjeld over 8,000 feet (see Fig. 2). Moreover, the area was dislocated by faults running in several directions, and along these cracks there occurred both subsidences and also lines of weakness along which rivers eroded deep valleys in the plateaus.

Through such cracks and vents in the earth's crust, the pressures associated with the Alpine disturbances forced volcanic material in a number of places, and the Faroe Islands and Iceland in the far north-west are almost entirely formed of these volcanic accumulations.

In the Ice Age, snow accumulated on the high plateaus and ice was formed which worked its way down the valleys, deepening them and changing their section from V-shape to U-shape. In many other ways, too, glaciation played a part in producing the present relief; and its general importance is so great that we may at this point consider it further, although its influence extended far beyond the limits of the North-west Highlands.

At one stage the climate was so cold and precipitation was so great that the great ice-sheet from the Scandinavian Highlands and the smaller ones from the British Highlands extended south-



ward as far as the broken line marked as the maximum extension of the ice on the map showing the distribution of glaciation (Fig. 3). After this period, the climate became warmer, the southern part of the ice-sheet gradually melted and its edge lay progressively farther north ; this continued until the climatic improvement ceased and the margin of the sheet remained in the same position. Here lines of terminal moraine, composed of boulders, gravels, sands and clays, marked the end of this stage in the retreat of the ice. In the area between the outer margin of the earlier ice-sheet and the terminal moraines, there was now visible a layer of boulder-clay, the ground moraine formed below the ice in its wider extension. Also, melted ice-water washed away clayey and sandy material from the later terminal moraines, and much of this was deposited upon parts of the ground moraine ; occasionally such sheets of gravel and sand covered considerable areas. At later periods, with other climatic changes, the ice-edge withdrew farther, and the various stages in the retreat of the ice are therefore marked by alternations of lines of very irregular and often hilly terminal moraines, and flatter stretches of clayey or sandy character. Since the farthest southward advance of ice occurred, there has elapsed sufficient time for streams and weathering to reduce considerably, and to smooth out to some extent, the glacial deposits, but some of the later series remain so little affected that they dominate the landscape and largely control the way in which man uses the land.

An important effect of the ice was to obstruct or alter the courses of the streams, and in many parts this is now shown by rapids in the rivers and by the presence of lakes or swamps. Immature river-development and poor drainage are frequent characteristics of glaciated regions.

In general, the areas from which the ice worked its way outward are those in which its scouring action predominated, while the marginal areas of glaciation are those of deposition. Hence, over parts of the North-western Highlands region the soil was completely worn away and bare rock is the witness of the action of the ice, while in other parts are the coarse gravels and sands of the later terminal moraines. Taken as a whole, in the northern regions glaciation has made surface conditions more difficult for man's occupation and use ; on the other hand, some of the glaciated regions of central and western Europe have

benefited by the finely ground and fertile material brought from the north.

Another very important element in the evolution of the North-western Highlands was a succession of changes in the relative level of land and sea which have occurred several times since the Alpine dislocations, and are still in progress. These changes

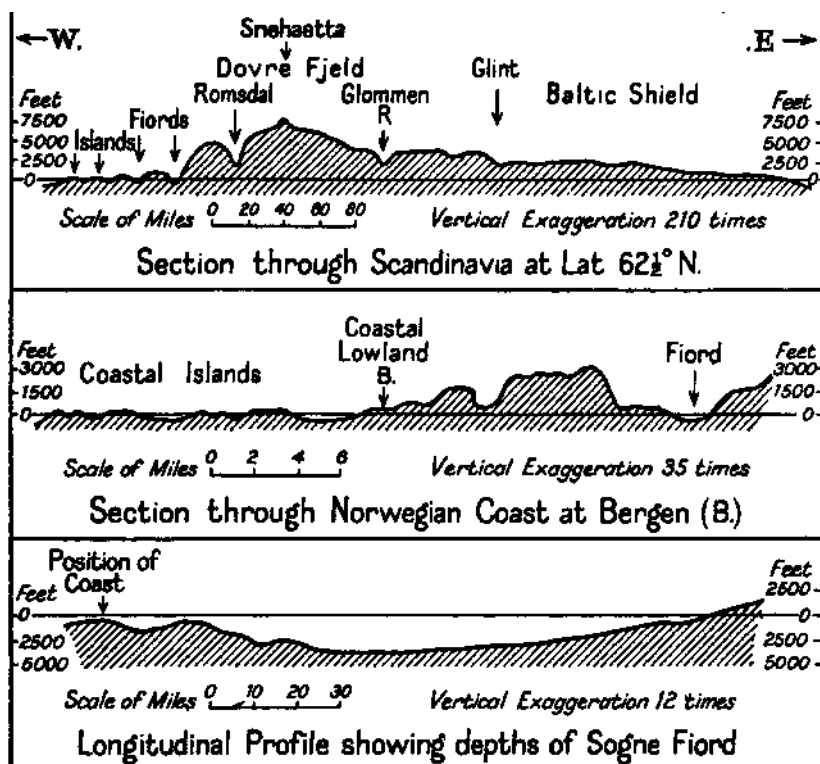


FIG. 2.—SECTIONS SHOWING RELIEF OF SCANDINAVIA.

may be due either to alterations in the level of the sea or to the slow risings, sinkings or tiltings of the land masses; in this part of the world the broad result has been a general sinking of the continental margin as compared with the Atlantic waters, and consequently the shores have been partially "drowned." The low terrace off the Norwegian coast has been reduced either to several small archipelagoes or to narrow patches of lowland extending beyond the highlands (see middle section in Fig. 2).

Also, the lower parts of the valleys, whether due to faulting, to stream erosion, to scraping and deepening by ice, or to a combination of these processes, have been invaded by sea-water and have become the wonderful fiords, with great side-branches leading inland, in some cases for scores of miles. Usually the fiords have steep or even vertical sides, rising to many hundreds of feet, while below the quiet waters are corresponding depths (see bottom section in Fig. 2). Apart from the narrow patches of coastal lowland the only habitable areas are either at the heads of the fiords or at the sides where old terraces interrupt the mountain slopes ; they give landing-places when they are at the water-level, and fields and pastures when they are a little above it.

The influence of this history and its resultant land-forms on human occupation will be considered in detail later. Yet it may be at once observed that it is in the main unfavourable, although the indented coast affords harbours for seafaring. Less obvious is the fact that the enormous amount of denudation has brought the surface of the earth down to the level of the minerals, originally formed in the depths, and now able to be reached by man ; iron and copper ores are therefore among the rather scanty resources of the Scandinavian Peninsula (see Fig. 6).

Another very important result of the geological history is the modification of climatic conditions by the upraised continental margin bordering the ocean. The precipitation of rain or snow is concentrated, as it were, along the coast and on the neighbouring mountains, while in the lee of the great barrier the Baltic lands are relatively dry. Similarly, the moderating influence of the oceanic winds is mainly limited to the Atlantic margins ; behind the highlands continental conditions at once begin, and from Sweden right across north-eastern Europe and far into northern Asia extend regions where the long, severe winters allow the growth only of the tundra or coniferous forest vegetation.

. **The Baltic Shield.**—The Scandinavian Highlands descend, often by a marked drop, known as the Glipt (see Fig. 2), to a great region which dips gently eastward under the Gulf of Bothnia and rises again in Finland, thence sinking in northern Russia till its border is largely covered by the waters of the Arctic Sea, the White Sea and Lakes Onega and Ladoga. Because this

region is slightly concave towards its centre under the northern arm of the Baltic Sea, and thereby resembles an inverted shield, it has been termed the Baltic Shield. It is one of the most ancient land surfaces on the globe, for it is composed of highly resistant granites, gneiss and crystalline schists which, although folded in the dim geological past, before life appeared upon the earth, have remained almost undisturbed during and since the Palaeozoic Era. Faultings have let down parts where relatively small areas of Palaeozoic sedimentary rocks have been preserved,

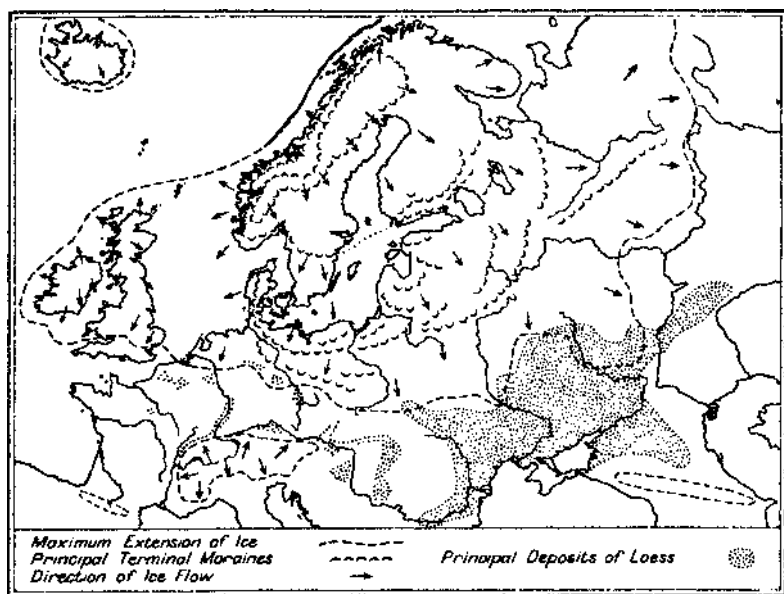


FIG. 3.—DISTRIBUTION OF GLACIATION AND LOESS.

and where the surface is rather lower than the rest, as, for example, in the "Lake Belt" of southern Sweden, in which are situated Lakes Vaner, Vatter and Malar.

For the most part the bed-rock forms undulating country in which the characteristic land-forms are due to glaciation. Near the southern margin there are long lines of hilly terminal moraines, behind which the glacial deposits are still so abundant and so recent that rivers have not been able to develop mature drainage systems. Their courses are irregular, and lakes are numerous. In central Finland, indeed, lakes and marshes cover much of the country and the roads make use of long,

narrow, winding ridges which stand above the waters; these are asar, or eskers, trains of gravel and sand deposited beneath or on the margins of the ice-sheet.

Yet over large areas the naked rock is exposed, for much of the soil was scraped away by the ice and transported to the surrounding regions ; nor was this loss remedied in the lower areas near the Baltic Sea and the Gulf of Bothnia by the deposit of sandy or clayey material when, for a time, the waters spread farther over the land.

Although the ancient rocks contain certain minerals, the Baltic Shield has proved a generally inhospitable region to man, even apart from its climatic conditions.

3. The Hercynian Uplands.—As the mountains of the north of the British Isles are akin to the Scandinavian Highlands, so the uplands of the south of Ireland and of the south-west of England and Wales are akin to a number of others scattered widely over the continent. They are known as the Hercynian Uplands because they represent fragments of mountain systems folded in the Hercynian earth-movements which occurred at the close of the Carboniferous Period. These mountains were continuous over great areas, though their traces are now found only in scattered fragments, and their folds ran in various directions. In the south-west of Britain and the adjoining region of Brittany, the general direction was about west to east with a trend to the south-east towards the centre of France, as is shown by the direction of the lines in these areas in Fig. 1 ; folds running in this direction are referred to as Armorican, from the ancient name of part of Brittany. In central Europe, however, the common direction is from south-west to north-east, termed Variscan, from the name of a tribe long ago living in the neighbourhood of the Fichtel Gebirge.¹ The Variscan direction is seen in the structure of the Rhine Plateau, which is cut across by the Rhine in its course between Bingen and Bonn, and also in the Harz Mountains, the Vosges and the Black Forest Mountains. In the Central Plateau of France both directions are seen, and still others appear in other regions, notably in the central tableland, or " Meseta " of Spain, in the " Diamond " formed

¹ Both the term " Armorican " and that of " Variscan " are sometimes used to denote all these foldings and all the regions of this type, but it seems best to restrict them as is here done, and to employ the term " Hercynian " in the general sense. " Hercynian " is derived from the old name of the Harz Mountains, one of the regions of this type.

by Bohemia and its margins, and in the Lysa Gora -Uplands of Poland. Even in eastern Europe are two similar Hercynian areas, viz. the Donetz Plateau in the south, and the Ural Mountains, with their offshoot, the Timan Uplands, on the borders of Asia.

The various mountains formed by the Hercynian movements have had a history somewhat like that of the older Caledonian mountains ; they were worn down to peneplains, so that the directions of the folds showed only in the strips of the various strata outcropping along the surface, like the graining of the wood in a sawn tree trunk. The Hercynian peneplains later suffered changes : over some areas they were depressed and upon them were laid down sedimentary rocks during the Secondary and early Tertiary Eras, and in the succeeding Alpine earth-movements they were considerably fractured, tilted, upraised or depressed.

Consequently much of what continuity they had previously shown has disappeared, only those parts which stand up above the surrounding lowlands being clearly recognizable as Hercynian Uplands of the usual type. These, which are shown as such on the map of structural regions in Fig. 1, were uplifted to plateau-like form, with more or less level surfaces, but denudation has since removed most of the overlying sedimentary rocks of Secondary and Tertiary date, and has exposed the older rocks of the peneplains with their graining ; even in this older rock the less resistant strips have been etched out so that the more resistant stand up above the general level as ridges running in the direction of the original mountain-folds.

Where an uplifted mass is bounded by clearly marked, and more or less parallel, faulted edges, it is known as a " horst," and such structures are common in the Hercynian Uplands. The converse of a raised horst is a rift-valley, which has subsided between two parallel series of faults. One very important rift-valley is that in which the Rhine flows between Basel and Mainz ; the parallel faults which bound it are shown in the map in Fig 46, and the section in Fig. 47.

In many cases, uplands due to dislocation rise steeply on one side where they are bounded by marked faults, and descend more gently in other directions ; structures of this kind are commonly known as " massifs " and are exemplified by the " Massif Central " or " Central Plateau " of France, which is fault-edged where it overlooks the Rh6ne Valley.

The dislocations which broke up the Hercynian areas allowed igneous material to be forced up along faults and through volcanic vents, and in several parts, notably in the Central Plateau of France, great sheets of lava and the remains of volcanic cones bear striking witness to this part of the history.

In the rocks of the Carboniferous Period which enter into the structure of the Hercynian regions, there were formed widely extending coal-measures containing seams of valuable coal, and these coal-measures were involved in the Hercynian foldings. Where they formed parts of the upfolds which were first denuded, the coal-measures have been worn away, but where they formed parts of downfolds or basins they have, to a certain

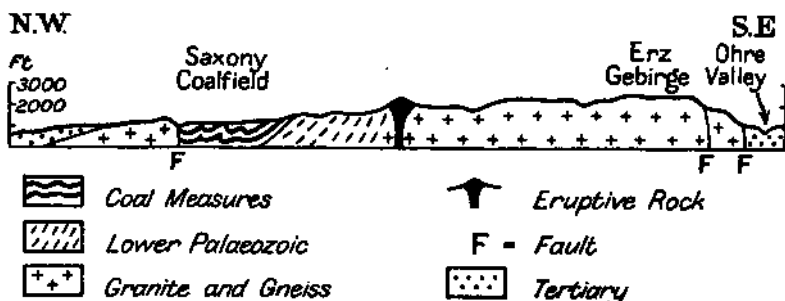


FIG. 4.—SECTION THROUGH THE SAXON UPLANDS, ERZ GEBIRGE AND EGER (OHRE) VALLEY.

extent at least, been preserved. Consequently there are important coal-fields associated with some of the Hercynian Uplands, and these, together with other mineral resources found in their exposed rocks, are the basis of mining and manufacturing industries which have attracted people to the mineral-bearing areas.

The structure of the Hercynian Uplands is illustrated in Fig. 4 by the section through the Erz Gebirge and Saxon Uplands; this area exhibits most of the elements described above.

Yet in general the Hercynian Uplands are not well populated, for they are not productive agricultural regions, since, as they stand above the surrounding lowlands, they have a relatively cool and moist climate, and also they do not usually bear fertile soils. Hence they naturally tend to be heath or moor lands or to be clothed with forests.

4. Central and Western Lowlands and Scarp-lands.—After the Hercynian earth-movements and the later wearing down of the resultant mountain systems, most of Europe, except the north, was submerged under the waters of seas or lakes. This submergence was, however, not uniform over the whole of the southern part of the present continent; some parts were beneath relatively deep seas in which was deposited the ooze from which limestones were formed, while other parts were covered by shallow seas or lakes in which clay-forming muds were laid down, while elsewhere sand was dropped which was changed to more resistant sandstones or remained in an unconsolidated form. Moreover, alterations in the depths of the various parts brought differing conditions first to one region and then to another, and thus at a given place there might occur first the formation of sandstones, then of limestones, and later perhaps of sands or clays.

Thus over wide areas of central and southern Europe there was a succession of deposits of varying composition during considerable parts of the Secondary and Tertiary Eras, and consequently thick strata of sedimentary rock covered platforms of more ancient formation.

Where, in the Alpine earth-movements, the platforms and their coverings of Secondary and Tertiary sediments were broken and upraised, the Hercynian Upland regions were formed as has been described above, but in the less-disturbed areas the strata remained at a lower elevation and the sedimentary cover was less exposed to denudation. In central and western Europe this was the case between and around the blocks of the Hercynian Uplands, where basins were formed such as those of south-eastern England and northern and south-western France, or where there were broader depressions, such as that on the southern shores of the North Sea and the Baltic Sea; in these regions the older rocks are still covered by a succession of sedimentary strata lying above one another in more or less saucer-like form or in an almost horizontal position, as is shown in the section through northern France in Fig. 38. v*

In other parts the rocks have a pronounced tilt, as in England west of the London Basin, in France west of the Vosges Mountains and in Germany east of the Black Forest Mountains; in such cases the less-resistant strata have been worn away, leaving the more resistant as long, tilted slabs, and giving to the

whole region a scarp-land character. This structure is shown in the section in Fig. 48.

Moreover, in the Ice Age, parts of these lowlands were invaded by ice, especially from the North-western Highlands, as was described above, and in such parts various deposits of clays, sands and gravels were laid down.

Frequently, fertile soils have developed upon the rocks of the lowlands and scarp-lands, and agriculture and pastoral work are carried on in such forms as the generally favourable climatic conditions have allowed.

Exceptional fertility marks the soils which have been derived from a mantle of loess covering the earlier deposits in certain parts of the central and western lowlands, and over a great area in south-eastern Europe (see Fig. 3). This loess resembles that of China in its composition ; it is fine-grained, loose and sufficiently porous to allow a free downward drainage of water after rain, and a slow upward movement by capillary-action in dry weather. Its existence in Europe is due to dry climatic conditions which occurred during and after the Ice Age, when southward-blowing winds raised clouds of dust from the finely ground particles of the moraine areas, and deposited them over the surrounding lowlands until a layer was accumulated, in the west often to a depth of scores of feet, and in the east to much greater depths. In central and western Europe the existence of the loess was specially important during the period of man's early settlement and cultivation of these regions, for loess areas were usually free from forest, easily worked and gave abundant return to the simple forms of agriculture then practised.

Minerals are not characteristic of the later sedimentary rocks, though iron ores were formed in some of the Secondary strata (again see Fig. 6), and lignite deposits are found in some of the Tertiary. Yet where the older rocks of the Hercynian Uplands dip down beneath the edges of the basins, the coalfields may extend beneath the younger strata, and therefore in several cases coal-mining has spread from the Hercynian margins some distance into the neighbouring lowlands.

Because of the subsidence of the basins and hollows, the waters of the Atlantic have invaded the lowest parts, and oceanic inlets or inland seas adjoin these lands and bring opportunities for fishing and trading. Hence the lowlands and scarp-lands of central and western Europe have varied resources, and as a

whole have become the most densely populated parts of the continent.

3. The Regions of " Alpine " Folding.—Great as were the changes brought about by the Alpine earth-movements in northern and central Europe, they were but small compared with those which entirely transformed the southern part of the present continent.

It appears that during a very long period about the middle of the Tertiary Era, the block of the earth's crust which forms northern Africa moved northwards towards the similar block forming the platform of ancient and resistant rock which in central Europe underlay the sedimentary strata of Secondary and early Tertiary date. The northward movement was irresistible: the older rock structures of central Europe were broken and displaced, while the younger, sedimentary strata of the south were contorted in a most complicated fashion.

In a general way it may be said that massive sheets of limestones and other sedimentary rocks were ridged up into folds along lines which formed great curves, as indicated in Fig. 1. These curves appear to sweep round from the south of Spain across the Strait of Gibraltar into the Atlas Mountains of northern Africa, whence they are continued across the central narrows of the Mediterranean Sea into Sicily and through the Apennine backbone of Italy into the Alps; even the Pyrenees and the Cantabrian mountains of northern Spain are linked with this system, which therefore almost completely encircles the area of the western Mediterranean. A small spur from the Alpine system is seen in the Jura Mountains.

On their eastern side the Alpine folds appear to spread out, both to the north-east in the Carpathian system and to the south-east in the Dinaric Alps, thus enclosing the lowlands of the middle Danube. The southern part of the Carpathian system swings round into the Balkan Mountains, so that between these and the southward continuation of the Dinaric Alps is another enclosed area in the neighbourhood of the northern part of the *Mæan* Sea. An eastward continuation of the Balkan Mountains is probably to be seen in the Yaila Mountains of the Crimea and in the Caucasus, while those of the southern part of the Balkan Peninsula are continued in the islands of the southern *Mæan* and curve again into the mountains of Asia Minor. Indeed, the whole system extends east-

ward across Asia on a still greater scale and culminates in the highest ranges of the world.

The term "folded" is, however, inadequate to describe the^T contortions which the strata have suffered (see Fig. 5). They have been squeezed together in most complicated ways, and on the outer side of many of the curves, sheets of rock (called "nappes") measuring hundreds or thousands of square miles in area, have been thrust bodily forward over other strata till

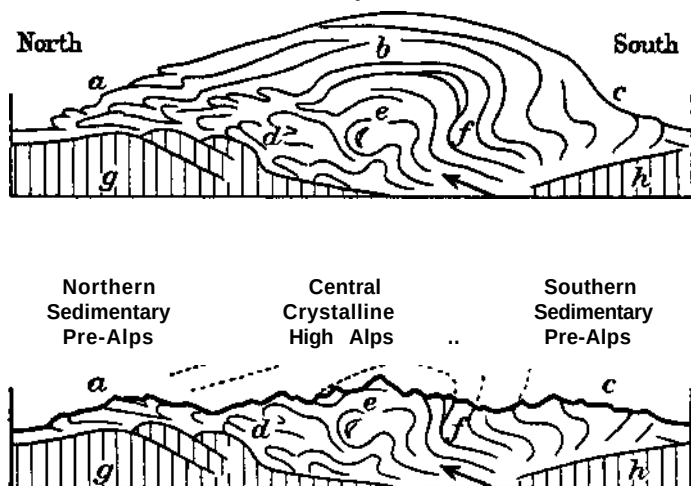


FIG. 5.—DIAGRAMMATIC SECTION THROUGH THE EASTERN ALPS.

(Vertical Scale greatly exaggerated.)

Note.—The upper diagram shows in a simplified form the contortions due to a thrust from the south. The underlying platform, *g* and *A*, is dislocated; the lower sedimentary rocks, *d*, *e* and *f*, are metamorphosed into crystalline nappes; the sedimentary nappes of the upper strata, *a*, *b* and *c*, are thrust northward (except in the extreme south), far from their roots.

The lower diagram shows the present constitution of the Eastern Alps after great denudation. In the central zone the crystalline nappes are exposed, and in the northern zone the sedimentary strata are left widely separated from their counterparts in the south.

they have been parted from their "roots" and now lie in regions far distant from those in which they were formed.

Under the pressures which have brought about such movements, some of the rock was metamorphosed into crystalline form; for example, a large part of the central Alps is composed of crystalline rocks which were thus formed. In some parts, too, molten material was forced up from the depths, and igneous rocks thus add to the complexity. Moreover, volcanoes were formed and are still to be observed, and even now earthquakes show that stability has not yet been attained in this part of the earth's surface.

The Alpine foldings have not only affected sedimentary rocks ; within them have been enclosed masses of older date and more resistant composition. For example, in the central Alps themselves are large areas, including the Mont Blanc massif, consisting of splinters of an Hercynian floor driven up into the folded pile above ; again, in the system of the Carpathians (in the wider sense of the name) is the great and ancient massif of the Transylvanian Alps as well as ancient fragments on the west of Transylvania and in parts of the Tatra Mountains.

Other blocks or massifs occur within the folded mountains of southern Europe, notably that between the Balkan Mountains proper and the western heights of the Balkan Peninsula ; here is the massif of which the Rodopi Mountains form the highest part. Again, within the curved folds of the western Mediterranean, there stand up ancient massifs forming the greater part of the islands of Corsica and Sardinia.

Another very marked, and very important, feature of the region affected by the Alpine foldings is the formation of great basins within the mountain system. These are of varying depth : in the western Mediterranean subsidences have let down the earth's surface over 10,000 feet below sea-level; the Adriatic Sea, however, is relatively shallow, especially in its northern part, and the North Italian Plain is essentially a continuation of this depression now just above the level of the sea. The iEgean Sea occupies another area of subsidence ; it is " half-drowned," and the higher parts of the previously continuous mountain chains form the islands which appear as stepping-stones between the Balkan Peninsula and Asia Minor. The southern part of the Black Sea is another well-marked basin; the north-western edge of the deeper area is the line of shallows showing the earlier connection between the Balkan Mountains and those of the Crimea.

A less-marked basin is that between the Balkan Mountains and the Transylvanian Alps where the relatively recent deposits forming the Walachian Plain stand above sea-level, and thus resemble those of the North Italian Plain.

Broadly similar in origin are the lowlands between the Alps and the great curves of the Carpathian system.

The Alps themselves, and to a less extent other parts of the great fold-mountains, reach such heights that, during the Ice Age, they bore ice-sheets which overrode the highest parts, and

in the case of the western Alps extended into neighbouring regions. The complex results of glaciation in the Alpine Lands and the Alpine Forelands will be described in later chapters.

The effects of the geological history on other conditions than structure and relief are very great; we can here only hint at a few of the results. There is the existence of the Mediterranean and Black Seas which separate Europe from Africa and southern Asia; these seas have physical influences, such as their warming influence upon the winter climate of the neighbouring lands, and influences upon human life, such as the way in which they have enabled civilization to spread all around their habitable coasts.

Corresponding to the variety in the rock structure and the relief of southern Europe is the variety of resources which include mineral deposits, Alpine pastures, mountain forests, broad inland lowlands and hill-sides facing the seas, all capable of human utilization; thus the extraordinary complexity of the geological history has been followed by an extraordinary complexity in the conditions of human life.

6. The Russian Platform.—In eastern Europe the physical development and the human history have been quite different. The ancient rocks of the Baltic Shield dip gently south-eastward, and form the substratum of the great structural region known as the Russian Platform. Apart from its margins, where there are the Hercynian areas of the Ural and Timan Mountains and the Donetz Block, the whole area between the Caledonian Highland system and the fold-mountains of the Crimea and Caucasus has remained almost unaffected by the later disturbances, and the most important movements have been relatively slight alterations in its general elevation as compared with sea-level. Because of these alterations, the area has been covered by the waters of seas of varying extent, and hence the ancient rocks which continue those of the Baltic Shield are covered in the north-west of Russia by deposits of Palaeozoic age, while farther to the south-east these are followed first by Secondary, and then by Tertiary, strata.

But because these deposits have lain almost undisturbed, they have not been subjected to pressures which would have changed their character, and in general even the oldest remain in much the same condition as those of recent formation; stone

which could be used for building or road material is a rarity over large areas of Russia.

The region is not of uniform elevation ; the Valdai Hills are over 1,100 feet above sea-level and form part of the water-parting between the rivers flowing north-west to the Arctic and Baltic Seas and those flowing south-east to the Black and Caspian Seas. The greater part of eastern Europe is less than 600 feet in height, while the land immediately north of the Caspian and the surface of that great inland lake are below the general sea-level of the globe.

Moreover, there have occurred warpings of the underlying platform which, although very slight if measured in degrees of slope, when continued over the great distances of eastern Europe have important consequences. The most marked of these warpings occurs in the south-west, where it brings up to the surface a belt of granite (Fig. 1); through this resistant mass the Dnieper River has been able to cut its southward reach only incompletely, and there are rapids which prevented navigation, but gave water-power now used for industrial purposes.

It must also be observed that all the northern part of the region has been glaciated, with results similar to those found in the plains of the central and western parts of the continent.

Because of its uneventful history, the Russian Platform has in general lacked the formation of mineral ores. Apart from some coal in the Palaeozoic strata near Moscow and iron in the granitic belt, the chief minerals are in the Hercynian areas of the Donetz and the Urals, where industrial development can utilize resources lacking over most of European Russia.

One consequence of the geological history is of the first importance. Undisturbed by the great forces which have led to such a complicated relief in the rest of Europe, the east has remained open, level country in close physical association with the similar lands of western Asia, for the Ural Mountains do not form an effective barrier of any kind. Hence the climates of western Asia are continued across " Trunk Europe " about as far as " Peninsular Europe." Similarly, the belts of natural vegetation, i.e. the tundras, the forests, the steppe-lands and the semi-deserts, extend unbroken from Asia across eastern Europe. Consequently peoples who have adapted their ways of life to each of these types of vegetation have worked their way, either westward or eastward, along almost the whole extent of the

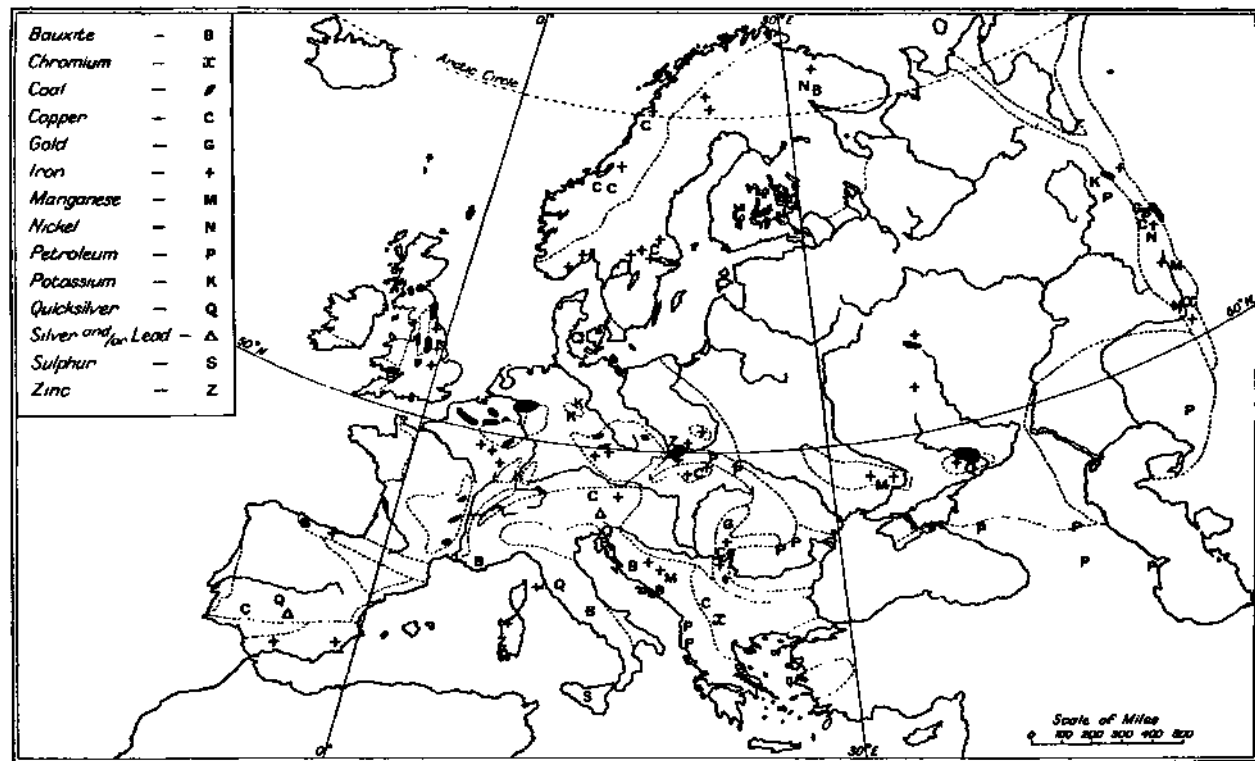


FIG. 6.—PRINCIPAL MINERAL WORKINGS.

Note.—There are also numerous lignite workings, especially in central Europe.

belts, and so kept western Asia and Trunk Europe in very close association from the human point of view.

7. The Caspian Basin.—Here is a region which is certainly more " Asiatic " than " European." It is a part of a great depression which includes the three inland seas : Caspian, Aral and Balkash. To this hollow flow the waters of the surrounding higher lands, and to the Caspian Sea the Volga brings the drainage from a large part of eastern Europe. With the water is brought down the material worn away by the rivers, and the Caspian Basin is covered partly by such recent alluvium and partly by deposits formed when a greater sea than the present one occupied the area.

Moreover, the formation of the Caspian depression, in causing the greatest river of Europe to flow, not towards the Mediterranean, but to the south-east, and to end in a lake without access to the oceans, has tended to hinder close association between eastern Europe and the remaining part of the continent.

QUESTIONS

1. How much knowledge of the Ice Age do you consider necessary in order to understand the present-day geography of the northern half of Europe ? Illustrate by reference to particular areas and their characteristics.

2. Certain parts of Europe may be referred to as being regions of " Alpine folding." Make a sketch-map showing these regions, and consider to what extent they have geographical, and not merely geological similarity.

3. What are the common structural characteristics of the " Hercynian Uplands," and how do these characteristics affect their utilization by man ?

4. Distinguish between four types of coast on account of their structure, and state their location in Europe. Give a description of any two of these types.

5. Define " Trunk " and " Peninsular " Europe respectively, and explain the fundamental causes of the contrasts between these areas.

CHAPTER II

CLIMATE

Wind Systems.—Over much of Europe, oceanic influences play a very great part in determining the climatic conditions, and the belts of wind systems which are developed over the oceans are therefore important. Since these belts lie in certain latitudes, the position of Europe as regards latitude must be first noted. *On its southern margin, Europe forms the northern part of the Mediterranean area; Gibraltar is about lat. 36° N. In the north of Europe the Scandinavian peninsula extends well beyond the Arctic Circle; North Cape is about lat. 71° N.*

As a consequence of this position, all the continent except the east, i.e. Peninsular Europe as distinct from Trunk Europe, comes under the influence of the great system of winds known as the "westerlies," which appear on wind maps as blowing from a more or less westerly direction, that is, from the neighbouring Atlantic Ocean, whose waters are exceptionally warm for their latitude because they have been brought from tropical regions by the Gulf Stream Drift.

It may therefore be deduced that the climate of Europe, in so far as it is determined by these westerly winds, is not only made equable, but on the average is exceptionally warm for its latitude; further, it may be deduced that these winds bring water-vapour which is precipitated as rain or snow over the land, especially on the windward side of the highlands.

But though there is truth in these ideas, there is the complication that the westerlies are not by any means constant, even in those parts where the maps show that the prevailing winds blow from the west in all seasons. In England, for example, the "prevailing" winds may be shown on a climate map as coming from the south-west, but this is the actual direction of the winds only for about 20 per cent. of the observations. Indeed, the most characteristic fact about the winds experienced in England is that they frequently change, depending upon the passage of low-pressure systems called "lows," "depressions" or, less

frequently, " cyclones," or upon the development of high-pressure systems or anticyclones.

Hence the belt of the westerlies may be usefully considered as a belt in which depressions are common and travel in a generally west-to-east direction. In these depressions are two main streams of air, one coming from a south-westerly or

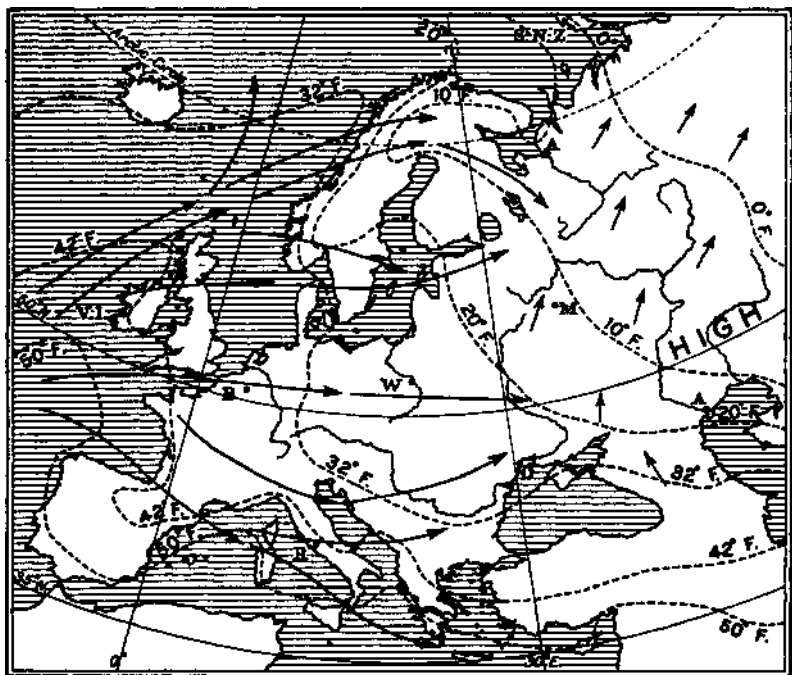


FIG. 7_JANUARY " LOW " TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean January temperatures reduced to sea-level.

southerly direction and bringing warmth and usually rain, the other coming from a north-westerly, northerly or easterly direction and bringing cool and dry weather. As the depressions pass over a given place, there are accordingly changes in the weather as the warmer and the cooler air-streams cover the area in turn ; on the whole, however, the " lows " bring rain, and on their southern side warmth, although cold weather may be found on their northern side. Since the centres pass most frequently over the northern part of Europe, it is their southern sections, with warmth and rain, which most affect the continent.

As the central parts of depressions are areas of low air-pressure, the regions over which they are most commonly found necessarily appear on maps showing the average barometric pressures as areas of lowest pressure, e.g. that between Iceland and north-western Europe.

On the contrary, anticyclonic conditions are marked by high

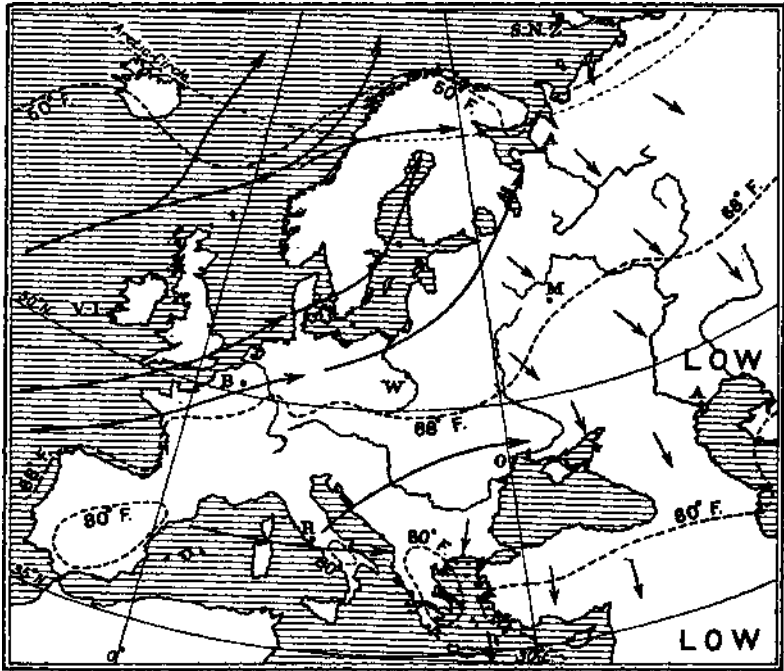


FIG. 8.—JULY "LOW" TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean July temperatures reduced to sea-level.

pressures, gentle winds or calms, and dry weather. Such conditions only occasionally develop within the belt of the westerlies, but they are more common on the southern side of this belt, that is, in the sub-tropical latitudes to the south of Europe, where the climate maps show relatively high average pressure.

Hence, one may shortly say that western Europe is in general under the influence of the belt of the cyclonic, rainy westerlies, while to the south of Europe lies the belt of sub-tropical calms and droughts.

The two belts, however, are themselves not always in the same latitudes, but shift with the sun, southward in winter and northward in summer. Consequently in winter the westerlies cover the whole of western Europe, and their depressions may fairly often pass over the Mediterranean area. In summer, on the other hand, the depressions leave the Mediterranean relatively free, especially in the east, and the south of Europe frequently experiences the calms and drought of the sub-tropical belt of high pressure.

In Figs. 7 and 8 the long arrows show the tracks commonly followed by the centres of "lows," but it must be understood that the area covered by a depression is normally very considerable ; if the centre passes over Berlin, for instance, its influence would probably extend from central Scandinavia in the north to the northern Adriatic in the south. Bearing this in mind, it will be seen from the maps that in winter cyclonic conditions characterize the whole of Peninsular Europe, while in the summer they are generally less frequent, particularly in the Mediterranean region.

In eastern or Trunk Europe the depressions have less influence, for they tend to pass over seas rather than lands, and when they do penetrate the great land-mass, they diminish in intensity. The climate of eastern Europe is therefore more closely related to that of Asia ; it is marked by a reversal of the conditions as between summer and winter which is associated with the monsoonal changes of the greater continent.

In summer the heat sets up a system of continuous low pressure over Asia towards which the winds blow inwards, though deflected, by the earth's rotation, to the right of the most direct path ; consequently in the east of Europe they commonly blow from a more or less north-westerly direction, as is shown by the short arrows in Fig. 8. Even in the eastern Mediterranean this influence is felt, and the prevailing northerly winds of this season were there known to the ancient Greeks as the " Etesian " or " annual " winds, whose onset marked the beginning of uninterrupted easy navigation for their small ships.

In winter the continental land-mass is cooled, high pressure is more continuously developed and the air tends to move outward. The winds, deflected to the right of their direct outward path, usually blow from a more or less southerly direction over most of eastern Europe (see Fig. 7), though in the Mediter-

ranean region they are more frequently interrupted by the passage of cyclones.

Temperatures.—The wind systems combine with the direct heating effect of the sun to determine the temperature conditions,

In the summer the sun's direct influence is the greater, as may be seen from Fig. 8, in which are shown the isotherms drawn from the records of the mean monthly observations of air temperatures in July. (To simplify the maps, the temperatures have been reduced to sea-level; consequently the uplands and highlands have cooler conditions than are indicated.) Where the sun is relatively high in the sky, that is, in southern Europe, the heat is greatest, and over the southern parts of the three peninsulas the lowlands have mean temperatures at, or even over, 80° F. during July. In the far north the temperatures are at about 50°. The course of the isotherm of 68° is worth noting: in the Atlantic area it is well to the south of latitude 50°, for the ocean is relatively cool; in eastern Europe it passes considerably to the north of this latitude because the continental mass is greatly heated by solar radiation; in central Europe the isotherm runs almost along the line of latitude, and places east and west of one another have about the same summer temperatures.

It is convenient to say that when the mean temperature is above 68° F. (20° C.) the climate is "hot"; when between 68° and 50° F. (20° and 10° C.) it is "warm"; when between 50° and 32° F. (10° and 0° C.) it is "cool"; and when below 32° F. (0° C.), it is "cold." Adopting these terms, we may point out that the temperature map shows that in July the climate of most of Europe south of latitude 50°, together with all south-eastern Russia, is hot, that of most of Europe north of latitude 50° is warm, but the lands adjoining the Arctic Sea are cool.

The January map indicates marked contrasts, for in the latitudes of Europe the winter sun is visible for a shorter time in the day and is lower in the sky than in the summer; consequently the sun has much less effect and the winds have relatively more influence, as they bring warm air from the Atlantic Ocean.

The isotherm of 50° is now the highest and, away from the Atlantic, only the southern Mediterranean lands have this temperature. This is due partly to the latitude and partly to the influence of the Mediterranean Sea itself, for this sea remains remarkably warm in the winter because it is shut off

TABLE OF CLIMATIC CONDITIONS

Climate Stations		Lat. N.	Height above Sea-level (Feet)	Temperatures (Deg. F.)				Precipitation (Inches)				
				Mean Monthly		Mean Annual		Annual Total	Seasonal Totals			
									Win. D.J.F.	Spr. M.A.M.	Sum. J.J.A.	Aut. S.O.N.
				Jan.	July	Min.	Max.					
Arctic	South of N. Zemlya	72	50	2	44	—	—	6	0.9	0.8	2.2	1.7
Boreal	Haparanda	66	10	11	59	—27	81	19	4.0	3.2	5.4	6.6
	Archangel	65	50	8	60	—32	84	17	2.5	2.7	6.6	5.0
Sub-boreal	Stockholm	59	150	27	62	—2	83	21	4.6	4.2	7.0	5.5
	Moscow	56	500	12	66	—17	88	21	3.5	4.6	7.7	5.2
Oceanic Temperate	Bodo	67	10	30	55	7	75	36	9.1	6.3	7.7	12.5
	Bergen	60	70	34	59	12	79	84	24.5	15.2	17.6	27.0
	Valentia Is.	52	30	45	59	28	72	56	17.3	11.4	11.8	15.2
	Brest	48	180	43	64	23	90	32	9.5	6.2	6.2	10.6
	Santiago	43	890	45	66	28	95	65	21.7	17.1	6.9	19.1
Mid-Temperate	London	51	20	39	63	18	88	25	5.6	5.2	7.3	7.0
	Brussels	51	200	34	63	14	88	30	6.6	6.0	8.7	8.3
	Paris	49	180	37	65	12	93	21	4.1	4.8	6.0	5.9
	Karlsruhe	49	390	33	66	8	91	38	7.3	8.7	12.1	9.7
	Lyons	46	570	36	70	10	95	40	7.0	8.7	10.1	11.1
	Milan	46	480	34	75	14	93	40	7.7	10.2	9.3	12.5
	Bordeaux	45	250	41	68	18	95	33	8.0	8.0	7.4	10.0
Interior Temperate	Konigsberg	55	20	27	63	—2	90	25	4.1	4.6	8.8	7.8
	Berlin	52	160	31	64	7	91	23	5.0	5.0	7.6	5.1
	Warsaw	52	440	26	66	6	90	22	3.8	4.7	8.5	5.0
	Munich	48	1,700	27	63	0	86	35	4.8	8.6	14.2	7.6
	Budapest	47	500	28	70	10	91	25	4.6	7.0	7.0	6.7
	Sona	43	1,800	27	69	2	95	26	4.3	7.1	8.0	6.2
Mediterranean	Genoa	44	180	45	75	28	90	52	13.2	11.7	6.9	20.3
	Marseilles	43	250	43	72	21	91	22	5.2	5.2	2.8	8.3
	Borne	42	160	44	77	27	95	32	9.8	7.7	3.2	11.9
	Oporto	41	270	48	67	32	93	48	15.8	13.4	3.4	15.4
	Madrid	40	2,100	40	76	18	104	16	4.0	5.4	2.1	4.9
	Valencia	39	70	49	75	32	99	19	4.5	4.8	1.6	8.2
	Palermo	38	230	50	76	39	99	29	11.7	6.7	1.5	9.3
	Athens	38	350	49	81	28	100	15	5.9	2.9	1.4	5.2
Steppe	Orenburg	52	360	4	72	—23	97	15	3.1	3.3	5.0	3.7
	Odessa	46	210	26	73	0	91	16	2.9	3.5	5.6	4.1
	Bucharest	44	280	25	73	—4	95	23	4.0	6.2	8.0	4.9
Arid	Astrakhan	46	—50	19	77	—15	97	6	1.3	1.5	1.7	1.3

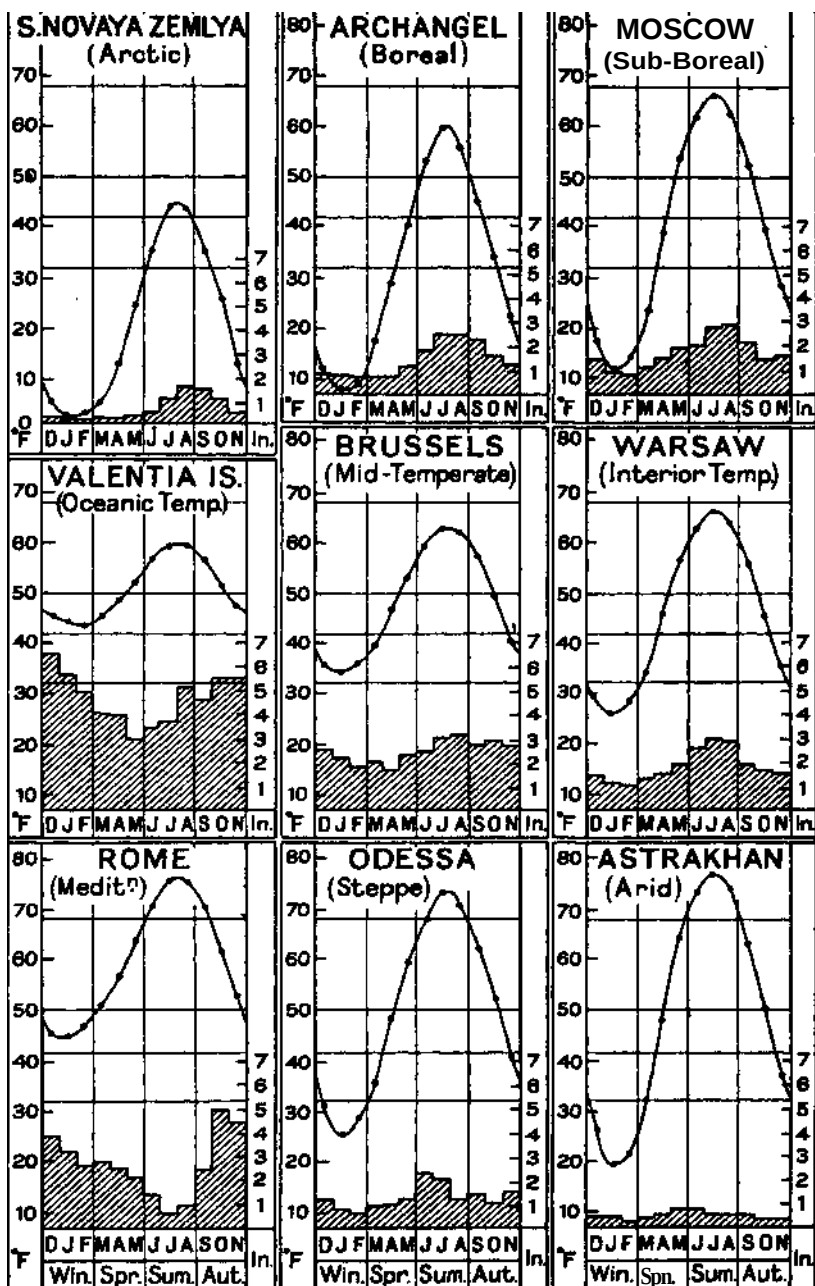


FIG. 9.—TEMPERATURE AND RAINFALL GRAPHS OF CLIMATIC TYPES.

from the cold waters in the depths of the Atlantic by the narrow and shallow entrance at the Strait of Gibraltar.

Most of the other isotherms of the January map have a course broadly similar to that of 50° : in the Atlantic area they run from north to south, showing that the oceanic west is warmer than the continental east, while towards the interior of Europe they run more from west to east because it is colder in the north, where the sun has very little effect.

The isotherm of 32° F. is of special interest, for it marks out an area to the east and north of it where, during a normal January, the average temperature is below freezing-point. As a consequence, within this area, precipitation in January normally takes the form of snow instead of rain, and if the snowfall is heavy there is a snow-cover to the land lasting for at least a month. Moreover, except in a narrow belt adjoining the course of the isotherm, inland waters are normally frozen over and harbours are closed by ice for a month or more ; the chief exception to this latter rule is that the warm Atlantic waters drifting along the coast of Norway keep the harbours of all the west coast of Scandinavia open throughout the year. The extremely cold winters in north-eastern Europe should be observed ; in the neighbourhood of the northern Ural Mountains the mean temperature in January is 0° F., i.e. 32° below freezing-point.

Employing the terms " cool," " cold," etc., as stated above, we may summarize the conditions in January by saying that in eastern Europe as a whole, together with most of Scandinavia and the eastern part of central Europe, the climate is cold ; in most of western Europe it is merely cool, while the south of the Mediterranean area has even warm conditions in this month.

By comparing the mean temperatures in January with those in July, as shown either on the maps or in the table on p. 26, it may be seen to what extent the climate of any place may be regarded as extreme or equable. Subtracting the figure for January from that for July, the annual range is obtained : e.g. for Valentia Island it is only 14° , for Warsaw it is 40° and for Moscow it is 54° . A climate with an annual range of about 30° or less may be regarded as equable, and western Europe as a whole and most of the coast-lands around the Mediterranean Sea have an equable climate. One with an annual range of over 40° is extreme, and all eastern Europe has an extreme climate.

Between these well-marked types comes central Europe, transitional in this respect.

The map of mean temperatures for January shows the average reading of the thermometer in that month, but the actual conditions are at some times above, and at other times below, this average ; hence the winter temperatures are at times more severe than the mean temperature suggests. The lowest temperature which is normally experienced in winter (i.e. the average of the lowest taken over a number of years) is called the mean annual minimum, and for certain stations is given in the table on p. 26. In this table it will be seen that, for example, while the mean January temperature at Moscow is 12° F. (20° below freezing-point), the mean annual minimum is -17° F., i.e. 29° lower (49° below freezing-point). Again, at Archangel the normally lowest reading in January is -32° F. (64° of frost).

Similarly the July map shows the mean temperatures for that month, but the summer temperatures actually rise much higher than these ; the table shows that while at Moscow, for example, the mean July temperature is 66° F., the mean annual maximum, which is the mean of the highest July readings, is 88° F. In the south of Europe the mean annual maximum at Athens is 100° , and at Madrid it reaches even 104° F.

All the conditions hitherto considered relate to those of the coldest or hottest months, but it is also important to know what is happening during other times of the year. This is to some extent shown by the graphs in Fig. 9, which indicate by dots the mean temperatures of each month and join these by curves depicting the normal " march of temperature " throughout the year. From such curves useful deductions may be made ; for instance, at Moscow the mean temperature falls below freezing-point (shown by the line at the level of 32° F.) about the beginning of November and does not rise above it until about the end of March ; we may therefore conclude that normally there is a period of frost lasting about five months. Similarly it may be deduced from the graphs that the period of frost at Archangel is about six months, while at Warsaw it is rather more than three months ; a map showing by lines the lengths of the normal period of frost in all parts of Europe is given in Fig. 10.

Another example of the deductions that can be made from graphs of the normal march of temperature is the duration of the " warm " period, i.e. the time during which the mean

temperature is above 50° F. (10° C). At Valentia Island, off south-west Ireland, the curve rises above the 50° F. line at the beginning of May, and falls below the 50° F. line again near the end of October; the warm period therefore lasts about six months; compare the curve for Archangel, where the warm period lasts only about three months. A map showing the

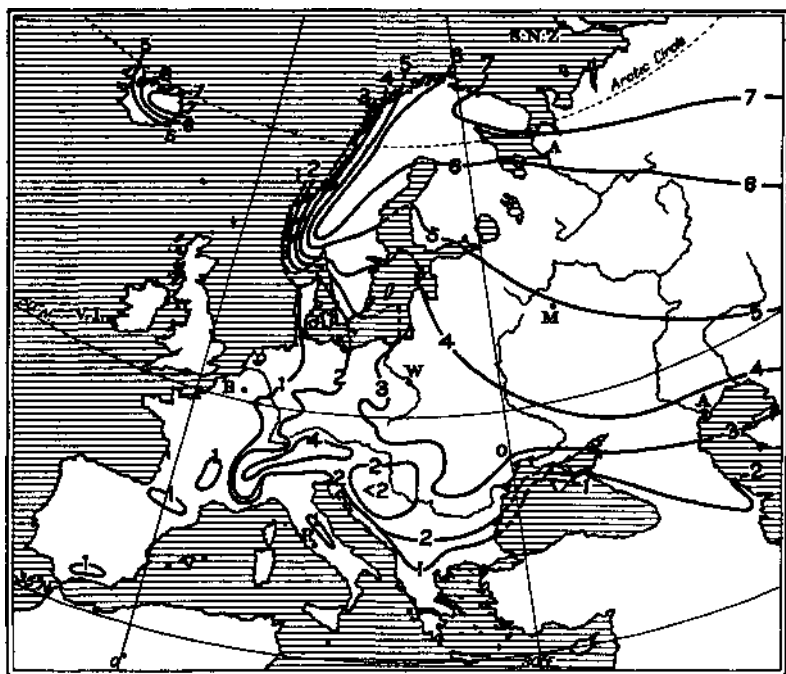


FIG. 10.—DURATION OF FROST PERIOD.

Note.—The lines show the number of months during which the mean temperature is below freezing-point (32° F., 0° C), the calculations being based on actual temperatures (not reduced to sea-level). On the Alpine margins the lines of 3 and 4 months are so close that the former has been omitted, and for a similar reason the 1-month and 2-month lines have not been separately indicated on the margins of the SE. Alps and Dinaric Alps. Note that the area of the Central Danubian Lowlands, marked < 2, has a period of less than two months of frost.

duration of the warm period in all parts of Europe is given in Fig. 11.

From the point of view of the relation of climate to plants the mean temperatures for the hottest month give a very inadequate idea of the temperature conditions which affect growth. For example, the figures for July show that the mean midsummer temperature is about the same at Valentia Island as at Archangel, and yet the graph shows that the warm period is twice as long at the former place as at the latter.

An important fact regarding the relation of climate to plant-life is that for a number of plants growth can begin only when the mean temperature rises above about 42° F. (6° C.). This level is shown by another horizontal line on the temperature graphs, and it may be deduced from the curves that, for example, wheat can begin to grow earlier at Brussels than at Moscow, although the latter place has a higher midsummer temperature.

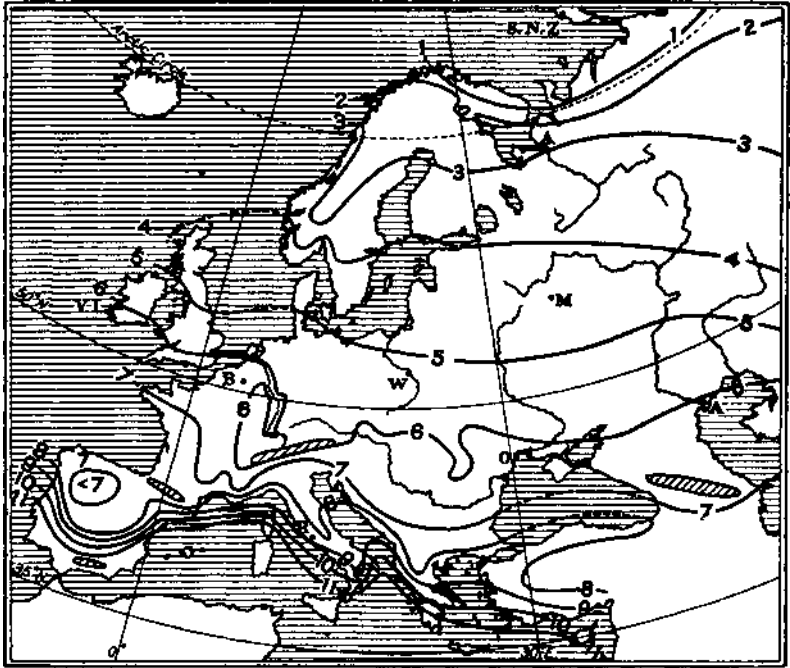


FIG. 11.—DURATION OF WARM PERIOD.

Note.—The lines show the number of months during which the mean temperature is above 50° F. (10° C.), the calculations being based on actual temperatures (not reduced to sea-level).

Conditions in the Alps and other high mountain regions vary so greatly that these areas have been excluded from the map. Note that in the interior of Spain an area marked < 7 has a period of less than seven months of warmth.

Precipitation.—The next element of climate to be considered is precipitation in the form of rain or snow, and this study may well be begun in connexion with the wind systems for July and January respectively.

In July, depressions advance from the Atlantic over northern and central Europe, and since in them the warmer air from the Atlantic rises, it is cooled and water-vapour is precipitated in the form of "cyclonic rains." In eastern Europe the prevail-

ing winds come from the north-west, and have sufficient water-vapour for rain to occur, although in less amount than in the west (see Fig. 13). The greatest precipitation is on the highlands which compel the air currents to rise and to produce "relief rains." In the Mediterranean region and in southern Russia depressions seldom occur, and cyclonic rains are therefore slight, though relief rains give a rather better water-supply

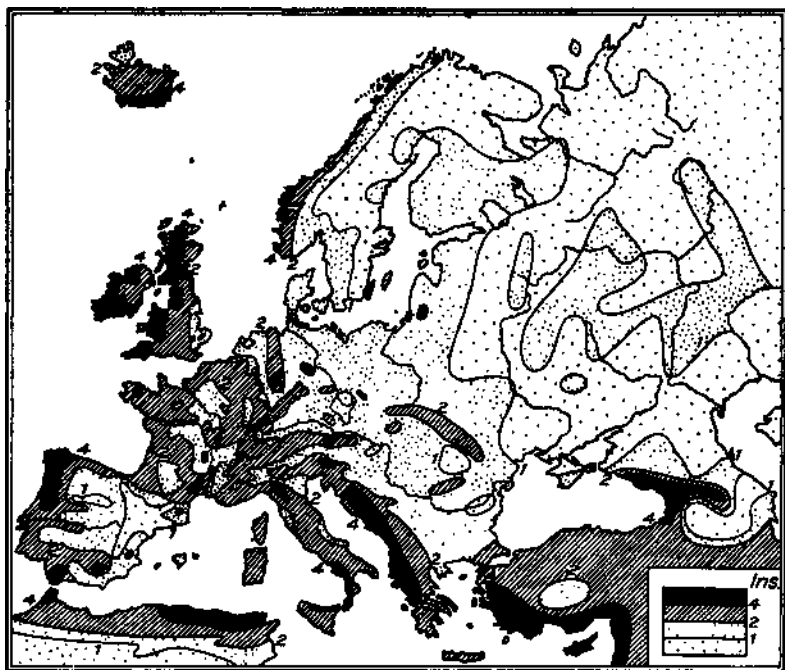


FIG. 12.—MEAN JANUARY PRECIPITATION.

to the mountains, especially to the Caucasus. In the far north there is little rainfall, even in connexion with the depressions, for the cool air can hold but little water-vapour and though the air is further cooled by ascent only a small precipitation can result.

Where cyclonic influence is weak, settled weather is the general rule, but during a period of such weather in summer there may occur thunderstorms and heavy rains, due to the relatively great heating and the consequent rising of the air in particular localities ; such " convectonal rains " account for a considerable proportion of the precipitation in central and eastern Europe.

In January, depressions normally affect the whole of the continent except the extreme east, and where the air is warm enough to contain much water-vapour, precipitation may be considerable. This is the case particularly along the Atlantic margins, where there are the heaviest rains, and in the Mediterranean region ; moreover, on the highlands relief rains add to the total (see Fig. 12). But away from the relatively warm areas adjoining the Atlantic and the Mediterranean the air is so

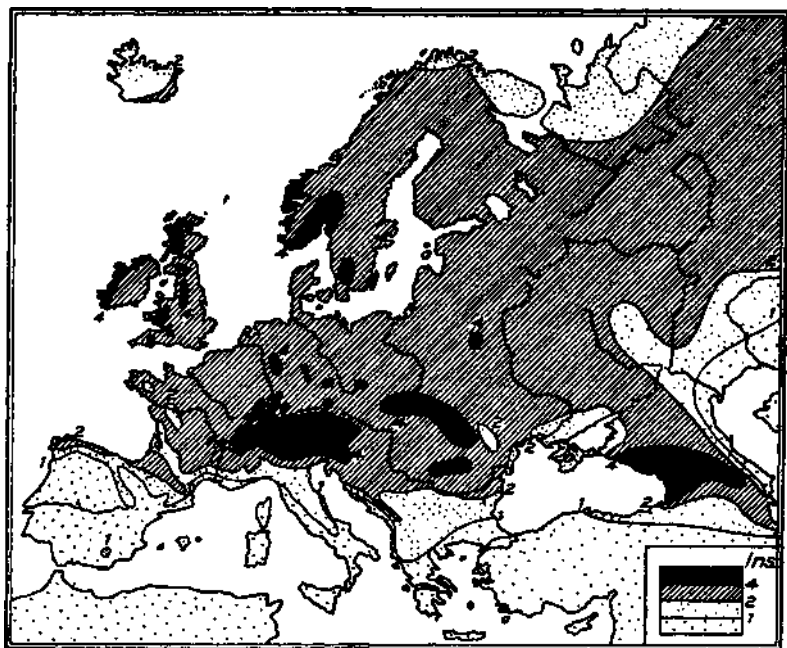


FIG. 13.—MEAN JULY PRECIPITATION.

cold that it can contain little water-vapour and precipitation is generally slight, though relief rains, or falls of snow, occur on the highlands. (In reading maps or statistics of precipitation, it must be remembered that in their compilation one foot of snow is taken as the equivalent of one inch of rain.) In eastern Russia the cold, out-blowing air from the Asiatic high-pressure area is necessarily dry, and this part of Europe would be rainless in winter but for occasional depressions.

The maps for January and July are in general indicative of the whole of the winter and summer seasons respectively ; this

can be seen by the rainfall graphs in Fig. 9, in which the three winter months of December, January and February and the three summer months of June, July and August are marked off by vertical lines.

The rains of spring and autumn are equally important, but as they are to a considerable extent transitional between the more extreme conditions of winter and summer, they are more evenly distributed over the continent. Near the Atlantic and in the Mediterranean region, however, the autumn rains are frequently heavier than those of any other season. These statements about the rainfalls of spring and autumn should be verified by examining the graphs for the stations given in Fig. 9 and the accompanying page of statistics.

A useful summary of the distribution of precipitation during the year at any particular place can be made by adding together the amounts in each group of three months to get the totals for the four seasons respectively, and this has been done for certain places in the table on p. 26. Further, the total for the whole year for the selected stations is given in the same table, and the distribution of the total annual precipitation over the continent is shown by the map in Fig. 14.

By putting together the facts given in the maps, the graphs and the table, a fairly complete idea of the precipitation can be obtained, and some of the main conclusions may be summarized as follows : (i) The regions adjoining the Atlantic have a heavy rainfall fairly well distributed through the year, although greatest in autumn and winter, (ii) Central Europe has an annual total varying according to elevation, considerable on the highlands and moderate on the lower lands ; on the whole, the rainfall is fairly evenly distributed through the year, although the greater amounts occur in summer and autumn and the tendency to a summer maximum increases towards the interior, (iii) Eastern Europe, including most of Scandinavia, has a rather small total precipitation with a summer maximum, and in the extreme north-east and south-east the amounts at all seasons are very small indeed, (iv) In the Mediterranean region the total annual rainfall varies from being very considerable on the highlands behind the Adriatic to being very slight over most of eastern Spain, but the common characteristic is that of summer drought; in the northern part of the Mediterranean region the period of drought is short, but towards

the south the period becomes longer and the intensity of the drought may be severe.

Indeed, throughout all southern Europe, including the south of Russia, the summer is normally a time of drought, for the high temperatures cause rapid evaporation, and the efficiency of what precipitation may occur is thereby greatly reduced. Conversely, in northern Europe evaporation is much less and the rainfall is correspondingly more effective.

Another important consideration is the variability of the rainfall from year to year. This variability is, in the main, greatest where the total amounts are least, and it is consequently quite considerable in the east and in some parts of the Mediterranean region. Moreover, while in a well-watered region a decrease from the average is not a serious matter, in the areas of scanty rainfall it may have calamitous results; thus, in particular years the normal summer drought of the Mediterranean may be unusually prolonged and may even become disastrous, while in southern Russia in years of sub-normal rainfall harvests fail and famines result.

One more point must be noted: when there is little rainfall either during the whole year or during one season of the year, that rainfall tends to occur in short, sharp downfalls; this is frequently the case in the Mediterranean region and with the summer thunderstorms of eastern Europe. A rapid fall means that the immediate run-off of water to the streams is great, and the plants cannot use so much of it; also, after the rain bright weather quickly follows, and evaporation may dispose of much of the water and thus further reduce the value of the already small precipitation. The rapid run-off, moreover, tends to wash away the soil, and therefore soil erosion is a serious factor in the utilization of the Mediterranean and other areas of short and sharp rainfall.

Other Climatic Elements.—The frequent passage of depressions over the Atlantic margin has effects upon the climate of that region besides the equability of the temperature and the heavy precipitation; there are, for instance, the facts that the winds are often violent and the sky covered with cloud. On the contrary, the relative absence of depressions in the Mediterranean region, even in winter, allows a clearness of the sky and an abundance of sunshine which are important factors in attracting visitors from north-western Europe. Similarly eastern Europe has in general clearer skies than the west.

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A SYSTEMATIC REGIONAL GEOGRAPHY

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VOLUME II

EUROPE

BY

J. F. UNSTEAD, M.A., D.Sc.

**FORMERLY PROFESSOR OF GEOGRAPHY IN THE
(UNIVERSITY OF LONDON)**

**WITH NUMEROUS MAPS AND
DIAGRAMS SPECIALLY PREPARED
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PREFACE

THIS study of the lands and peoples of Europe is written primarily for the use of students taking " Intermediate " or " General " courses towards a University degree, " Higher School " examinations, or courses in Training Colleges.

It aims at providing a twofold training : in the first place it not only presents facts but points out their significance and how they may be correlated ; in the second place, it shows the interaction between the facts of geography and those human affairs, economic and political, which are the concern of all.

From both points of view a study of Europe is important. To the geographer, this continent offers a great variety of conditions within an area small enough to be studied in some detail and with some approach to actuality. To every man, the economic and political affairs of Europe influence his own life whether he lives within the borders of the continent or beyond the seas.

Yet a study of Europe involves considerable difficulties, for it is scarcely too much to say that it confronts one with a mosaic of geographical units, a jig-saw puzzle of nationalities and a kaleidoscopic picture of States ; one has to work out a method of recognizing order and causation in this complexity, for the three factors cited above overlap and conflict in a most confusing manner. In many cases, the natural unit of the geographer, e.g. the Rhine Rift Valley, the Alpine Highland or the Lower Hungarian Plain, is inhabited by people of more than one nationality and divided among two or more States ; again, the fact that the limits of the nationalities by no means correspond with those of the political divisions is the origin of some of the most serious problems of Europe.

Because the various States bear so little relationship to geographical regions, and also are liable to sudden and catastrophic changes, it seems to the writer impracticable to arrange a study of Europe according to the political divisions ; hence this book has three parts.

Part I makes a general survey of the continent as a whole—its relief and structure, its climates, soils and vegetation, the

types of land-utilization and production and, by combining these factors, the major geographical regions; at this stage, also, a general survey of the peoples and States of Europe is given. The broad pattern of the distribution of the physical and human elements is thus brought out.

Part II presents a more detailed study on the basis of the natural or geographical regions which comprise the continent : the major and minor regions and, except in eastern Europe, the sub-regions. These are treated as units, and in each the interrelations of the physical and human factors are considered. This is the longest section of the book, and in it the economic conditions are given special attention.

In Part III each of the States is dealt with in turn. Their physical and economic foundations are reviewed, the peoples who form their populations are considered, and an examination is made of the boundary changes of recent years and of those international problems which are either influenced by geographical factors or have geographical effects. In this section, facts are stated without prejudice, causes and consequences are pointed out, but judgments are deliberately withheld as unsuitable to a geographical text-book.

The relative space allotted to the various parts of the continent has been determined partly according to their importance as the homes and work-places of large populations or of characteristic groups of people, and partly according to the nearness to Britain.

A large number of maps have been specially drawn to illustrate the text. These deal with all aspects of the geography, but the available space has been used to supplement, not to duplicate, the maps to be found in atlases; it is assumed that an atlas will be constantly used with this book.

Questions have been added, in many cases designed to require a reconsideration of the facts and ideas already given and to promote individual thought.

The writer cordially thanks Mr. L. Brooks, M.A., Mr. G. J. Cons, M.A., Professor C. B. Fawcett, Dr. H. A. Matthews and Dr. S. W. Wooldridge, who have each read the draft of parts of the book and have given advice which has been gratefully accepted.

J. F. U.

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NOTE

IN March, 1939, while this book was being printed, the State of Czecho-Slovakia was dismembered ; Germany established one Protectorate over Bohemia and Moravia and another over Slovakia, while Hungary annexed Ruthenia (Carpatho-Ukraine). The political boundaries on the end-paper maps have been altered to conform with these changes, and on pages 344 and 345 the geographical consequences are described in such a way as to bring Part III of the book up to date. The statements made in Chapter XIX regarding the States of Germany and Hungary must therefore be modified by the facts given on pages 344 and 345.

The account in Chapter XIX of the conditions of Czecho-slovakia, as it was just before March, 1939, explains the fundamental political and economic factors in the problems and relationships of the three States ; many of these factors, though modified in certain respects, still remain and are still important in the human geography of Central Europe. Similarly, the map of the earlier boundary changes in Czecho-Slovakia (Fig. 80) is still useful in showing important features of the areas which have now passed into the possession of Germany and Hungary.

In April, 1939, following disagreement between the governments of Italy and Albania, Italian troops overran Albania. The King fled, a group of Albanians offered the Crown to the King of Italy, and the two States were thus united.

April, 1939.

PART I

EUROPE AS A WHOLE

CHAPTER I

RELIEF AND STRUCTURE

Introduction.—If we want to understand the nature of any region and the manner of life of its people, and we trace back to the reasons for the facts, we find that the most fundamental consideration is the position of the region in the world—its situation on the globe.

That position has, in the past, determined the way in which the region has shared in the great earth movements which have, for example, raised some areas to broad highlands, subjected some to foldings producing mountain systems, or lowered others, in some cases even below sea-level; in other words, the position has determined the broad features of the relief and structure of the region.

The main characteristics of the climate are similarly due to its position on the globe, which exposes the area to the influence of the sun and to that of one or more great wind-systems, while the relief also influences the climatic conditions.

Climate and relief together are directly or indirectly the chief factors conditioning the type of vegetation which can live in the region, and this in turn has a great influence on the agricultural and pastoral work by which many of the people get their living.

Of course, the environment of a people does not *determine* their work, nor their particular manner of life, for different peoples are at different stages of development and have different traditions and habits. Yet the position of a region in relation to other regions, either near at hand or far away, has been one of the main factors in aiding the immigration of peoples and ideas, and so affecting the character of the population and their mode of life. Moreover, the incentives and opportunities which their environment may offer influence their further development.

The position of regions may therefore be regarded from several points of view, and in each of the earlier chapters of this book, which deal with the general characteristics of Europe and its peoples, we shall examine the position of the continent from the particular aspect with which we are concerned. Accordingly, we will now consider how the varied relief and structure of the continent are related to the situation of its constituent regions.

A relief map of Europe shows at once a marked contrast between the relatively level and unbroken east, and the remaining part of the continent which is diversified by many uplands and lowlands and, moreover, is divided by invasions of the Atlantic waters and by inland seas. This fundamental distinction as to relief and outline affects practically all aspects of the physical and human geography of the two contrasted regions, known sometimes as "Trunk Europe" (because it forms part of the great trunk of the Euro-Asiatic land-mass) and "Peninsular Europe" respectively. The cause of the contrast lies in the fact that whereas eastern Europe is situated in a part of the globe which has been relatively stable through much of its geological history, the rest of the continent has been involved in repeated disturbances and dislocations of the crust of the earth.

In Peninsular Europe, on the north-west margin of the continent, one group of highlands stands out clearly and will be first considered.

The North-western Highlands.—The Highlands of Scotland-and-the north of Ireland resemble in many ways, though on a smaller scale, the Highlands of Scandinavia because they have shared the same geological history."

Some of the rocks comprising these regions were formed before the Palaeozoic Era, i.e. before any life appeared upon the earth ; even at that time the surface was contorted, and these earliest rocks were folded into great mountain ranges, but of these denudation has by now removed all but the deepest roots.¹

During the Palaeozoic Era other rocks were formed, and in the Devonian Period there occurred a series of dislocations of the earth's crust which were called the " Caledonian " earth-movements because their effects were studied in the structure of Scotland. At this period the rocks were subjected to great

¹ A time-sequence of the geological periods and the great earth-movements is given in Appendix I.

foldings in a general south-west to north-east direction. As a result the Caledonian mountain system arose, which extended over all the region now forming the north-western margins of Europe (see Fig. 1), including Spitsbergen far to the north of Scandinavia. In the course of these disturbances much of the rock was metamorphosed into crystalline forms, including schists and gneisses, while there are also large areas of granite, gabbro and other resistant igneous rocks.

From this period onward through the Secondary Era the great mountain system was worn down to the condition of a peneplain, and only its stumps remained. Then, in the "Alpine" earth-movements of the Tertiary Era, the region again suffered disturbance, this time by faulting and the uplift of some of the resultant dislocated blocks and the subsidence of others. At this time, too, that part of the earth's surface now under the Atlantic waters was detached from the continental platform from which the lands of Europe rise, and the present shape of this margin of Europe was determined.

On the continental side, the blocks were raised probably in more than one stage, so that a low terrace-like step was formed between the sea and the great plateaus which in the Dovre Fjeld now reach over 7,500 feet and in the Jotun Fjeld over 8,000 feet (see Fig. 2). Moreover, the area was dislocated by faults running in several directions, and along these cracks there occurred both subsidences and also lines of weakness along which rivers eroded deep valleys in the plateaus.

Through such cracks and vents in the earth's crust, the pressures associated with the Alpine disturbances forced volcanic material in a number of places, and the Faroe Islands and Iceland in the far north-west are almost entirely formed of these volcanic accumulations.

In the Ice Age, snow accumulated on the high plateaus and ice was formed which worked its way down the valleys, deepening them and changing their section from V-shape to U-shape. In many other ways, too, glaciation played a part in producing the present relief; and its general importance is so great that we may at this point consider it further, although its influence extended far beyond the limits of the North-west Highlands.

At one stage the climate was so cold and precipitation was so great that the great ice-sheet from the Scandinavian Highlands and the smaller ones from the British Highlands extended south-

ward as far as the broken line marked as the maximum extension of the ice on the map showing the distribution of glaciation (Fig. 3). After this period, the climate became warmer, the southern part of the ice-sheet gradually melted and its edge lay progressively farther north ; this continued until the climatic improvement ceased and the margin of the sheet remained in the same position. Here lines of terminal moraine, composed of boulders, gravels, sands and clays, marked the end of this stage in the retreat of the ice. In the area between the outer margin of the earlier ice-sheet and the terminal moraines, there was now visible a layer of boulder-clay, the ground moraine formed below the ice in its wider extension. Also, melted ice-water washed away clayey and sandy material from the later terminal moraines, and much of this was deposited upon parts of the ground moraine ; occasionally such sheets of gravel and sand covered considerable areas. At later periods, with other climatic changes, the ice-edge withdrew farther, and the various stages in the retreat of the ice are therefore marked by alternations of lines of very irregular and often hilly terminal moraines, and flatter stretches of clayey or sandy character. Since the farthest southward advance of ice occurred, there has elapsed sufficient time for streams and weathering to reduce considerably, and to smooth out to some extent, the glacial deposits, but some of the later series remain so little affected that they dominate the landscape and largely control the way in which man uses the land.

An important effect of the ice was to obstruct or alter the courses of the streams, and in many parts this is now shown by rapids in the rivers and by the presence of lakes or swamps. Immature river-development and poor drainage are frequent characteristics of glaciated regions.

In general, the areas from which the ice worked its way outward are those in which its scouring action predominated, while the marginal areas of glaciation are those of deposition. Hence, over parts of the North-western Highlands region the soil was completely worn away and bare rock is the witness of the action of the ice, while in other parts are the coarse gravels and sands of the later terminal moraines. Taken as a whole, in the northern regions glaciation has made surface conditions more difficult for man's occupation and use ; on the other hand, some of the glaciated regions of central and western Europe have

benefited by the finely ground and fertile material brought from the north.

Another very important element in the evolution of the North-western Highlands was a succession of changes in the relative level of land and sea which have occurred several times since the Alpine dislocations, and are still in progress. These changes

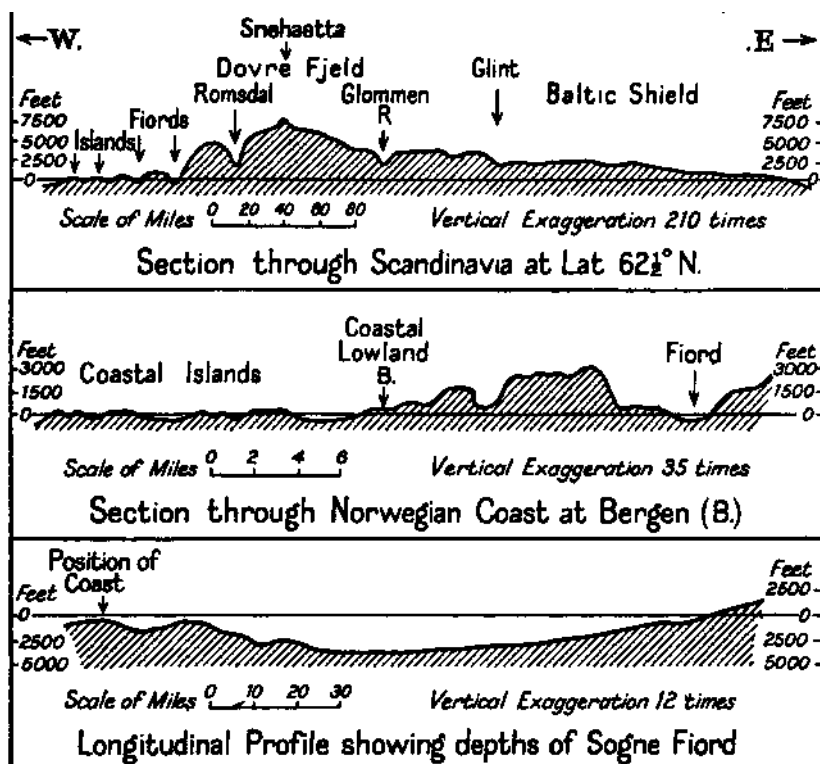


FIG. 2.—SECTIONS SHOWING RELIEF OF SCANDINAVIA.

may be due either to alterations in the level of the sea or to the slow risings, sinkings or tiltings of the land masses; in this part of the world the broad result has been a general sinking of the continental margin as compared with the Atlantic waters, and consequently the shores have been partially "drowned." The low terrace off the Norwegian coast has been reduced either to several small archipelagoes or to narrow patches of lowland extending beyond the highlands (see middle section in Fig. 2).

Also, the lower parts of the valleys, whether due to faulting, to stream erosion, to scraping and deepening by ice, or to a combination of these processes, have been invaded by sea-water and have become the wonderful fiords, with great side-branches leading inland, in some cases for scores of miles. Usually the fiords have steep or even vertical sides, rising to many hundreds of feet, while below the quiet waters are corresponding depths (see bottom section in Fig. 2). Apart from the narrow patches of coastal lowland the only habitable areas are either at the heads of the fiords or at the sides where old terraces interrupt the mountain slopes ; they give landing-places when they are at the water-level, and fields and pastures when they are a little above it.

The influence of this history and its resultant land-forms on human occupation will be considered in detail later. Yet it may be at once observed that it is in the main unfavourable, although the indented coast affords harbours for seafaring. Less obvious is the fact that the enormous amount of denudation has brought the surface of the earth down to the level of the minerals, originally formed in the depths, and now able to be reached by man ; iron and copper ores are therefore among the rather scanty resources of the Scandinavian Peninsula (see Fig. 6).

Another very important result of the geological history is the modification of climatic conditions by the upraised continental margin bordering the ocean. The precipitation of rain or snow is concentrated, as it were, along the coast and on the neighbouring mountains, while in the lee of the great barrier the Baltic lands are relatively dry. Similarly, the moderating influence of the oceanic winds is mainly limited to the Atlantic margins ; behind the highlands continental conditions at once begin, and from Sweden right across north-eastern Europe and far into northern Asia extend regions where the long, severe winters allow the growth only of the tundra or coniferous forest vegetation.

. **The Baltic Shield.**—The Scandinavian Highlands descend, often by a marked drop, known as the Glipt (see Fig. 2), to a great region which dips gently eastward under the Gulf of Bothnia and rises again in Finland, thence sinking in northern Russia till its border is largely covered by the waters of the Arctic Sea, the White Sea and Lakes Onega and Ladoga. Because this

region is slightly concave towards its centre under the northern arm of the Baltic Sea, and thereby resembles an inverted shield, it has been termed the Baltic Shield. It is one of the most ancient land surfaces on the globe, for it is composed of highly resistant granites, gneiss and crystalline schists which, although folded in the dim geological past, before life appeared upon the earth, have remained almost undisturbed during and since the Palaeozoic Era. Faultings have let down parts where relatively small areas of Palaeozoic sedimentary rocks have been preserved,

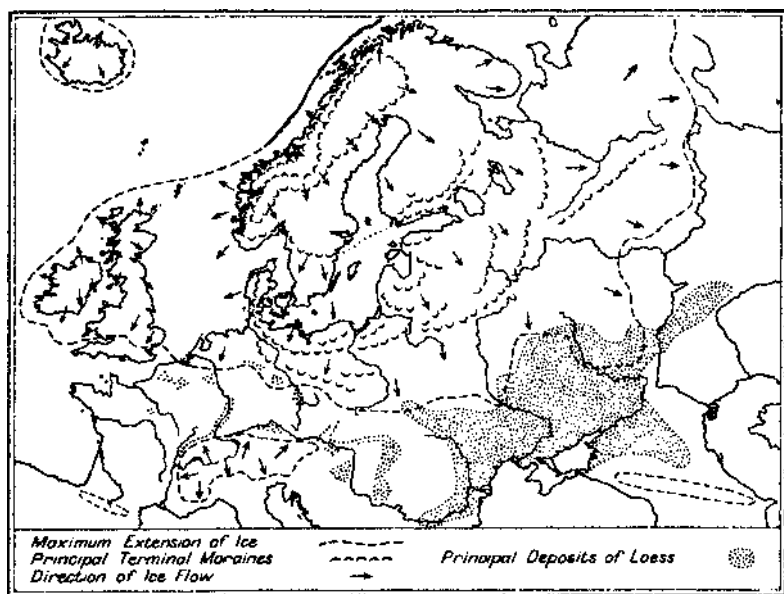


FIG. 3.—DISTRIBUTION OF GLACIATION AND LOESS.

and where the surface is rather lower than the rest, as, for example, in the " Lake Belt " of southern Sweden, in which are situated Lakes Vaner, Vatter and Malar.

For the most part the bed-rock forms undulating country in which the characteristic land-forms are due to glaciation. Near the southern margin there are long lines of hilly terminal moraines, behind which the glacial deposits are still so abundant and so recent that rivers have not been able to develop mature drainage systems. Their courses are irregular, and lakes are numerous. In central Finland, indeed, lakes and marshes cover much of the country and the roads make use of long,

narrow, winding ridges which stand above the waters; these are asar, or eskers, trains of gravel and sand deposited beneath or on the margins of the ice-sheet.

Yet over large areas the naked rock is exposed, for much of the soil was scraped away by the ice and transported to the surrounding regions ; nor was this loss remedied in the lower areas near the Baltic Sea and the Gulf of Bothnia by the deposit of sandy or clayey material when, for a time, the waters spread farther over the land.

Although the ancient rocks contain certain minerals, the Baltic Shield has proved a generally inhospitable region to man, even apart from its climatic conditions.

3. The Hercynian Uplands.—As the mountains of the north of the British Isles are akin to the Scandinavian Highlands, so the uplands of the south of Ireland and of the south-west of England and Wales are akin to a number of others scattered widely over the continent. They are known as the Hercynian Uplands because they represent fragments of mountain systems folded in the Hercynian earth-movements which occurred at the close of the Carboniferous Period. These mountains were continuous over great areas, though their traces are now found only in scattered fragments, and their folds ran in various directions. In the south-west of Britain and the adjoining region of Brittany, the general direction was about west to east with a trend to the south-east towards the centre of France, as is shown by the direction of the lines in these areas in Fig. 1 ; folds running in this direction are referred to as Armorican, from the ancient name of part of Brittany. In central Europe, however, the common direction is from south-west to north-east, termed Variscan, from the name of a tribe long ago living in the neighbourhood of the Fichtel Gebirge.¹ The Variscan direction is seen in the structure of the Rhine Plateau, which is cut across by the Rhine in its course between Bingen and Bonn, and also in the Harz Mountains, the Vosges and the Black Forest Mountains. In the Central Plateau of France both directions are seen, and still others appear in other regions, notably in the central tableland, or " Meseta " of Spain, in the " Diamond " formed

¹ Both the term " Armorican " and that of " Variscan " are sometimes used to denote all these foldings and all the regions of this type, but it seems best to restrict them as is here done, and to employ the term " Hercynian " in the general sense. " Hercynian " is derived from the old name of the Harz Mountains, one of the regions of this type.

by Bohemia and its margins, and in the Lysa Gora -Uplands of Poland. Even in eastern Europe are two similar Hercynian areas, viz. the Donetz Plateau in the south, and the Ural Mountains, with their offshoot, the Timan Uplands, on the borders of Asia.

The various mountains formed by the Hercynian movements have had a history somewhat like that of the older Caledonian mountains ; they were worn down to peneplains, so that the directions of the folds showed only in the strips of the various strata outcropping along the surface, like the graining of the wood in a sawn tree trunk. The Hercynian peneplains later suffered changes : over some areas they were depressed and upon them were laid down sedimentary rocks during the Secondary and early Tertiary Eras, and in the succeeding Alpine earth-movements they were considerably fractured, tilted, upraised or depressed.

Consequently much of what continuity they had previously shown has disappeared, only those parts which stand up above the surrounding lowlands being clearly recognizable as Hercynian Uplands of the usual type. These, which are shown as such on the map of structural regions in Fig. 1, were uplifted to plateau-like form, with more or less level surfaces, but denudation has since removed most of the overlying sedimentary rocks of Secondary and Tertiary date, and has exposed the older rocks of the peneplains with their graining ; even in this older rock the less resistant strips have been etched out so that the more resistant stand up above the general level as ridges running in the direction of the original mountain-folds.

Where an uplifted mass is bounded by clearly marked, and more or less parallel, faulted edges, it is known as a " horst," and such structures are common in the Hercynian Uplands. The converse of a raised horst is a rift-valley, which has subsided between two parallel series of faults. One very important rift-valley is that in which the Rhine flows between Basel and Mainz ; the parallel faults which bound it are shown in the map in Fig 46, and the section in Fig. 47.

In many cases, uplands due to dislocation rise steeply on one side where they are bounded by marked faults, and descend more gently in other directions ; structures of this kind are commonly known as " massifs " and are exemplified by the " Massif Central " or " Central Plateau " of France, which is fault-edged where it overlooks the Rh6ne Valley.

The dislocations which broke up the Hercynian areas allowed igneous material to be forced up along faults and through volcanic vents, and in several parts, notably in the Central Plateau of France, great sheets of lava and the remains of volcanic cones bear striking witness to this part of the history.

In the rocks of the Carboniferous Period which enter into the structure of the Hercynian regions, there were formed widely extending coal-measures containing seams of valuable coal, and these coal-measures were involved in the Hercynian foldings. Where they formed parts of the upfolds which were first denuded, the coal-measures have been worn away, but where they formed parts of downfolds or basins they have, to a certain

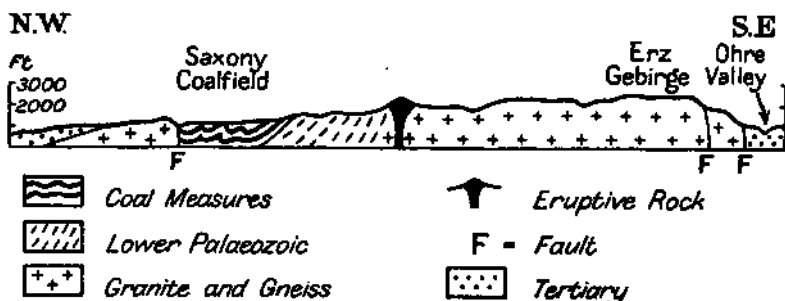


FIG. 4.—SECTION THROUGH THE SAXON UPLANDS, ERZ GEBIRGE AND EGER (OHRE) VALLEY.

extent at least, been preserved. Consequently there are important coal-fields associated with some of the Hercynian Uplands, and these, together with other mineral resources found in their exposed rocks, are the basis of mining and manufacturing industries which have attracted people to the mineral-bearing areas.

The structure of the Hercynian Uplands is illustrated in Fig. 4 by the section through the Erz Gebirge and Saxon Uplands; this area exhibits most of the elements described above.

Yet in general the Hercynian Uplands are not well populated, for they are not productive agricultural regions, since, as they stand above the surrounding lowlands, they have a relatively cool and moist climate, and also they do not usually bear fertile soils. Hence they naturally tend to be heath or moor lands or to be clothed with forests.

4. Central and Western Lowlands and Scarp-lands.—After the Hercynian earth-movements and the later wearing down of the resultant mountain systems, most of Europe, except the north, was submerged under the waters of seas or lakes. This submergence was, however, not uniform over the whole of the southern part of the present continent; some parts were beneath relatively deep seas in which was deposited the ooze from which limestones were formed, while other parts were covered by shallow seas or lakes in which clay-forming muds were laid down, while elsewhere sand was dropped which was changed to more resistant sandstones or remained in an unconsolidated form. Moreover, alterations in the depths of the various parts brought differing conditions first to one region and then to another, and thus at a given place there might occur first the formation of sandstones, then of limestones, and later perhaps of sands or clays.

Thus over wide areas of central and southern Europe there was a succession of deposits of varying composition during considerable parts of the Secondary and Tertiary Eras, and consequently thick strata of sedimentary rock covered platforms of more ancient formation.

Where, in the Alpine earth-movements, the platforms and their coverings of Secondary and Tertiary sediments were broken and upraised, the Hercynian Upland regions were formed as has been described above, but in the less-disturbed areas the strata remained at a lower elevation and the sedimentary cover was less exposed to denudation. In central and western Europe this was the case between and around the blocks of the Hercynian Uplands, where basins were formed such as those of south-eastern England and northern and south-western France, or where there were broader depressions, such as that on the southern shores of the North Sea and the Baltic Sea; in these regions the older rocks are still covered by a succession of sedimentary strata lying above one another in more or less saucer-like form or in an almost horizontal position, as is shown in the section through northern France in Fig. 38. v*

In other parts the rocks have a pronounced tilt, as in England west of the London Basin, in France west of the Vosges Mountains and in Germany east of the Black Forest Mountains; in such cases the less-resistant strata have been worn away, leaving the more resistant as long, tilted slabs, and giving to the

whole region a scarp-land character. This structure is shown in the section in Fig. 48.

Moreover, in the Ice Age, parts of these lowlands were invaded by ice, especially from the North-western Highlands, as was described above, and in such parts various deposits of clays, sands and gravels were laid down.

Frequently, fertile soils have developed upon the rocks of the lowlands and scarp-lands, and agriculture and pastoral work are carried on in such forms as the generally favourable climatic conditions have allowed.

Exceptional fertility marks the soils which have been derived from a mantle of loess covering the earlier deposits in certain parts of the central and western lowlands, and over a great area in south-eastern Europe (see Fig. 3). This loess resembles that of China in its composition ; it is fine-grained, loose and sufficiently porous to allow a free downward drainage of water after rain, and a slow upward movement by capillary-action in dry weather. Its existence in Europe is due to dry climatic conditions which occurred during and after the Ice Age, when southward-blowing winds raised clouds of dust from the finely ground particles of the moraine areas, and deposited them over the surrounding lowlands until a layer was accumulated, in the west often to a depth of scores of feet, and in the east to much greater depths. In central and western Europe the existence of the loess was specially important during the period of man's early settlement and cultivation of these regions, for loess areas were usually free from forest, easily worked and gave abundant return to the simple forms of agriculture then practised.

Minerals are not characteristic of the later sedimentary rocks, though iron ores were formed in some of the Secondary strata (again see Fig. 6), and lignite deposits are found in some of the Tertiary. Yet where the older rocks of the Hercynian Uplands dip down beneath the edges of the basins, the coalfields may extend beneath the younger strata, and therefore in several cases coal-mining has spread from the Hercynian margins some distance into the neighbouring lowlands.

Because of the subsidence of the basins and hollows, the waters of the Atlantic have invaded the lowest parts, and oceanic inlets or inland seas adjoin these lands and bring opportunities for fishing and trading. Hence the lowlands and scarp-lands of central and western Europe have varied resources, and as a

whole have become the most densely populated parts of the continent.

3. The Regions of " Alpine " Folding.—Great as were the changes brought about by the Alpine earth-movements in northern and central Europe, they were but small compared with those which entirely transformed the southern part of the present continent.

It appears that during a very long period about the middle of the Tertiary Era, the block of the earth's crust which forms northern Africa moved northwards towards the similar block forming the platform of ancient and resistant rock which in central Europe underlay the sedimentary strata of Secondary and early Tertiary date. The northward movement was irresistible: the older rock structures of central Europe were broken and displaced, while the younger, sedimentary strata of the south were contorted in a most complicated fashion.

In a general way it may be said that massive sheets of limestones and other sedimentary rocks were ridged up into folds along lines which formed great curves, as indicated in Fig. 1. These curves appear to sweep round from the south of Spain across the Strait of Gibraltar into the Atlas Mountains of northern Africa, whence they are continued across the central narrows of the Mediterranean Sea into Sicily and through the Apennine backbone of Italy into the Alps; even the Pyrenees and the Cantabrian mountains of northern Spain are linked with this system, which therefore almost completely encircles the area of the western Mediterranean. A small spur from the Alpine system is seen in the Jura Mountains.

On their eastern side the Alpine folds appear to spread out, both to the north-east in the Carpathian system and to the south-east in the Dinaric Alps, thus enclosing the lowlands of the middle Danube. The southern part of the Carpathian system swings round into the Balkan Mountains, so that between these and the southward continuation of the Dinaric Alps is another enclosed area in the neighbourhood of the northern part of the *Mæan* Sea. An eastward continuation of the Balkan Mountains is probably to be seen in the Yaila Mountains of the Crimea and in the Caucasus, while those of the southern part of the Balkan Peninsula are continued in the islands of the southern *Mæan* and curve again into the mountains of Asia Minor. Indeed, the whole system extends east-

ward across Asia on a still greater scale and culminates in the highest ranges of the world.

The term "folded" is, however, inadequate to describe the^T contortions which the strata have suffered (see Fig. 5). They have been squeezed together in most complicated ways, and on the outer side of many of the curves, sheets of rock (called "nappes") measuring hundreds or thousands of square miles in area, have been thrust bodily forward over other strata till

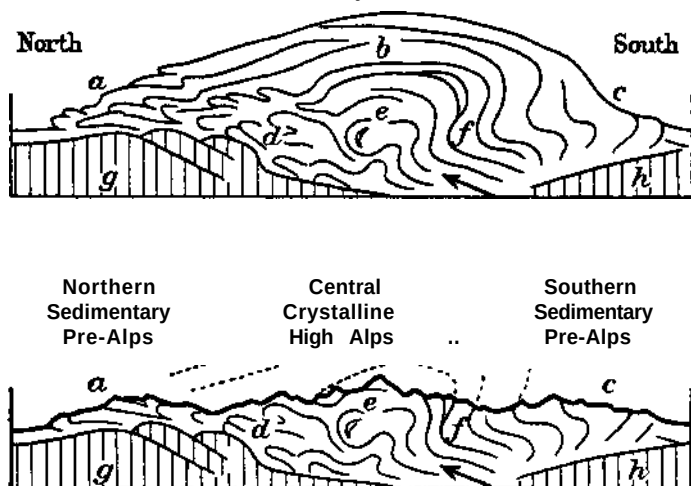


FIG. 5.—DIAGRAMMATIC SECTION THROUGH THE EASTERN ALPS.

(Vertical Scale greatly exaggerated.)

Note.—The upper diagram shows in a simplified form the contortions due to a thrust from the south. The underlying platform, *g* and *A*, is dislocated; the lower sedimentary rocks, *d*, *e* and *f*, are metamorphosed into crystalline nappes; the sedimentary nappes of the upper strata, *a*, *b* and *c*, are thrust northward (except in the extreme south), far from their roots.

The lower diagram shows the present constitution of the Eastern Alps after great denudation. In the central zone the crystalline nappes are exposed, and in the northern zone the sedimentary strata are left widely separated from their counterparts in the south.

they have been parted from their "roots" and now lie in regions far distant from those in which they were formed.

Under the pressures which have brought about such movements, some of the rock was metamorphosed into crystalline form; for example, a large part of the central Alps is composed of crystalline rocks which were thus formed. In some parts, too, molten material was forced up from the depths, and igneous rocks thus add to the complexity. Moreover, volcanoes were formed and are still to be observed, and even now earthquakes show that stability has not yet been attained in this part of the earth's surface.

The Alpine foldings have not only affected sedimentary rocks ; within them have been enclosed masses of older date and more resistant composition. For example, in the central Alps themselves are large areas, including the Mont Blanc massif, consisting of splinters of an Hercynian floor driven up into the folded pile above ; again, in the system of the Carpathians (in the wider sense of the name) is the great and ancient massif of the Transylvanian Alps as well as ancient fragments on the west of Transylvania and in parts of the Tatra Mountains.

Other blocks or massifs occur within the folded mountains of southern Europe, notably that between the Balkan Mountains proper and the western heights of the Balkan Peninsula ; here is the massif of which the Rodopi Mountains form the highest part. Again, within the curved folds of the western Mediterranean, there stand up ancient massifs forming the greater part of the islands of Corsica and Sardinia.

Another very marked, and very important, feature of the region affected by the Alpine foldings is the formation of great basins within the mountain system. These are of varying depth : in the western Mediterranean subsidences have let down the earth's surface over 10,000 feet below sea-level; the Adriatic Sea, however, is relatively shallow, especially in its northern part, and the North Italian Plain is essentially a continuation of this depression now just above the level of the sea. The iEgean Sea occupies another area of subsidence ; it is " half-drowned," and the higher parts of the previously continuous mountain chains form the islands which appear as stepping-stones between the Balkan Peninsula and Asia Minor. The southern part of the Black Sea is another well-marked basin; the north-western edge of the deeper area is the line of shallows showing the earlier connection between the Balkan Mountains and those of the Crimea.

A less-marked basin is that between the Balkan Mountains and the Transylvanian Alps where the relatively recent deposits forming the Walachian Plain stand above sea-level, and thus resemble those of the North Italian Plain.

Broadly similar in origin are the lowlands between the Alps and the great curves of the Carpathian system.

The Alps themselves, and to a less extent other parts of the great fold-mountains, reach such heights that, during the Ice Age, they bore ice-sheets which overrode the highest parts, and

in the case of the western Alps extended into neighbouring regions. The complex results of glaciation in the Alpine Lands and the Alpine Forelands will be described in later chapters.

The effects of the geological history on other conditions than structure and relief are very great; we can here only hint at a few of the results. There is the existence of the Mediterranean and Black Seas which separate Europe from Africa and southern Asia; these seas have physical influences, such as their warming influence upon the winter climate of the neighbouring lands, and influences upon human life, such as the way in which they have enabled civilization to spread all around their habitable coasts.

Corresponding to the variety in the rock structure and the relief of southern Europe is the variety of resources which include mineral deposits, Alpine pastures, mountain forests, broad inland lowlands and hill-sides facing the seas, all capable of human utilization; thus the extraordinary complexity of the geological history has been followed by an extraordinary complexity in the conditions of human life.

6. The Russian Platform.—In eastern Europe the physical development and the human history have been quite different. The ancient rocks of the Baltic Shield dip gently south-eastward, and form the substratum of the great structural region known as the Russian Platform. Apart from its margins, where there are the Hercynian areas of the Ural and Timan Mountains and the Donetz Block, the whole area between the Caledonian Highland system and the fold-mountains of the Crimea and Caucasus has remained almost unaffected by the later disturbances, and the most important movements have been relatively slight alterations in its general elevation as compared with sea-level. Because of these alterations, the area has been covered by the waters of seas of varying extent, and hence the ancient rocks which continue those of the Baltic Shield are covered in the north-west of Russia by deposits of Palaeozoic age, while farther to the south-east these are followed first by Secondary, and then by Tertiary, strata.

But because these deposits have lain almost undisturbed, they have not been subjected to pressures which would have changed their character, and in general even the oldest remain in much the same condition as those of recent formation; stone

which could be used for building or road material is a rarity over large areas of Russia.

The region is not of uniform elevation ; the Valdai Hills are over 1,100 feet above sea-level and form part of the water-parting between the rivers flowing north-west to the Arctic and Baltic Seas and those flowing south-east to the Black and Caspian Seas. The greater part of eastern Europe is less than 600 feet in height, while the land immediately north of the Caspian and the surface of that great inland lake are below the general sea-level of the globe.

Moreover, there have occurred warpings of the underlying platform which, although very slight if measured in degrees of slope, when continued over the great distances of eastern Europe have important consequences. The most marked of these warpings occurs in the south-west, where it brings up to the surface a belt of granite (Fig. 1); through this resistant mass the Dnieper River has been able to cut its southward reach only incompletely, and there are rapids which prevented navigation, but gave water-power now used for industrial purposes.

It must also be observed that all the northern part of the region has been glaciated, with results similar to those found in the plains of the central and western parts of the continent.

Because of its uneventful history, the Russian Platform has in general lacked the formation of mineral ores. Apart from some coal in the Palaeozoic strata near Moscow and iron in the granitic belt, the chief minerals are in the Hercynian areas of the Donetz and the Urals, where industrial development can utilize resources lacking over most of European Russia.

One consequence of the geological history is of the first importance. Undisturbed by the great forces which have led to such a complicated relief in the rest of Europe, the east has remained open, level country in close physical association with the similar lands of western Asia, for the Ural Mountains do not form an effective barrier of any kind. Hence the climates of western Asia are continued across " Trunk Europe " about as far as " Peninsular Europe." Similarly, the belts of natural vegetation, i.e. the tundras, the forests, the steppe-lands and the semi-deserts, extend unbroken from Asia across eastern Europe. Consequently peoples who have adapted their ways of life to each of these types of vegetation have worked their way, either westward or eastward, along almost the whole extent of the

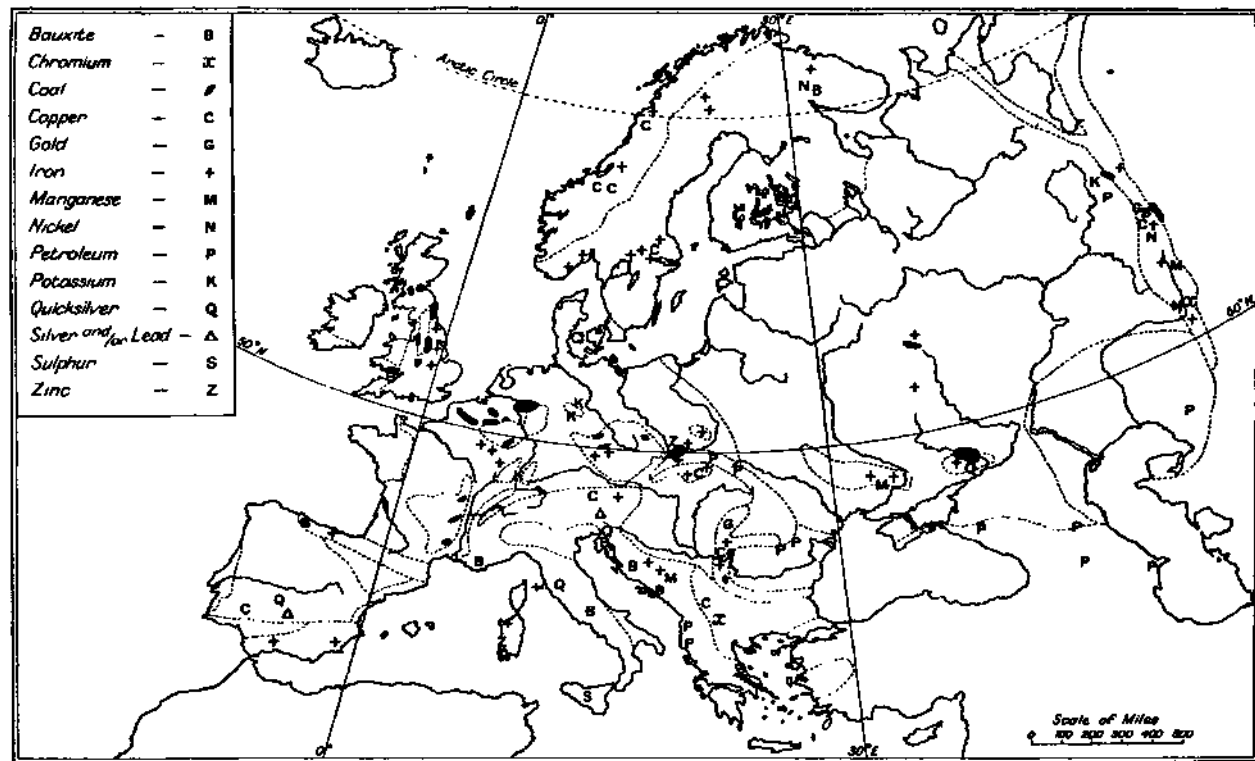


FIG. 6.—PRINCIPAL MINERAL WORKINGS.

Note.—There are also numerous lignite workings, especially in central Europe.

belts, and so kept western Asia and Trunk Europe in very close association from the human point of view.

7. The Caspian Basin.—Here is a region which is certainly more " Asiatic " than " European." It is a part of a great depression which includes the three inland seas : Caspian, Aral and Balkash. To this hollow flow the waters of the surrounding higher lands, and to the Caspian Sea the Volga brings the drainage from a large part of eastern Europe. With the water is brought down the material worn away by the rivers, and the Caspian Basin is covered partly by such recent alluvium and partly by deposits formed when a greater sea than the present one occupied the area.

Moreover, the formation of the Caspian depression, in causing the greatest river of Europe to flow, not towards the Mediterranean, but to the south-east, and to end in a lake without access to the oceans, has tended to hinder close association between eastern Europe and the remaining part of the continent.

QUESTIONS

1. How much knowledge of the Ice Age do you consider necessary in order to understand the present-day geography of the northern half of Europe ? Illustrate by reference to particular areas and their characteristics.

2. Certain parts of Europe may be referred to as being regions of " Alpine folding." Make a sketch-map showing these regions, and consider to what extent they have geographical, and not merely geological similarity.

3. What are the common structural characteristics of the " Hercynian Uplands," and how do these characteristics affect their utilization by man ?

4. Distinguish between four types of coast on account of their structure, and state their location in Europe. Give a description of any two of these types.

5. Define " Trunk " and " Peninsular " Europe respectively, and explain the fundamental causes of the contrasts between these areas.

CHAPTER II

CLIMATE

Wind Systems.—Over much of Europe, oceanic influences play a very great part in determining the climatic conditions, and the belts of wind systems which are developed over the oceans are therefore important. Since these belts lie in certain latitudes, the position of Europe as regards latitude must be first noted. On its southern margin, Europe forms the northern part of the Mediterranean area; Gibraltar is about lat. 36° N. In the north of Europe the Scandinavian peninsula extends well beyond the Arctic Circle; North Cape is about lat. 71° N.

As a consequence of this position, all the continent except the east, i.e. Peninsular Europe as distinct from Trunk Europe, comes under the influence of the great system of winds known as the "westerlies," which appear on wind maps as blowing from a more or less westerly direction, that is, from the neighbouring Atlantic Ocean, whose waters are exceptionally warm for their latitude because they have been brought from tropical regions by the Gulf Stream Drift.

It may therefore be deduced that the climate of Europe, in so far as it is determined by these westerly winds, is not only made equable, but on the average is exceptionally warm for its latitude; further, it may be deduced that these winds bring water-vapour which is precipitated as rain or snow over the land, especially on the windward side of the highlands.

But though there is truth in these ideas, there is the complication that the westerlies are not by any means constant, even in those parts where the maps show that the prevailing winds blow from the west in all seasons. In England, for example, the "prevailing" winds may be shown on a climate map as coming from the south-west, but this is the actual direction of the winds only for about 20 per cent. of the observations. Indeed, the most characteristic fact about the winds experienced in England is that they frequently change, depending upon the passage of low-pressure systems called "lows," "depressions" or, less

frequently, " cyclones," or upon the development of high-pressure systems or anticyclones.

Hence the belt of the westerlies may be usefully considered as a belt in which depressions are common and travel in a generally west-to-east direction. In these depressions are two main streams of air, one coming from a south-westerly or

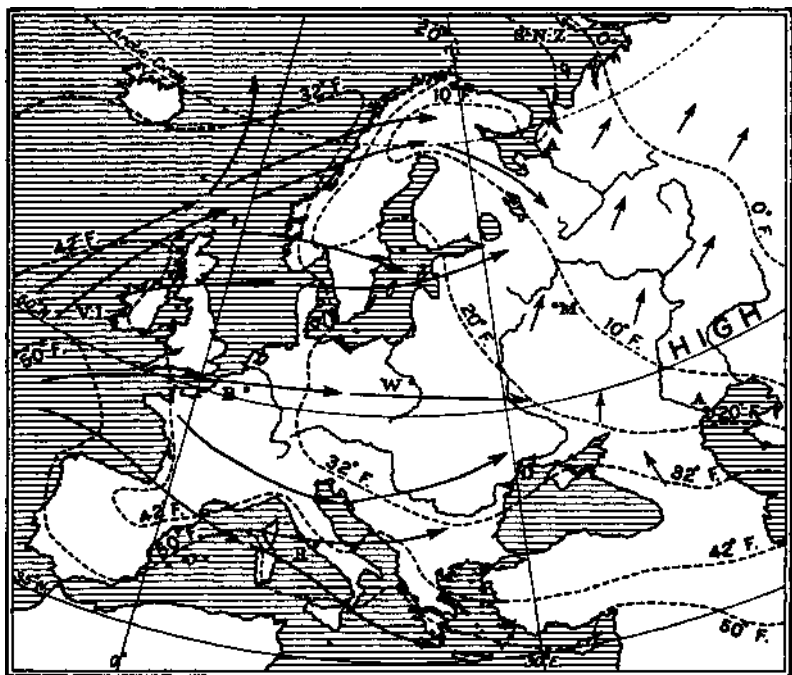


FIG. 7_JANUARY " LOW " TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean January temperatures reduced to sea-level.

southerly direction and bringing warmth and usually rain, the other coming from a north-westerly, northerly or easterly direction and bringing cool and dry weather. As the depressions pass over a given place, there are accordingly changes in the weather as the warmer and the cooler air-streams cover the area in turn ; on the whole, however, the " lows " bring rain, and on their southern side warmth, although cold weather may be found on their northern side. Since the centres pass most frequently over the northern part of Europe, it is their southern sections, with warmth and rain, which most affect the continent.

As the central parts of depressions are areas of low air-pressure, the regions over which they are most commonly found necessarily appear on maps showing the average barometric pressures as areas of lowest pressure, e.g. that between Iceland and north-western Europe.

On the contrary, anticyclonic conditions are marked by high

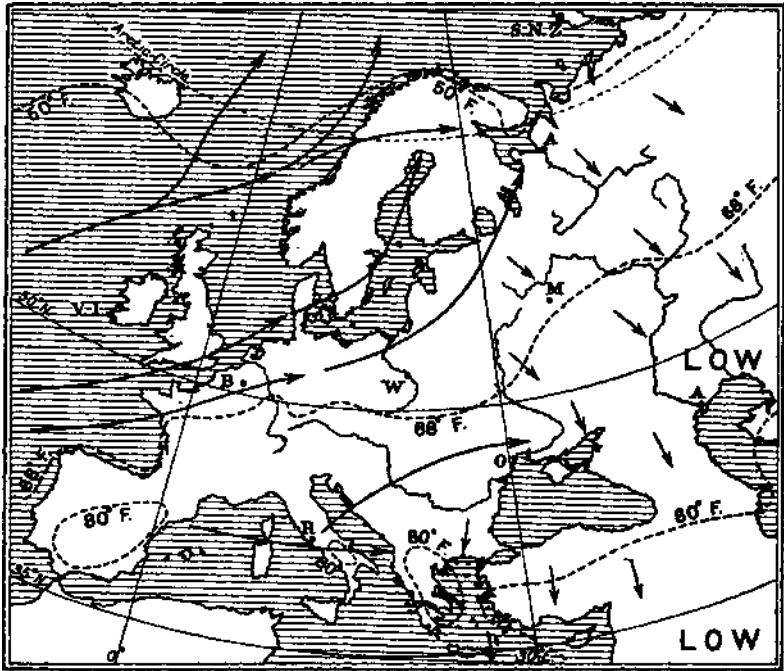


FIG. 8.—JULY "LOW" TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean July temperatures reduced to sea-level.

pressures, gentle winds or calms, and dry weather. Such conditions only occasionally develop within the belt of the westerlies, but they are more common on the southern side of this belt, that is, in the sub-tropical latitudes to the south of Europe, where the climate maps show relatively high average pressure.

Hence, one may shortly say that western Europe is in general under the influence of the belt of the cyclonic, rainy westerlies, while to the south of Europe lies the belt of sub-tropical calms and droughts.

The two belts, however, are themselves not always in the same latitudes, but shift with the sun, southward in winter and northward in summer. Consequently in winter the westerlies cover the whole of western Europe, and their depressions may fairly often pass over the Mediterranean area. In summer, on the other hand, the depressions leave the Mediterranean relatively free, especially in the east, and the south of Europe frequently experiences the calms and drought of the sub-tropical belt of high pressure.

In Figs. 7 and 8 the long arrows show the tracks commonly followed by the centres of "lows," but it must be understood that the area covered by a depression is normally very considerable ; if the centre passes over Berlin, for instance, its influence would probably extend from central Scandinavia in the north to the northern Adriatic in the south. Bearing this in mind, it will be seen from the maps that in winter cyclonic conditions characterize the whole of Peninsular Europe, while in the summer they are generally less frequent, particularly in the Mediterranean region.

In eastern or Trunk Europe the depressions have less influence, for they tend to pass over seas rather than lands, and when they do penetrate the great land-mass, they diminish in intensity. The climate of eastern Europe is therefore more closely related to that of Asia ; it is marked by a reversal of the conditions as between summer and winter which is associated with the monsoonal changes of the greater continent.

In summer the heat sets up a system of continuous low pressure over Asia towards which the winds blow inwards, though deflected, by the earth's rotation, to the right of the most direct path ; consequently in the east of Europe they commonly blow from a more or less north-westerly direction, as is shown by the short arrows in Fig. 8. Even in the eastern Mediterranean this influence is felt, and the prevailing northerly winds of this season were there known to the ancient Greeks as the " Etesian " or " annual " winds, whose onset marked the beginning of uninterrupted easy navigation for their small ships.

In winter the continental land-mass is cooled, high pressure is more continuously developed and the air tends to move outward. The winds, deflected to the right of their direct outward path, usually blow from a more or less southerly direction over most of eastern Europe (see Fig. 7), though in the Mediter-

ranean region they are more frequently interrupted by the passage of cyclones.

Temperatures.—The wind systems combine with the direct heating effect of the sun to determine the temperature conditions,

In the summer the sun's direct influence is the greater, as may be seen from Fig. 8, in which are shown the isotherms drawn from the records of the mean monthly observations of air temperatures in July. (To simplify the maps, the temperatures have been reduced to sea-level; consequently the uplands and highlands have cooler conditions than are indicated.) Where the sun is relatively high in the sky, that is, in southern Europe, the heat is greatest, and over the southern parts of the three peninsulas the lowlands have mean temperatures at, or even over, 80° F. during July. In the far north the temperatures are at about 50°. The course of the isotherm of 68° is worth noting: in the Atlantic area it is well to the south of latitude 50°, for the ocean is relatively cool; in eastern Europe it passes considerably to the north of this latitude because the continental mass is greatly heated by solar radiation; in central Europe the isotherm runs almost along the line of latitude, and places east and west of one another have about the same summer temperatures.

It is convenient to say that when the mean temperature is above 68° F. (20° C.) the climate is "hot"; when between 68° and 50° F. (20° and 10° C.) it is "warm"; when between 50° and 32° F. (10° and 0° C.) it is "cool"; and when below 32° F. (0° C.), it is "cold." Adopting these terms, we may point out that the temperature map shows that in July the climate of most of Europe south of latitude 50°, together with all south-eastern Russia, is hot, that of most of Europe north of latitude 50° is warm, but the lands adjoining the Arctic Sea are cool.

The January map indicates marked contrasts, for in the latitudes of Europe the winter sun is visible for a shorter time in the day and is lower in the sky than in the summer; consequently the sun has much less effect and the winds have relatively more influence, as they bring warm air from the Atlantic Ocean.

The isotherm of 50° is now the highest and, away from the Atlantic, only the southern Mediterranean lands have this temperature. This is due partly to the latitude and partly to the influence of the Mediterranean Sea itself, for this sea remains remarkably warm in the winter because it is shut off

TABLE OF CLIMATIC CONDITIONS

Climate Stations		Lat. N.	Height above Sea-level (Feet)	Temperatures (Deg. F.)				Precipitation (Inches)				
				Mean Monthly		Mean Annual		Annual Total	Seasonal Totals			
									Win. D.J.F.	Spr. M.A.M.	Sum. J.J.A.	Aut. S.O.N.
				Jan.	July	Min.	Max.					
Arctic	South of N. Zemlya	72	50	2	44	—	—	6	0.9	0.8	2.2	1.7
Boreal	Haparanda	66	10	11	59	—27	81	19	4.0	3.2	5.4	6.6
	Archangel	65	50	8	60	—32	84	17	2.5	2.7	6.6	5.0
Sub-boreal	Stockholm	59	150	27	62	—2	83	21	4.6	4.2	7.0	5.5
	Moscow	56	500	12	66	—17	88	21	3.5	4.6	7.7	5.2
Oceanic Temperate	Bodo	67	10	30	55	7	75	36	9.1	6.3	7.7	12.5
	Bergen	60	70	34	58	12	79	84	24.5	15.2	17.6	27.0
	Valentia Is.	52	30	45	59	28	72	56	17.3	11.4	11.8	15.2
	Brest	48	180	43	64	23	90	32	9.5	6.2	6.2	10.6
	Santiago	43	890	45	66	28	95	65	21.7	17.1	6.9	19.1
Mid-Temperate	London	51	20	39	63	18	88	25	5.6	5.2	7.3	7.0
	Brussels	51	200	34	63	14	88	30	6.6	6.0	8.7	8.3
	Paris	49	180	37	65	12	93	21	4.1	4.8	6.0	5.9
	Karlsruhe	49	390	33	66	8	91	38	7.3	8.7	12.1	9.7
	Lyons	46	570	36	70	10	95	40	7.0	8.7	10.1	11.1
	Milan	46	480	34	75	14	93	40	7.7	10.2	9.3	12.5
	Bordeaux	45	250	41	68	18	95	33	8.0	8.0	7.4	10.0
Interior	Konigsberg	55	20	27	63	—2	90	25	4.1	4.6	8.8	7.8
	Berlin	52	160	31	64	7	91	23	5.0	5.0	7.6	5.1
	Warsaw	52	440	26	66	6	90	22	3.8	4.7	8.5	5.0
	Munich	48	1,700	27	63	0	86	35	4.8	8.6	14.2	7.6
Temperate	Budapest	47	500	28	70	10	91	25	4.6	7.0	7.0	6.7
	Sona	43	1,800	27	69	2	95	26	4.3	7.1	8.0	6.2
Mediterranean	Genoa	44	180	45	75	28	90	52	13.2	11.7	6.9	20.3
	Marseilles	43	250	43	72	21	91	22	5.2	5.2	2.8	8.3
	Borne	42	160	44	77	27	95	32	9.8	7.7	3.2	11.9
	Oporto	41	270	48	67	32	93	48	15.8	13.4	3.4	15.4
	Madrid	40	2,100	40	76	18	104	16	4.0	5.4	2.1	4.9
	Valencia	39	70	49	75	32	99	19	4.5	4.8	1.6	8.2
	Palermo	38	230	50	76	39	99	29	11.7	6.7	1.5	9.3
	Athens	38	350	49	81	28	100	15	5.9	2.9	1.4	5.2
Steppe	Orenburg	52	360	4	72	—23	97	15	3.1	3.3	5.0	3.7
	Odessa	46	210	26	73	0	91	16	2.9	3.5	5.6	4.1
	Bucharest	44	280	25	73	—4	95	23	4.0	6.2	8.0	4.9
Arid	Astrakhan	46	—50	19	77	—15	97	6	1.3	1.5	1.7	1.3

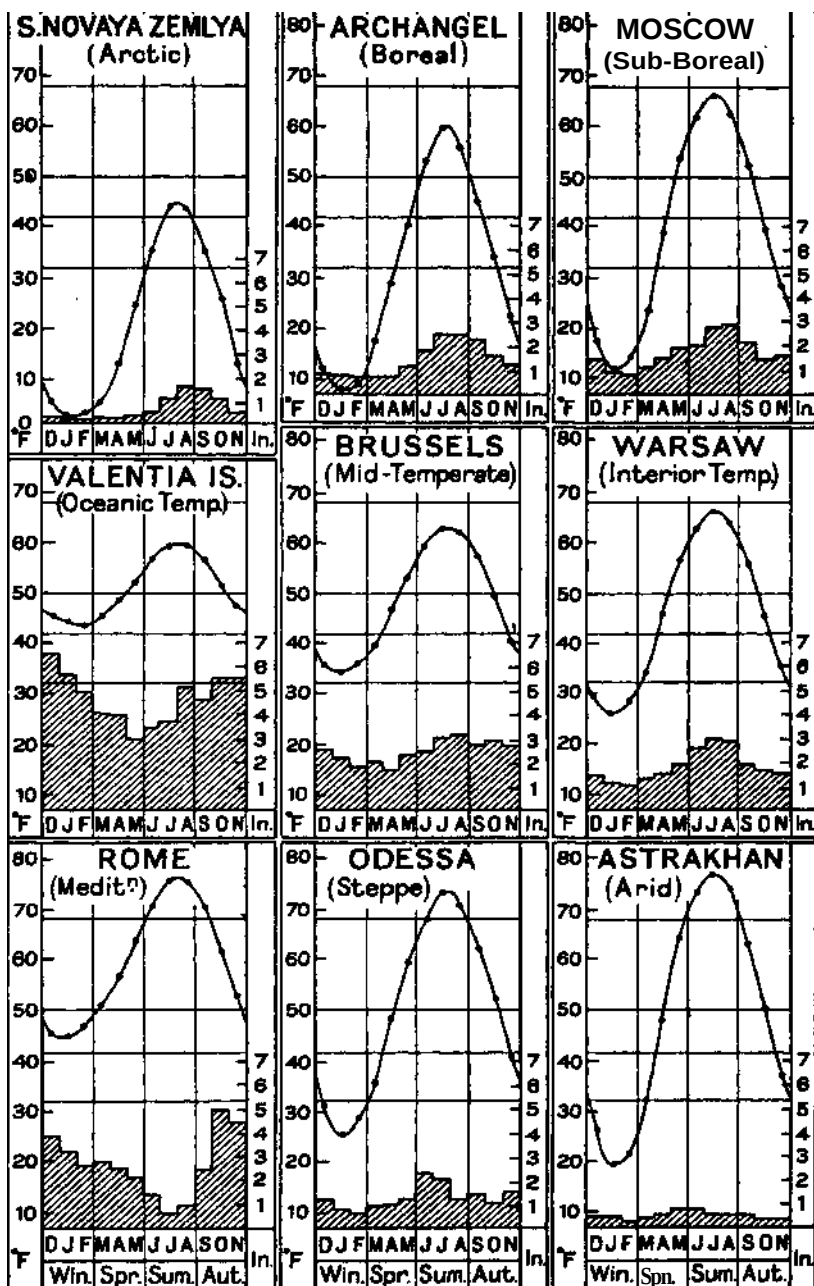


FIG. 9.—TEMPERATURE AND RAINFALL GRAPHS OF CLIMATIC TYPES.

from the cold waters in the depths of the Atlantic by the narrow and shallow entrance at the Strait of Gibraltar.

Most of the other isotherms of the January map have a course broadly similar to that of 50° : in the Atlantic area they run from north to south, showing that the oceanic west is warmer than the continental east, while towards the interior of Europe they run more from west to east because it is colder in the north, where the sun has very little effect.

The isotherm of 32° F. is of special interest, for it marks out an area to the east and north of it where, during a normal January, the average temperature is below freezing-point. As a consequence, within this area, precipitation in January normally takes the form of snow instead of rain, and if the snowfall is heavy there is a snow-cover to the land lasting for at least a month. Moreover, except in a narrow belt adjoining the course of the isotherm, inland waters are normally frozen over and harbours are closed by ice for a month or more ; the chief exception to this latter rule is that the warm Atlantic waters drifting along the coast of Norway keep the harbours of all the west coast of Scandinavia open throughout the year. The extremely cold winters in north-eastern Europe should be observed ; in the neighbourhood of the northern Ural Mountains the mean temperature in January is 0° F., i.e. 32° below freezing-point.

Employing the terms " cool," " cold," etc., as stated above, we may summarize the conditions in January by saying that in eastern Europe as a whole, together with most of Scandinavia and the eastern part of central Europe, the climate is cold ; in most of western Europe it is merely cool, while the south of the Mediterranean area has even warm conditions in this month.

By comparing the mean temperatures in January with those in July, as shown either on the maps or in the table on p. 26, it may be seen to what extent the climate of any place may be regarded as extreme or equable. Subtracting the figure for January from that for July, the annual range is obtained : e.g. for Valentia Island it is only 14° , for Warsaw it is 40° and for Moscow it is 54° . A climate with an annual range of about 30° or less may be regarded as equable, and western Europe as a whole and most of the coast-lands around the Mediterranean Sea have an equable climate. One with an annual range of over 40° is extreme, and all eastern Europe has an extreme climate.

Between these well-marked types comes central Europe, transitional in this respect.

The map of mean temperatures for January shows the average reading of the thermometer in that month, but the actual conditions are at some times above, and at other times below, this average ; hence the winter temperatures are at times more severe than the mean temperature suggests. The lowest temperature which is normally experienced in winter (i.e. the average of the lowest taken over a number of years) is called the mean annual minimum, and for certain stations is given in the table on p. 26. In this table it will be seen that, for example, while the mean January temperature at Moscow is 12° F. (20° below freezing-point), the mean annual minimum is -17° F., i.e. 29° lower (49° below freezing-point). Again, at Archangel the normally lowest reading in January is -32° F. (64° of frost).

Similarly the July map shows the mean temperatures for that month, but the summer temperatures actually rise much higher than these ; the table shows that while at Moscow, for example, the mean July temperature is 66° F., the mean annual maximum, which is the mean of the highest July readings, is 88° F. In the south of Europe the mean annual maximum at Athens is 100° , and at Madrid it reaches even 104° F.

All the conditions hitherto considered relate to those of the coldest or hottest months, but it is also important to know what is happening during other times of the year. This is to some extent shown by the graphs in Fig. 9, which indicate by dots the mean temperatures of each month and join these by curves depicting the normal " march of temperature " throughout the year. From such curves useful deductions may be made ; for instance, at Moscow the mean temperature falls below freezing-point (shown by the line at the level of 32° F.) about the beginning of November and does not rise above it until about the end of March ; we may therefore conclude that normally there is a period of frost lasting about five months. Similarly it may be deduced from the graphs that the period of frost at Archangel is about six months, while at Warsaw it is rather more than three months ; a map showing by lines the lengths of the normal period of frost in all parts of Europe is given in Fig. 10.

Another example of the deductions that can be made from graphs of the normal march of temperature is the duration of the " warm " period, i.e. the time during which the mean

temperature is above 50° F. (10° C). At Valentia Island, off south-west Ireland, the curve rises above the 50° F. line at the beginning of May, and falls below the 50° F. line again near the end of October; the warm period therefore lasts about six months; compare the curve for Archangel, where the warm period lasts only about three months. A map showing the

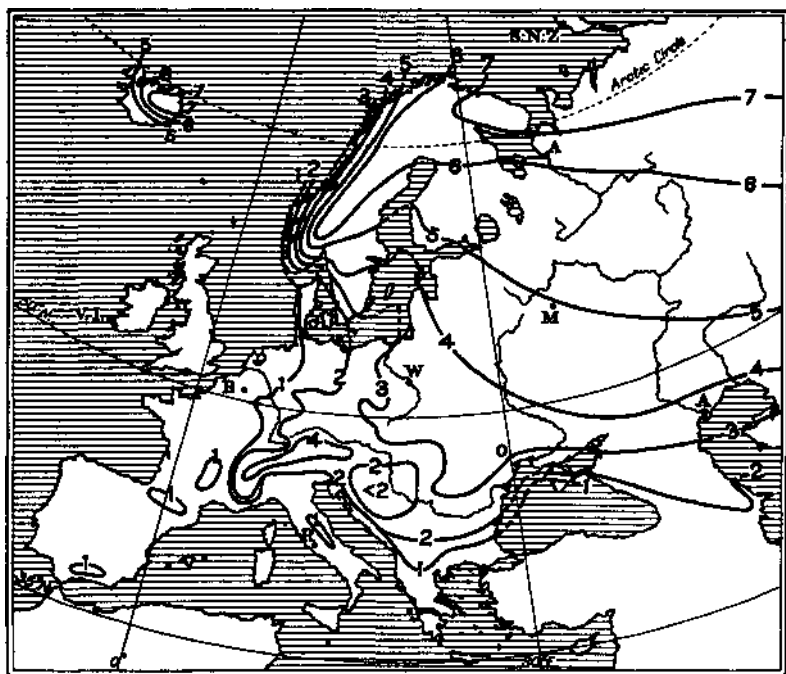


FIG. 10.—DURATION OF FROST PERIOD.

Note.—The lines show the number of months during which the mean temperature is below freezing-point (32° F., 0° C), the calculations being based on actual temperatures (not reduced to sea-level). On the Alpine margins the lines of 3 and 4 months are so close that the former has been omitted, and for a similar reason the 1-month and 2-month lines have not been separately indicated on the margins of the SE. Alps and Dinaric Alps. Note that the area of the Central Danubian Lowlands, marked < 2, has a period of less than two months of frost.

duration of the warm period in all parts of Europe is given in Fig. 11.

From the point of view of the relation of climate to plants the mean temperatures for the hottest month give a very inadequate idea of the temperature conditions which affect growth. For example, the figures for July show that the mean midsummer temperature is about the same at Valentia Island as at Archangel, and yet the graph shows that the warm period is twice as long at the former place as at the latter.

An important fact regarding the relation of climate to plant-life is that for a number of plants growth can begin only when the mean temperature rises above about 42° F. (6° C). This level is shown by another horizontal line on the temperature graphs, and it may be deduced from the curves that, for example, wheat can begin to grow earlier at Brussels than at Moscow, although the latter place has a higher midsummer temperature.

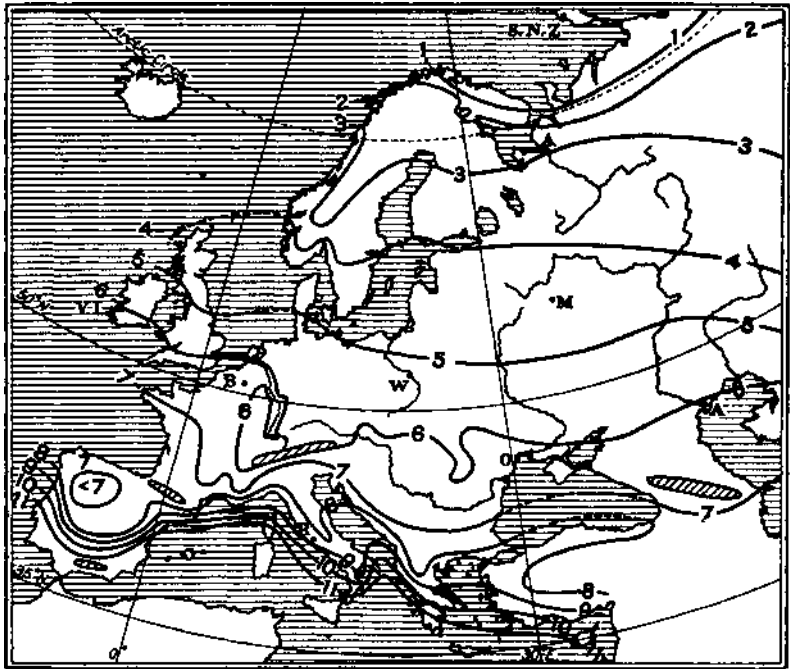


FIG. 11.—DURATION OF WARM PERIOD.

Note.—The lines show the number of months during which the mean temperature is above 50° F. (10° C), the calculations being based on actual temperatures (not reduced to sea-level).

Conditions in the Alps and other high mountain regions vary so greatly that these areas have been excluded from the map. Note that in the interior of Spain an area marked < 7 has a period of less than seven months of warmth.

Precipitation.—The next element of climate to be considered is precipitation in the form of rain or snow, and this study may well be begun in connexion with the wind systems for July and January respectively.

In July, depressions advance from the Atlantic over northern and central Europe, and since in them the warmer air from the Atlantic rises, it is cooled and water-vapour is precipitated in the form of "cyclonic rains." In eastern Europe the prevail-

ing winds come from the north-west, and have sufficient water-vapour for rain to occur, although in less amount than in the west (see Fig. 13). The greatest precipitation is on the highlands which compel the air currents to rise and to produce "relief rains." In the Mediterranean region and in southern Russia depressions seldom occur, and cyclonic rains are therefore slight, though relief rains give a rather better water-supply

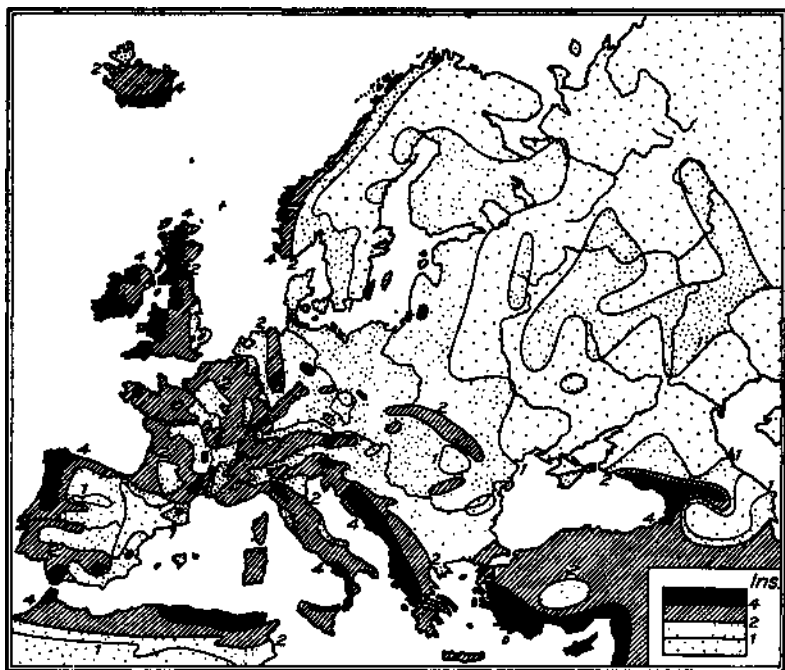


FIG. 12.—MEAN JANUARY PRECIPITATION.

to the mountains, especially to the Caucasus. In the far north there is little rainfall, even in connexion with the depressions, for the cool air can hold but little water-vapour and though the air is further cooled by ascent only a small precipitation can result.

Where cyclonic influence is weak, settled weather is the general rule, but during a period of such weather in summer there may occur thunderstorms and heavy rains, due to the relatively great heating and the consequent rising of the air in particular localities ; such " convectonal rains " account for a considerable proportion of the precipitation in central and eastern Europe.

In January, depressions normally affect the whole of the continent except the extreme east, and where the air is warm enough to contain much water-vapour, precipitation may be considerable. This is the case particularly along the Atlantic margins, where there are the heaviest rains, and in the Mediterranean region ; moreover, on the highlands relief rains add to the total (see Fig. 12). But away from the relatively warm areas adjoining the Atlantic and the Mediterranean the air is so

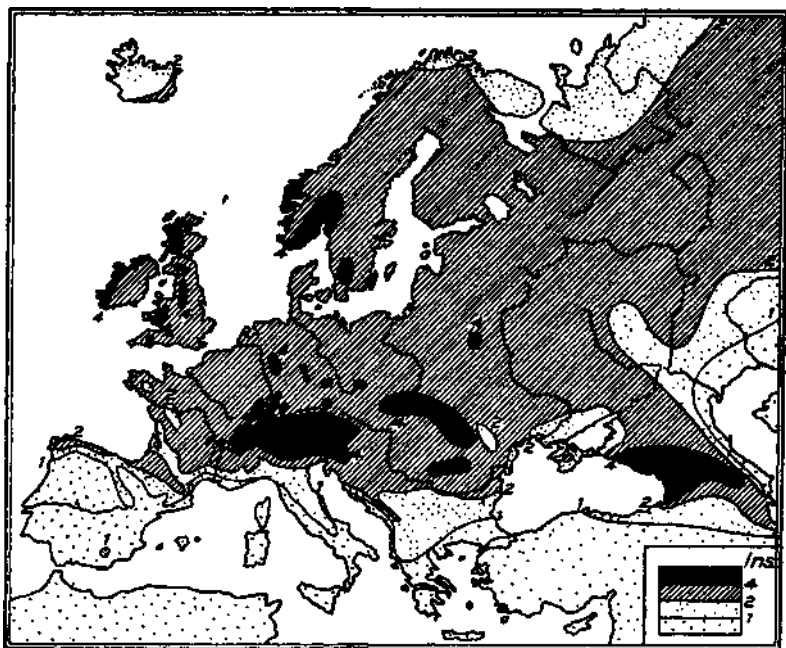


FIG. 13.—MEAN JULY PRECIPITATION.

cold that it can contain little water-vapour and precipitation is generally slight, though relief rains, or falls of snow, occur on the highlands. (In reading maps or statistics of precipitation, it must be remembered that in their compilation one foot of snow is taken as the equivalent of one inch of rain.) In eastern Russia the cold, out-blowing air from the Asiatic high-pressure area is necessarily dry, and this part of Europe would be rainless in winter but for occasional depressions.

The maps for January and July are in general indicative of the whole of the winter and summer seasons respectively ; this

can be seen by the rainfall graphs in Fig. 9, in which the three winter months of December, January and February and the three summer months of June, July and August are marked off by vertical lines.

The rains of spring and autumn are equally important, but as they are to a considerable extent transitional between the more extreme conditions of winter and summer, they are more evenly distributed over the continent. Near the Atlantic and in the Mediterranean region, however, the autumn rains are frequently heavier than those of any other season. These statements about the rainfalls of spring and autumn should be verified by examining the graphs for the stations given in Fig. 9 and the accompanying page of statistics.

A useful summary of the distribution of precipitation during the year at any particular place can be made by adding together the amounts in each group of three months to get the totals for the four seasons respectively, and this has been done for certain places in the table on p. 26. Further, the total for the whole year for the selected stations is given in the same table, and the distribution of the total annual precipitation over the continent is shown by the map in Fig. 14.

By putting together the facts given in the maps, the graphs and the table, a fairly complete idea of the precipitation can be obtained, and some of the main conclusions may be summarized as follows : (i) The regions adjoining the Atlantic have a heavy rainfall fairly well distributed through the year, although greatest in autumn and winter, (ii) Central Europe has an annual total varying according to elevation, considerable on the highlands and moderate on the lower lands ; on the whole, the rainfall is fairly evenly distributed through the year, although the greater amounts occur in summer and autumn and the tendency to a summer maximum increases towards the interior, (iii) Eastern Europe, including most of Scandinavia, has a rather small total precipitation with a summer maximum, and in the extreme north-east and south-east the amounts at all seasons are very small indeed, (iv) In the Mediterranean region the total annual rainfall varies from being very considerable on the highlands behind the Adriatic to being very slight over most of eastern Spain, but the common characteristic is that of summer drought; in the northern part of the Mediterranean region the period of drought is short, but towards

the south the period becomes longer and the intensity of the drought may be severe.

Indeed, throughout all southern Europe, including the south of Russia, the summer is normally a time of drought, for the high temperatures cause rapid evaporation, and the efficiency of what precipitation may occur is thereby greatly reduced. Conversely, in northern Europe evaporation is much less and the rainfall is correspondingly more effective.

Another important consideration is the variability of the rainfall from year to year. This variability is, in the main, greatest where the total amounts are least, and it is consequently quite considerable in the east and in some parts of the Mediterranean region. Moreover, while in a well-watered region a decrease from the average is not a serious matter, in the areas of scanty rainfall it may have calamitous results; thus, in particular years the normal summer drought of the Mediterranean may be unusually prolonged and may even become disastrous, while in southern Russia in years of sub-normal rainfall harvests fail and famines result.

One more point must be noted: when there is little rainfall either during the whole year or during one season of the year, that rainfall tends to occur in short, sharp downfalls; this is frequently the case in the Mediterranean region and with the summer thunderstorms of eastern Europe. A rapid fall means that the immediate run-off of water to the streams is great, and the plants cannot use so much of it; also, after the rain bright weather quickly follows, and evaporation may dispose of much of the water and thus further reduce the value of the already small precipitation. The rapid run-off, moreover, tends to wash away the soil, and therefore soil erosion is a serious factor in the utilization of the Mediterranean and other areas of short and sharp rainfall.

Other Climatic Elements.—The frequent passage of depressions over the Atlantic margin has effects upon the climate of that region besides the equability of the temperature and the heavy precipitation; there are, for instance, the facts that the winds are often violent and the sky covered with cloud. On the contrary, the relative absence of depressions in the Mediterranean region, even in winter, allows a clearness of the sky and an abundance of sunshine which are important factors in attracting visitors from north-western Europe. Similarly eastern Europe has in general clearer skies than the west.

The importance of the element of light in climate is, of course, great, and in this connexion latitude is the main factor. In northern Europe, which lies near and even beyond the Arctic Circle, there is a very marked contrast between winter and summer. In summer the days are very long, and within, the Arctic Circle the sun is above the horizon for the whole of the twenty-four hours during a period which at the Arctic Circle is

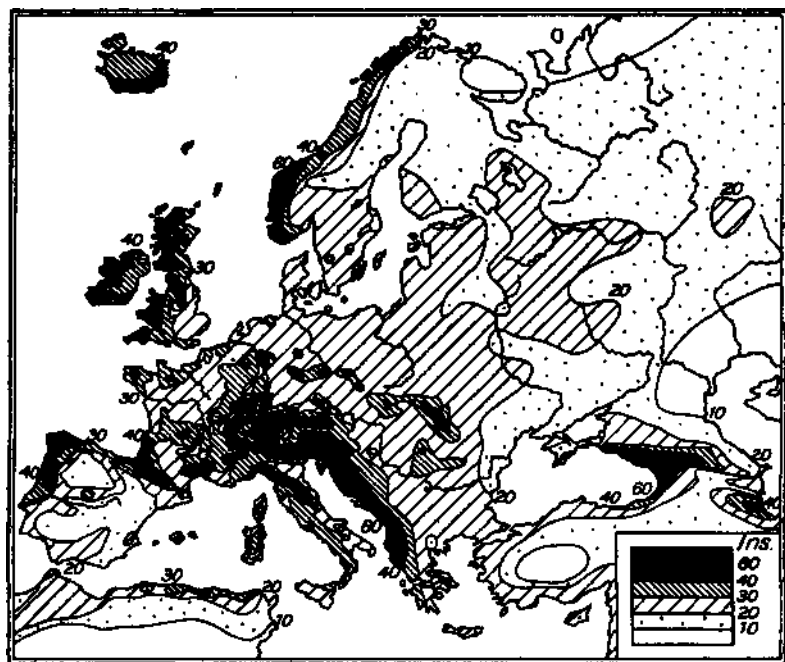


FIG. 14.—MEAN ANNUAL PRECIPITATION.

limited to one day, but at North Cape in Norway extends to over two months.

Conversely, at midwinter the sun is invisible at the Arctic Circle for twenty-four hours, and at North Cape for more than two months. Moreover, even during the short periods in winter when the sun is visible, it rises but little above the horizon.

Climate Regions.—The various elements of climate, e.g. winds, temperature, precipitation and light, of course all exist in the closest association ; they influence one another and have a combined effect upon other geographical phenomena and upon mankind. Regarded in this way, climate is seen to differ very

markedly in different parts of Europe, and it is useful to divide the continent into several regions, in each of which the climate has distinct characteristics. Yet climatic regions seldom have definite boundaries, and it must therefore be emphasized that, when maps are made like those in Fig. 15, the various regions usually "shade off" into one another and the descriptions are only generalizations which apply best to the central parts of the respective regions.

It is convenient, however, to draw lines to serve as approximate boundaries of climatic regions, and for this purpose two devices are commonly employed. In the first place, there are lines based upon meteorological records, like those drawn on the maps showing the conditions of temperature and precipitation. Such lines may be without much significance if they are based merely upon some arbitrarily selected numbers, such as 68° F. (rather than 70° F.), or a duration of frost for one month (rather than three weeks), or a rainfall of 10 inches (rather than 12 inches). It is often better, therefore, to employ the second device, i.e. the adoption of some more natural indication of the climates, and for this purpose vegetation, either natural or cultivated, is a useful guide. In the following chapter the main types of vegetation will be described, and it will there be pointed out how these types are related to climatic conditions ; in some cases it appears that the limits of the growth of particular plants correspond with a line indicating certain climatic conditions ; e.g. the northern limit of trees is found where the period of warmth (over 50° F.) decreases to one month. Hence the line indicating this condition on the map in Fig. 11 has been adopted on the map showing climatic regions (Fig. 15) as separating the "Arctic" from the "Boreal" type of climate. Similarly the other lines showing boundaries to climatic regions have been adopted because of some special significance which will be stated when the climates are described.

The conditions of the climates of Europe may now be summarized in the following paragraphs :

The Arctic climate is experienced around the Arctic Sea, and in the main within the Arctic Circle. Its "winter" is very long, with about seven months of frost, very cold, and for a considerable period almost sunless ; for most of the year the ground is covered with snow, and the subsoil is always frozen. The "summer" is correspondingly short, and although at mid-

summer the daylight is practically continuous, the sun is low in the sky; consequently the mean temperatures rise little above the limit of plant growth, and that only for a short period. Most of the scanty precipitation comes during the time of relative warmth, and is therefore available for plant-life; moreover, evaporation is little and the "effectiveness" of the precipitation is considerable.

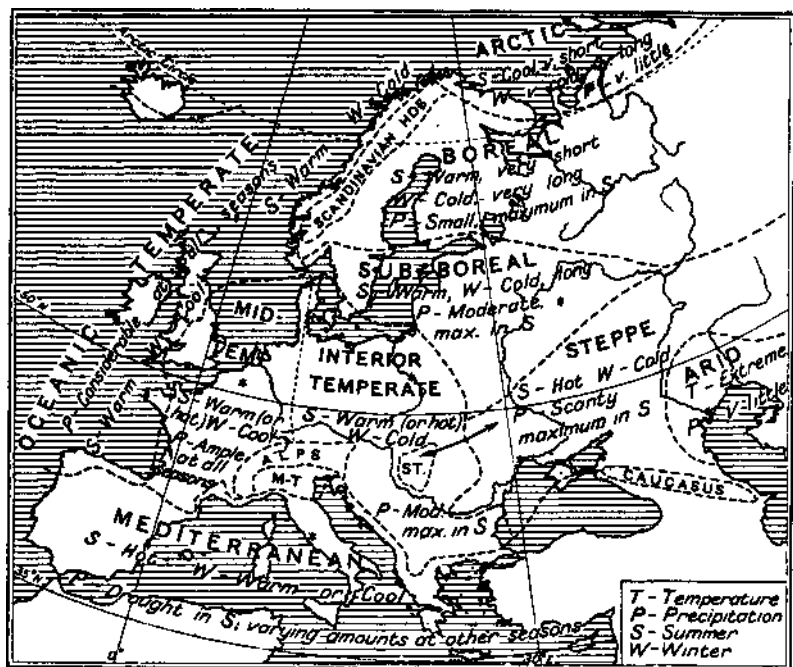


FIG. 15.—CLIMATE REGIONS OF EUROPE.

Note.—In all regions, the uplands or highlands show modifications of the general conditions, but the Alps, Caucasus and Scandinavian Highlands are shown as independent regions.

Except in areas of very marked relief, the boundary lines represent transitional belts rather than definite divisions between the regions. The asterisks indicate the situation of the stations for which graphs are given in Fig. 9.

The Boreal climate, or northern climate, is so called because it extends over much of the northern lands of the world which border upon the Arctic Circle; in Europe the belt begins immediately behind the Scandinavian Highlands, which largely exclude it from Atlantic influences. The cold is about as severe as in the Arctic climatic region at midwinter, but it has a shorter duration, and the thick cover of snow due to the winter precipitation lasts for less than half the year. In spring there is a

rapid rise of temperature above the limit of plant-growth, and the summer has from one to four months of warmth, with a small but effective rainfall. The contrast between the light conditions in summer and winter is very marked, though not so extreme as in the Arctic region.

The Sub-boreal climate is transitional between those of markedly continental character and those largely influenced by the Atlantic Ocean; it is experienced in a region in which Atlantic influence can just penetrate into eastern Europe, between the barriers of the Scandinavian Highlands on the north and the Alps and Carpathians on the south. The annual range of temperature is not much less than that of the European part of the boreal climatic region, but both in summer and in winter the temperatures are higher. The period of warmth lasts four months along the northern limit of this region, and increases southward. Also, during this period as well as during the rest of the year there is greater precipitation than in the boreal region. Hence conditions are more favourable for plant-growth, and for the utilization of the resources by man, than under the boreal type of climate.

The Steppe climate is a convenient label to apply to those conditions under which have developed the various forms of steppe vegetation which will be described in the next chapter. This type of climate, like all the others of eastern Europe except the transitional sub-boreal type, is definitely continental and extends far into Asia. It is exceptionally complex, especially as regards the interaction of the temperature and the precipitation, and demands a separate consideration of each of the four seasons.

For about three months or more there is a winter during which the mean temperature is below freezing-point, and for a considerable period the ground is covered by snow. In spring there is a rapid rise of temperature above the limit of plant-growth, and this growth is aided by the melting of the snow-cover and by a moderate amount of rain. In summer the precipitation as recorded by a rain-gauge is greater, but it tends to occur in heavy and short showers, while the weather becomes "hot" (over 68° F.) for about three months; consequently evaporation is great, the effectiveness of the rainfall is small, and the summer is a season of drought during which plant-growth ceases. In autumn, as in spring, the temperatures are moderate,

and the rainfall is consequently more effective ; yet it falls upon parched ground, and a reawakening of vegetable life is soon followed by the cold of winter.

As the complex climatic conditions are closely reflected in the periods of growth and rest which are characteristic of steppe vegetation, the approximate limits of this vegetation are here taken as the boundaries of the region.

In addition to southern Russia, there is an area in the central Danubian Lowlands which has a climate of this type, and may therefore be regarded as an " exclave " of the main steppe region.

The Arid climate is characteristic of the Caspian-Aral depression in the heart of the Eurasian continent, and is therefore only experienced on the south-eastern margin of Europe.

While in the north of the continent it is low temperatures which cause limitation of certain forms of life and activities, and while in the steppe region both the cold in winter and also the drought in summer are the critical phenomena, here in the Caspian-Aral region the precipitation is so scanty, irregular and ineffective, that aridity is the characteristic of the region during the whole year.

That is not to say that the temperature conditions are negligible. In the first place, the ineffectiveness of the precipitation is due to the high summer temperature, for a rainfall of less than 10 inches per annum, which here marks out the arid region, is accompanied by wet surface conditions in summer in north-eastern Europe. In the second place, the extreme character of the climate is in itself of geographical importance ; during the year a " cold " winter, which lasts about three months, is followed by a spring in which the climate rapidly passes through the " cool " and " warm " stages to a summer during which the weather is " hot " for three months, while the mean and maximum temperatures are among the highest in Europe.

The Temperate climate.—None of the regions of eastern Europe has climatic conditions which can be considered " temperate,"¹ for they all experience either considerable heat or considerable cold at some season of the year. In the south-east, moreover, there is a period of deficient moisture, and this characteristic of seasonal drought exists also in the Mediterranean lands.

¹ In accordance with the dictionary definition: " temperate = moderate in degree of any quality . . . cool, mild, moderate in temperature...."

Only in north-western and central Europe is there a comparative moderation of climatic conditions throughout the year ; hence the term " temperate " is restricted to the climate of this region. Within this region, however, conditions are by no means uniform, and three varieties of the temperate climate may be distinguished in Europe.

The Oceanic Temperate climate of the Atlantic margins of north-western Europe is markedly affected by depressions, accompanied by strong or even violent winds and by precipitation which, though heaviest in winter and autumn, is abundant at all seasons. The frequency of winds from the warm waters of the Gulf Stream Drift results in the warmth of the winters and the marked equability of the climate.

The extent of the region thus affected by the westerlies at all seasons is great from south to north ; hence there are considerable differences, especially as regards temperature, between the areas bordering on the Mediterranean climatic region at the one end, and those beyond the Arctic Circle at the other. Contrast the figures given in the table on p. 26, for Santiago in Spain, for Valentia Island, and for Bodo just within the Arctic Circle on the Norwegian coast.

The region which may be termed oceanic is clearly limited inland by the Scandinavian Highlands in the north, and almost as clearly by the uplands of the Iberian Peninsula ; but between these extremes there is a more gradual transition towards central Europe. In the British Isles the English lowland is less equable and less rainy than the uplands of the west and north, and may be better classed with the region next treated.

The Mid-Temperate climate has rather warmer summers, and the winters are so much less influenced by the maritime influences that there is a period during which plant-growth is checked ; also the precipitation is not so heavy. Except in the winter the conditions of heat and water-supply are sufficiently favourable to allow a considerable variety in the forms of plant-life which can here develop.

The North Italian Plain may be grouped with the warmest part of the Mid-Temperate climatic region, for its temperature and rainfall conditions closely resemble those of the nearest part of this region, viz. the Rhone Valley just below Lyons. (Compare the figures for Milan and Lyons in the table on p. 26.)

The Interior Temperate climate shows a further reduction in

the effects of proximity to the ocean. Apart from the higher areas, on which the temperatures are necessarily lower, a line drawn southward from the peninsula of Jutland separates the regions south of the North Sea, where in the coldest month the mean temperature is above freezing-point, from those south of the Baltic Sea, where the winters have a cold period lasting one, two or three months. Also, the precipitation is lower, and has a maximum in summer.

Eastward, conditions gradually approach those of the sub-boreal and steppe climatic regions, and it is convenient to take as the eastward boundary the approximate limit of the beech, which, because of its need for a fairly long vegetative period, is often regarded as a criterion of temperate as distinct from continental conditions.

The region extends far to the south-east, the main modification being a lengthening of the warm period and an increase in the midsummer heat, as may be seen by comparing the July temperatures at Berlin and Budapest.

The Mediterranean climate requires separate consideration for each season. In winter the temperature is almost everywhere above the limit of growth, and in the southern part it is definitely warm, while the rainfall is considerable ; hence neither plant-growth nor the outdoor activities of man need cease. In spring there is everywhere warmth, and in most parts there is sufficient rainfall for the processes of plant-life, enabling flowering, fruiting and ripening to continue. In summer there is a period of three months or more of heat (above 68° F.), and the maximum may be very high ; the rainfall becomes scanty or even fails, and with the high temperature this season is one of drought in which plant-growth ceases, except for deep-rooted types. In the autumn there is still warmth, and usually sufficient rainfall for a resumption of the growth of vegetation ; indeed, in much of the European part of the region the autumn is the season of maximum precipitation.

It is convenient to summarize the more striking features of the Mediterranean type of climate as "winter warmth and summer drought," but, as in the case of the steppe type, no simple meteorological formula can adequately express its character. For this reason the limit of the growth of the olive,, the most typical plant, is adopted as the northern boundary of the Mediterranean region save where, as in the interior of the

Iberian Peninsula, altitude modifies the climatic conditions and prevents the growth of this plant. (Compare the map showing the distribution of the olive in Fig. 18 with that of the climate regions.) It should be noted that, apart from the special case of the interior of the Iberian Peninsula (which will be discussed in a later chapter), the Mediterranean climate in Europe is rather closely restricted to the coast-lands of the Mediterranean Sea, together with the southern shores of the Crimean Peninsula.

Uplands and Highlands.—To simplify matters, it is lowland conditions which have been indicated in the text and in the map of climatic regions. In some parts, however, there are considerable complications, due to the lower temperatures and the greater precipitation which occur with higher altitudes. Such modifications will be taken into account in the more detailed regional studies which will follow, but here, and on the map in Fig. 15, attention can only be briefly drawn to the outstanding highland regions of the Alps and in Scandinavia. In several respects the latter highlands continue southward the characters of the Arctic climate, while conditions in the Alpine region are so complex that they must be specially described in a later chapter.

QUESTIONS

1. State the characteristics of the wind-belts which affect Europe. Explain how they influence different parts of the continent.
2. Draw a graph showing the annual "march of temperature" at any one place you name. Show (*a*) what deductions you can make from the graph, and (*b*) its incompleteness as a record of the temperatures.
3. For any one selected part of Europe, state and account for the essential characteristics of its rainfall.
4. Discuss whether it is possible to find and express definite limits to climatic regions.
5. Examine the truth of the statement that the critical element of climate in Europe is temperature in the north, and rainfall in the south.
6. "The Mediterranean climate has a mild winter and dry summer." Show in what ways this dictum is too simple.
7. Trace the normal succession of climatic conditions through the seasons in the steppe-lands of Europe.
8. Show by reference to one or more particular regions how the various elements of climate interact with one another.
9. To what extent can the climate of "Peninsular Europe" be regarded as a contrast to that of "Trunk Europe"?

CHAPTER III VEGETATION, SOILS AND LAND- UTILIZATION

NATURAL VEGETATION

IN England and in other parts of Europe which have long been settled, the natural vegetation has been either greatly modified or entirely superseded by cultivated plants, but over other parts of the continent the natural vegetation still dominates the landscape and greatly influences mankind.

It assumes many forms, according to the climate, soil and other factors which determine its growth, but certain main types may be perceived ; we will consider each of these in turn, beginning with those of eastern Europe, where the contrasts are clearly displayed.

Tundra and Alpine Vegetation.—In the preceding chapter it was pointed out that trees cannot grow where the period of warmth is less than one month. The Arctic climate, therefore, with its cool and very short vegetative season, can support low woody shrubs only on the margin of the forest, and the characteristic vegetation of the tundra region consists of mosses and lichens, in addition to many kinds of small flowering and berry-bearing plants. On the drier parts of the tundra lichens grow together so as to form close mats ; in wetter situations mosses grow in abundance, and peat accumulates from dead vegetation and may form hillocks covered with living moss. Wet meadows occur, and swamps with cotton-grass and sedges occupy hollow places.

The region formed by the Scandinavian Highlands, known as the Fjeld, continues Arctic-like conditions southward, the change of latitude being largely offset by increasing altitude ; consequently, below the ice-fields of the highest parts, the mountain flora closely resembles that of the tundra, and may be considered as of the same type.

There are, however, considerable areas on the Scandinavian Highlands, where in the summer there is a thick growth of grasses and herbaceous plants, which afford a fairly rich pasture of the Alpine type. This pasture is so named from the

zone of the Alps situated above the tree-line but below that of perpetual snow ; it is found also on other mountain regions—for example, on the Urals, Carpathians and Pyrenees.

It is impossible to show such a zonal arrangement of vegetation, varying according to altitude, on a small-scale map, and consequently only the type which occupies the greatest area has been indicated in Fig. 16. Thus, while the northern Urals and the Fjeld have been marked as belonging to the tundra and Alpine type, the other mountain regions have been shown as being mainly forested, but with Alpine pasture.

The Coniferous Forest.—Between the tundra and lowland forest is no sharp line of demarcation. Outposts of forest extend northwards into the tundra region, and patches of tundra vegetation are found within the limits of the forest. The dwarf birch which grows on the borders of the Arctic region is replaced by a larger kind farther south, while the spruce and pine increase southwards in number and size till they form the dominant trees in the great unbroken region of the coniferous forests.

In the eastern part of this region, extending into Siberia, the forest is known as the taiga ; here Siberian species of spruce and pine are found, and fir and larch are subordinate members of the plant associations. In the west, the forest is composed of European species ; the pine is that often known as Norway pine or Scots pine, and a zone of birch frequently forms the boundary towards the tundra or the fjeld. Throughout the coniferous forest, on the drier soils the pine predominates, and on the damper soils the spruce, while in the areas of poorest drainage moors with sphagnum moss are common.

Adaptation to the climate, with its short period of warmth, is shown by the needle-like form and leathery surface of the leaves. They are thus protected against the cold winds, and against the loss of moisture by transpiration at seasons when the water in the soil is frozen and there is therefore a time of " physiological drought." Yet the leaves do not fall in winter and are ready to take advantage of every spell of growing-weather ; the forest, therefore, is evergreen. A store of food in the form of starch in the tissues of the wood is another adaptation to the climatic conditions, and the coniferous forests supply timber which is " soft," as compared with the " hard " woods of the deciduous forests.

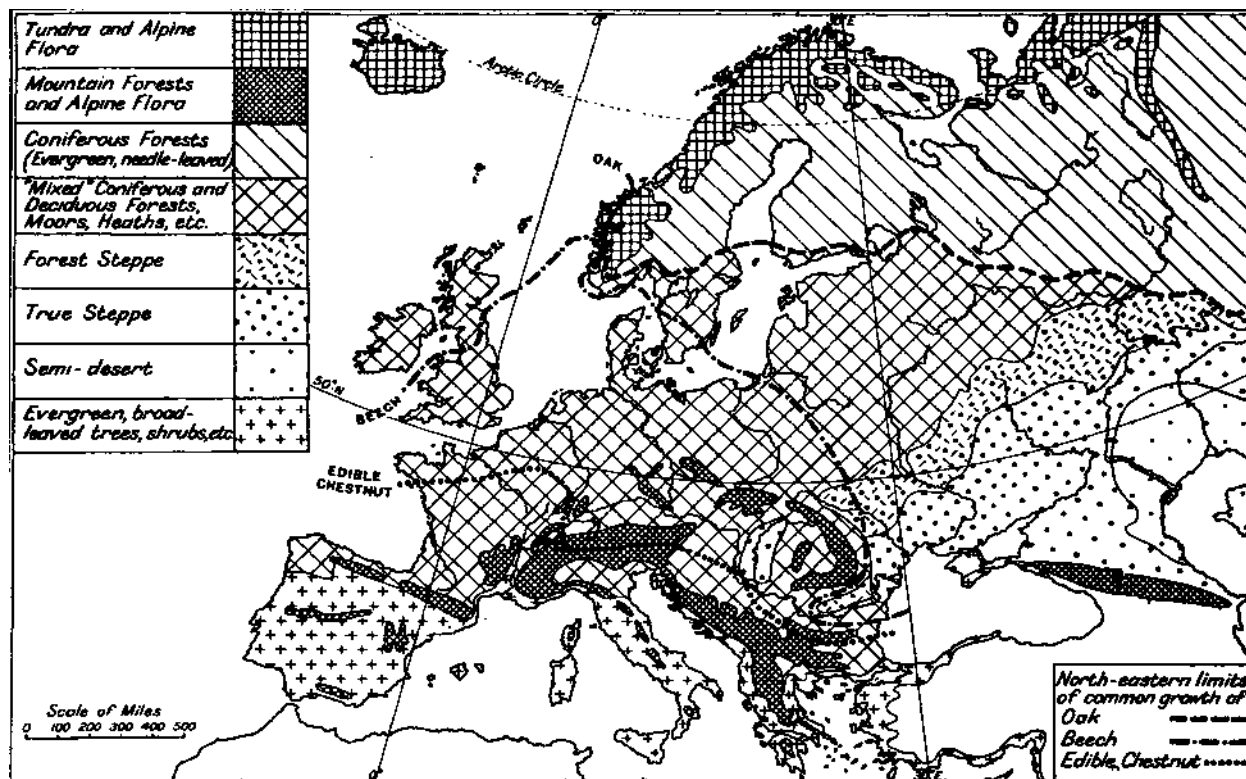


FIG. 16.—NATURAL VEGETATION REGIONS OF EUROPE.

The trees rise tall and straight, almost like poles, from a carpet of fallen needles, for there is little undergrowth in the coniferous forest. Factors which hinder the development of undergrowth are the lack of light beneath the high canopy of leafy branches, and the frequent freezing and thawing of the soil in spring and autumn, with the consequent injury to rootlets.

The "Mixed" Forest.—Even in the coniferous forests, there are representatives of the deciduous broad-leaved trees—for example, the birch, alder and poplar—and in more southerly regions these become more abundant, while others, such as the oak, appear and at last become common. Indeed, the occurrence of the oak is commonly taken as indicating the limit of the forests known as "mixed," and this criterion is here adopted on the map of natural vegetation. Yet the limits of even one species of tree cannot be accurately shown by a definite line, and those of the oak, beech, etc., shown on the map are necessary simplifications.

The annual leaf-fall of the deciduous trees is a protection against the cold and the consequent physiological drought of the winter, but this adaptation can occur only where the summer vegetative period is long enough, first for the growth of the new leaves, and then for their functioning. It appears that for this purpose it is necessary that the mean temperature should be above 42° F. for over five months.

The increasing length and warmth of the summers towards the south-west allow the growth of other species of trees which add to the variety, and in some cases to the value, of the deciduous forests. On the map in Fig. 16 this is illustrated by lines showing the approximate limits of the areas within which the beech and the edible chestnut are widely grown.

The varying nature of the mixed forests of coniferous and deciduous trees depends partly on the climate of the particular localities. In this respect, altitude, with the accompanying modifications of temperature and precipitation, is the main factor in causing the uplands and highlands to have forests of distinctive character; in central Europe the lower slopes are largely covered with deciduous trees and the upper with conifers, until the limit of forest growth is reached. Soil conditions as well as relief affect the character of the natural vegetation, and upland heaths and moors and lowland fens occupy considerable areas.

Over the greater part of the mixed forest region man has modified or transformed the original tree-cover. This has been done either intentionally, by cutting down the trees for timber or to clear the ground for agriculture, or unintentionally by fire or by allowing the young shoots to be eaten by goats[#] and other animals. Once destroyed, forests may be gradually replaced by a natural extension from neighbouring regions ; more commonly, however, new species are deliberately planted, in some parts forming woods of particular broad-leaved trees, and in other parts woods of conifers. In the main, however, cleared forest land has been utilized for agriculture or pasture.

On its southern margin, a climatic limit is set to the deciduous forest by an interruption of the period of summer growth. In the south-west and south this interruption is caused by the summer drought of the Mediterranean region, though the greater precipitation on the higher lands of that region allows trees to extend along the mountains far into the southern peninsulas of Europe.

In the south-east of the continent the hot and dry summer prevents tree growth in general, though there are tongues of forest stretching down the river valleys and " islands " of woodland or scattered trees in the damper places beyond the general limit. Indeed, the transition is so gradual that the northern belt of the steppe region is often known as the forest-steppe.

The Steppe Vegetation.—South-east of this transitional belt is the extensive region of the true steppes in which grasses and herbaceous plants, either annual or biennial, form the characteristic vegetation. As stated in the preceding chapter, the spring is the main season of plant activity ; the grasses and herbs appear above ground, grow rapidly, flower and produce their seeds in the short period between the winter cold and the drought of midsummer. Then they die down, and life is hidden beneath the surface, where, in tubers, bulbs, etc., a store of food is formed and preserved in readiness for the next season. A second short and less pronounced period of plant activity occurs in the autumn, but for most of the year until the next spring the ground appears bare.

According to differences of climate and soil within the steppe region, there are differences in the kinds, and the abundance, of the plant-forms. In the better-watered, northern and western parts of the true steppe there are areas of " meadow

steppe," of tall tufted grasses and gay flowering plants such as campanula and clover, which make a continuous thick cover to the ground ; even in a natural state, this can be mown to obtain a rich harvest of hay for use in the dry and cold seasons. In the less-watered districts, less succulent grasses and herbs which grow closer to the ground and are rather sparsely scattered form the greater part of the vegetation ; this can be utilized for grazing rather than for the cutting of hay.

As in the case of the more fertile forest regions, so here on the steppes the more productive areas have been much changed by man, both by pastoralists mowing or grazing the natural growths, and by agriculturalists cultivating the land for crops.

The Semi-desert Vegetation.—In the poorer steppe lands there appear some shrubs which have deep and long roots to obtain as much water as possible, and whitish, felted leaves from which the moisture is but slowly transpired ; there are also plants which are protected against the wind and the resultant loss of moisture by growing close to the surface of the ground. In the semi-desert, such forms of life adapted to an arid climate represent an increasing proportion of the vegetation as the grasses and herbaceous plants become fewer ; the amount of vegetation of any kind is but small and the bare soil is everywhere visible. As protection against still greater aridity, the woody growths commonly have their leaves reduced to spines. Also, as the conditions approach those of the deserts in which there are only occasional rains, the annual plants remain dormant below the surface for longer periods ; but whenever in the summer the soil receives a supply of water, they may appear, and pass rapidly through their very short vegetative period.

In the small areas in the extreme south-east which may properly be called desert, the vegetation is very scanty indeed, and only the " halophytes " adapted to living in salty soils, or plants which can find sufficient moisture in the sand-dunes, can exist.

The "Mediterranean" Vegetation.—As the winter temperatures are generally above the limit of growth, trees and woody shrubs which live throughout the year are the characteristic plant-forms ; they are protected against the loss of water in the dry summer by various devices, including deep and wide root development, a thick, rough bark, such as cork, and leaves of a different kind from those of the more northerly forest trees.

As the winter allows growth, there is no common period of leaf-

fall, nor need there be the extreme adaptation of a reduction of the leaves to needle-form ; the trees are evergreen and the leaves are broad, but their glossy and hard surface prevents rapid transpiration. The evergreen oak, cork oak, olive, holly, laurel and myrtle are of this kind and are typical of the region, although some of them may grow also in the south-western parts of the deciduous forest region where the winters are sufficiently warm.

Yet these broad-leaved evergreen trees are not the Only plants which can live under Mediterranean conditions, and an important group consists of low shrubs : e.g. heaths which are evergreen but have small and narrow leaves ; thyme, lavender and other aromatic shrubs ; the brightly flowering cistus, and many others.

Originally the Mediterranean region was largely forested, but these forests have almost disappeared ; now the natural vegetation, in the sense of that not deliberately planted by man, is only exceptionally forest or woodland, and that is found mainly on mountains or uplands where the temperatures are lower and the rainfall is greater than is normal. In such situations there are woods of evergreen oak or cork oak, as in the Iberian Peninsula, and there are also areas where the trees are those which are more common in other vegetation regions, such as the beech and edible chestnut, which extend southwards along the mountains of Italy, or the pines which grow on the uplands of the Balkan Peninsula.

Much more extensive are the thickets of evergreen shrubs which have replaced most of the original forests ; these growths may include low trees, such as the laurel and myrtle, and bushy plants, such as tree-heaths, cistus, broom and juniper. Such thickets are known as maquis in France, macchia in Italy and monte bajo in Spain.

Still poorer growths of lower bushes are formed of thyme, sage, lavender, small heaths, etc., with thistles and various flowering herbs, such as the asphodel and iris. These associations show bare earth between the plants; they are widely developed on the drier soils and are known as garrigues in France, tomillares in Spain and phrygana in Greece.

Meadows of the north-western European type are rare ; in well-watered situations there are associations of grasses and bulbous plants which give pasture, but these commonly dry up in the summer.

On the other hand, in very dry areas, such as the interior plateaus and the south-eastern lowlands of Spain, the climatic conditions and the vegetation approach those of the steppes of eastern Europe ; here grasses may predominate, and esparto grass is still the vegetation cover of some districts in Spain.

The natural or semi-natural vegetation is now found mainly on the higher parts, the steeper slopes and the poorer soils of the Mediterranean region ; most of the lowland and much of the hill-country has been taken in for cultivation.

SOILS

It might be expected that the nature of the soil is largely determined by the geological factor—the rock from which it is derived, for in England differences between soils often correspond to differences of the parent material. This view was generally held until Russian scientists, studying the soils of their vast country, which has such contrasted climates, realized that the climatic conditions are the main cause of the striking contrasts in the soils. To appreciate this, as well as to understand the essential character of the soils and their relation to agriculture, we may examine in turn the main soil types and soil regions of Europe, beginning with those of eastern Europe.

The Podsoles.—Beneath a thin superficial layer formed of fibrous vegetable material, the podsoles have an upper level, or "horizon," of an ashen-grey colour from which they were named (Russian : pod = under, zola = ash). This upper horizon has a loose structure, and consists of sandy and gravelly material. Both colour and structure are due to the washing down, or leaching, of the soluble salts, the lime constituent (calcium carbonate) and the clay from the uppermost to the second horizon, situated a foot or more beneath the surface. This second horizon, because of the materials washed into it, is usually compact, and often contains a layer cemented together by iron into an impermeable "pan." The essential process of leaching is the consequence of the downward drainage of water, and this occurs when the precipitation exceeds the combined loss by evaporation, the surface run-off and the transpiration of water by plants.

Hence climate is the main control of the development of the podsoles, and, moreover, the degree to which soils are leached is, directly and indirectly, due to the climate. The map in Fig. 17

shows the distribution of two types, the strongly leached and the moderately leached. The former extends widely over north-eastern Europe (excluding the tundra and mountain areas, which will be considered later), where the summer warmth is not enough to cause great evaporation. Also, the climate has here an indirect effect, since it allows the growth only of the coniferous forest, of which the vegetable residues tend to accumulate as a peaty layer, giving almost permanently wet conditions. The abundantly watered western side of Scandinavia also has soils of the same type. Farther south the coast-lands around the south-eastern corner of the North Sea have similar conditions, for the predominantly sandy character of the subsoil allows easy downward movement of the rain-water.

Soil conditions react upon the vegetation ; for example, the northern limit of the oak is partly determined by climate and partly by the difficulty with which this tree grows on the more strongly leached podsoles. Moreover, these strongly leached podsoles, having lost much of their plant-food constituents from the upper horizon, are unfavourable for cultivation ; to be productive, they need to be supplied with a considerable amount of lime and other manures and to be very thoroughly tilled.

The moderately leached podsoles are found in warmer well-watered regions, and in these the less-marked grey colour of the upper soil and the usual absence of a compact and cemented lower horizon bear witness to the retention of more of the plant-foods in a condition available for plant-life. The deciduous forests, too, supply an annual leaf-fall which is incorporated with the soil.

The map shows that the moderately leached podsoles extend over the deciduous forest regions of eastern Europe and over much of the north-western coast-lands of the continent, excepting the mountain areas ; they are also found on interior uplands. As there are no definite limits to climatic conditions and seldom sharp changes in the vegetation, so the resultant soil types usually merge into one another.

In areas of abundant water together with poor drainage, the podsol regions are characterized by the development of peaty soils. Moorland peats form acid soils of little value to man, but since the fen peats found in lower situations form less acid soils and contain more plant-food, they may prove productive when drained.

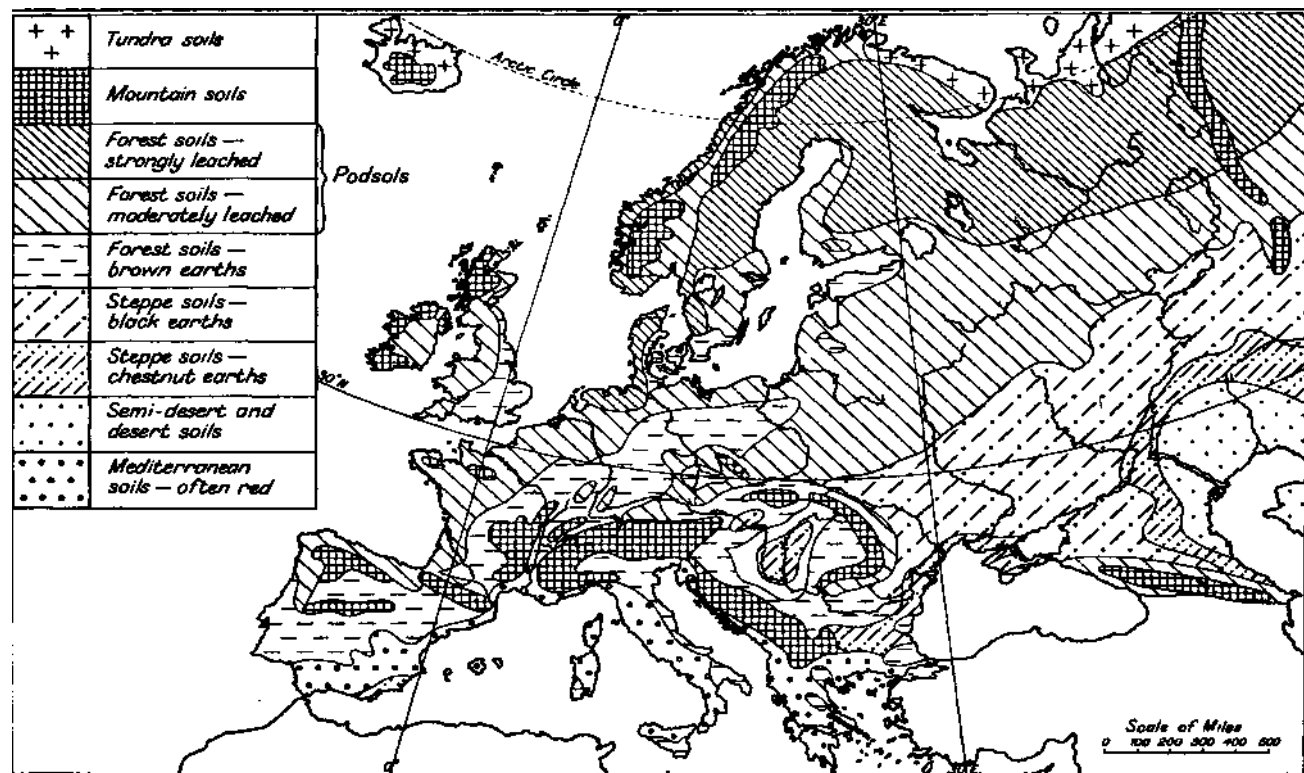


FIG. 17.—SOIL REGIONS OF EUROPE.

The Tundra Soils.—These soils of the far north are largely the result of their water-logged condition and the low temperatures. Evaporation is very slight and the subsoil is permanently frozen below a depth of 2 or 3 feet. Humus, the partially decomposed organic matter formed from plant residues, remains as a surface layer, for downward leaching is impossible, and the low temperatures hinder chemical or other changes ; peat is commonly formed.

It thus appears that an abundance or an excess of water is the main factor in determining the soil conditions in all the northern part of eastern Europe. In the south-eastern part, on the contrary, seasonal or permanent aridity is the controlling factor.

The Black Earths are the characteristic soils of most of the steppe areas, where they are known as chernozem. The black colour is due to a large proportion of humus in the upper horizon, which is usually about 3 feet in depth, and at the base of this there is an accumulation of calcium carbonate, before a transition to the parent material. This parent material is often, but not always, loess.

The humus is derived from the annual addition of vegetable matter from the grasses and herbaceous plants ; the decomposition remains incomplete, because it depends upon the activity of bacteria and other soil-organisms, which is limited, like that of the vegetation, by winter cold and summer drought.

Of great importance is the occurrence of rains and the melting of snow in spring followed in summer by heat and drought. In spring the calcium carbonate is washed down from the surface ; in summer the surface soil becomes dry, and by capillarity the water rises from below and brings up soluble matter, including calcium carbonate, which is then deposited as the water evaporates. There is thus an accumulation of the calcium carbonate at the base of the upper horizon—an indication of a balance in this black earth region between the downward leaching of the well-watered north and the upward movement which becomes most important in the arid south-east.

In the black earths there is an abundance of plant food, and cultivation is made easy by the crumbly structure of the humus-bearing layer ; consequently the black earths stand among the best of the world's soils from the point of view of fertility.

The Chestnut-coloured Soils.—On the northern side the

black earths pass through grades of greyness to the ashy soils of the forest regions ; on the south-eastern side they change to a light-brown, chestnut colour, since the dark humus decreases in amount as the plant-life from which it is derived becomes more scanty. Because of the increasing aridity there is still less leaching than in the black earths, and there is more calcium carbonate in the upper horizon. In themselves, these soils are nearly as valuable as the black earths, but the climate is not so propitious to agriculture.

It should be noted that the steppe soils, besides covering most of south-eastern Europe, are found in the middle Danubian lowlands and in other areas of central Europe too small to be shown on the map.

The Semi-desert and Desert Soils.—The marked aridity in the Caspian Depression continues the change just described, and the upper horizons of the soils progressively contain less humus and more calcium carbonate. Their colour changes through brown to grey, and their fertility decreases. In the most desert-like areas, blown sand is accumulated and even heaped up in dunes. Also, in some parts there appear upon the surface thin crusts, or efflorescences. These are formed by water from the occasional rains sinking some distance into the soil, which then again dries ; the water, after a period during which it dissolves the salts in the soil, works upward by capillarity and evaporates on the surface, where it leaves saline or alkaline deposits.

In these arid regions soil conditions combine with climate to make them inhospitable to man.

Brown Forest Earths.—From the point of view of the formation of productive soils, northern Russia suffers from an excess, and southern Russia from a deficit, of water ; the best balance occurs in the central Russian regions. A similar balance as regards the water-supply occurs in much of central and western Europe, and here it is associated with less severe temperature conditions than in the eastern part of the continent.

Consequently in these regions there is less leaching than in the case of the podsoles, while a greater activity of the soil organisms reduces the amount of humus as compared with that of the black earths. With a natural vegetation of deciduous forest, there is an annual leaf-fall which UNIVERSITY LIBRA

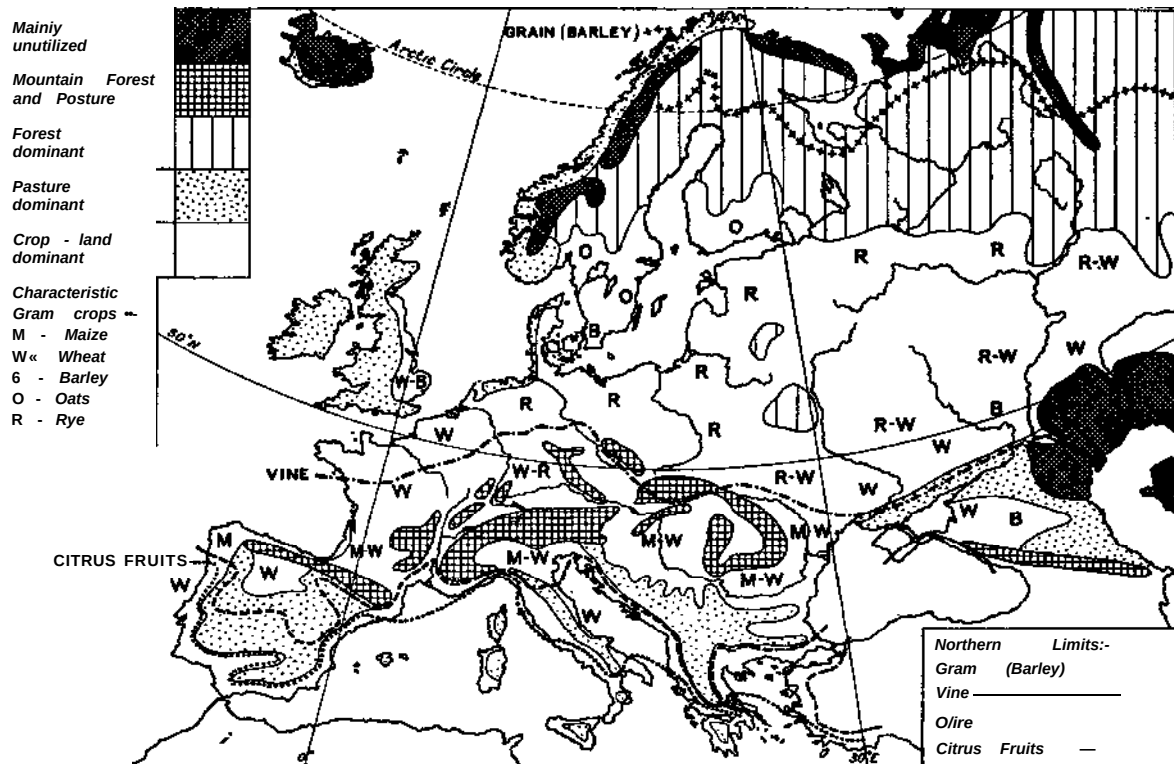


FIG. 18.—LAND-USE REGIONS OF EUROPE.

[Adapted from Jonasson.

the soils for cultivation, and their generally crumbly structure aids tillage.

This group of soils is a large one, and there are many differences in the colour and the other conditions, partly because with this "balanced" type of climate differences in the nature of the parent rock show themselves in the soils, as is well illustrated in the case of south-eastern England.

Moreover, since these soils are generally quite remunerative and have been worked by farmers for centuries, they have often been transformed from a natural to an artificial state.

Mediterranean Soils.—These are varied in character, but frequently have a reddish colour, and although they are often derived from limestone, they are typically fairly heavy clays; unfortunately soil science has not advanced far enough to reach an unquestioned explanation of their mode of origin. In several parts of the Mediterranean lands the red clays provide "oases" of cultivable land in otherwise almost barren limestone areas.

Mountain Soils.—Because of the low temperatures the weathering of the soils of mountain regions has been largely physical, and their development has not in general proceeded far. In the soils of areas above the forest limit there may be a humus layer, recalling that of the tundra, and below this a tendency to a podsol character shows itself. On the slopes there is usually only a thin covering of coarse rock fragments, while the finer material may be deposited as a deeper, and sometimes fertile, soil in the valleys.

LAND-USE AND CULTIVATION

The use that men make of the land depends partly on their desire for particular necessities and comforts, partly on their knowledge and equipment for obtaining these, and partly on natural conditions of climate, vegetation and soil.

Hence the map showing the main forms of land-use (see Fig. 18) shows certain broad similarities with the maps showing the climatic regions, the natural vegetation and the soil types.

Like those maps, that of land-use regions has had to be generalized, and the respective forms of utilization overlap considerably, but the following regions can be distinguished.

The "Mainly Unutilized" Areas.—In the cold north there are the tundra lands which offer practically nothing except a little pasturage for reindeer, the northern Urals and the parts of

the Scandinavian Mountains to which at best cattle may be driven for a few weeks in the year, and the greater part of Iceland, in which there are some areas of summer feeding for sheep. In the arid south-east of Europe there are only poor exclaves of the steppe-lands and small areas where irrigation is possible.

Dominant Forest areas are those of the coniferous forests in the broad belt of country forming the northern portions of Sweden, Finland and Russia. They are still mainly unbroken, although there are occasional clearings in which some agriculture and pastoral work are carried on. In the extreme north only vegetables can be grown, but in the remaining area barley, the grain crop which can ripen in the shortest vegetative period, is cultivated. . It should be noted that this grain is the " six-row " barley which is used for man's food ; it is an entirely different plant from the much more productive " two-row " barley which is grown in England mainly for malt, and in the south-west Baltic lands also as food for pigs. Farther south there are many " islands " of uncleared forest in the region marked on the map as dominant crop-land ; two of these are diagrammatically shown, one being the lake-studded area where Latvia, Lithuania and Russia adjoin, and the other the great Pripet Marshes.

Mountain Forest and Pasture.—These regions are the uplands and highlands of Central Europe and the Caucasus Mountains. In general, they are characterized by having deciduous forest with coniferous forest at higher levels, and then alpine pastures, and in some cases these are succeeded by culminating areas of bare rock and perpetual snow ; only in the valleys is cultivation possible. The use of the land varies from region to region, as will be explained in more detail in later chapters.

Dominant Pasture areas are those in which the main occupation of the people is the keeping of animals and in which a high proportion of the land is used for growing hay or for grazing, although there may be some crops grown either for fodder or for human use, and there may also be forests, moors or heaths. These largely pastoral areas fall into three main groups :

(i) Over much of north-western Europe, including the southern coast of Iceland, the climate is too wet for grain growing to be the most remunerative form of farming. In

Iceland sheep are reared ; in Britain both sheep and cattle are kept; in Norway, and in parts of the North Sea Lowlands, the keeping of cattle and the production of milk, butter and cheese are the main objects of farming. Grasses, clover and root crops are therefore grown and, as food for men, potatoes and oats—a grain which can ripen in relatively cool and wet summers.

(ii) In the Mediterranean region poor pasture has to a considerable extent superseded the forests of the uplands, while in parts woods of evergreen oak yield acorns as mast for animals. Not all the upland areas are used for pasture, however, for there are woods of cork oak, as well as of chestnut and other trees which yield their fruit. Sheep and goats are the animals most commonly kept, and in the Balkan Peninsula swine, too, are numerous. In the northern uplands of this peninsula, where the climate is not of the Mediterranean type, the forests have been so largely cut that even here pastoral work is now dominant ; cattle are relatively more important in these Balkan regions than in the other two southern peninsulas of Europe.

(iii) In the steppe-lands of south-eastern Europe the growing of crops gradually becomes less, and the work of the people becomes more restricted to the keeping of animals, towards the south-east. Cattle are reared in the rather better-watered part of the predominantly pastoral area around the Sea of Azov, and sheep mainly on the still drier country draining to the Caspian Sea.

Dominant Crop-land areas form the largest, as well as the most productive, group of agricultural regions of Europe. They are very varied in type, and one useful way of distinguishing them is according to the grain which is most commonly grown, although almost everywhere the keeping of animals is one aim of the farming, and generally vegetables are a product of considerable importance.

Grain Crops.—*Oats*, as stated above, form the characteristic crop over much of the pasture-lands of the north-west, and the crop-land in which they are predominant extends over southern Scandinavia to the lands north of the Gulf of Finland. Yet other grains, as well as root crops, are grown in the same area, and the two-rowed barley is particularly important in the region around the entry to the Baltic Sea. In eastern England, too, barley is largely grown, and here it rivals wheat as regards the amount of land devoted to it.

Rye.—The rye belt stretches from central Europe south of the North Sea and Baltic Sea across the middle of Russia as far as the Ural Mountains. Although rye requires a longer vegetative period than barley, and drier conditions for ripening than oats, it is a hardy grain and is largely grown on the inhospitable podsols of Russia and the glaciated areas of Germany and Poland. Rye bread has now been displaced by wheaten bread in western Europe, but it is still largely used in central Europe, and remains the staple food in the east. In Russia buckwheat and oats are also grown in the region in which rye is dominant.

Wheat.—The wheat zone is the most extensive, for its northern margin forms a great curve stretching from eastern England into central Europe and across Russia south of the rye belt, while it is largely grown in the warmer parts of central Europe and in the Mediterranean region. Thus wheat overlaps with barley in England, with rye in the Rhine-lands and in the black-earth areas of Russia, and with maize in the southern part of central and western Europe. Comparing the map of crop distributions in Fig. 18 with that of the duration of warmth in Fig. 11, it will be noticed that the northern part of the rye belt has a warm period lasting about four months, that of the wheat belt about five months and that of the maize belt over six months.

Yet the climatic conditions are, of course, by no means uniform over the whole range of wheat production of Europe, and the methods of cultivation consequently vary. In the west "winter wheat" is cultivated; that is to say, the grain is sown in autumn, remains dormant during the winter, grows as soon as the vegetative period begins in spring and is harvested in late summer. In the east the winters are too severe for this type of wheat, and "spring wheat" takes its place; though it is not sown until well in the spring, the hot summers allow a rapid growth and the harvest occurs rather late. In the Mediterranean region the wheat is sown in autumn, slowly continues its growth during the winter and ripens in the dry weather of the early summer.

On the map showing the crops, wheat is marked as the "characteristic" grain of certain regions, either with or without others indicated on this map, but it is almost always only one of several crops grown in rotation in successive years.

Maize.—In its climatic requirements this is the most exacting of the common grain crops of Europe, for it requires both con-

siderable heat and also a good supply of moisture ; hence it is grown in the parts of temperate Europe which have the warmest summers, but not commonly in the Mediterranean region nor in the eastern part of the steppe-lands, where there is a lack of rain in summer.

Barley.—Barley, and particularly the six-rowed varieties, can mature with little heat and with little moisture. Accordingly, barley is the marginal crop, not only in the cold north, but also in the dry south-east ; here and in the neighbouring parts of Asia it is the grain grown by the semi-nomadic peoples in the areas dividing " the desert " from " the sown."

Other Crops.—Space does not permit a separate comment on the distribution of all the other crops. Some are grown as food for men or animals, including grains such as rice, buck-wheat and millet, potatoes, root crops, and vegetables of many other kinds. Other are " industrial " crops from which other products are obtained ; e.g. sugar-beet, flax and tobacco. Among these, the sugar-beet is largely grown over an area which almost coincides with the northern part of the wheat belt, that is, from eastern England across the north of France into Belgium and Germany, and thence across Poland and Czechoslovakia into the black-earth region of Russia. Flax is another important industrial plant, from which the fibre is used for manufacturing linen and the seed is crushed for oil and cattle - food. It has a fairly wide climatic range and is cultivated in districts as far apart as northern Ireland, and northern and southern Russia.

Fruits.—The northern part of the area shown as crop-land can allow the growth only of the more hardy kinds of fruit, notably apples and cherries ; in the central part appear others, such as pears and plums ; in the south there is an increasingly great variety. The northern limits of three fruits of considerable importance are drawn on the map. The vine is very widely cultivated, and the wine made from it is used both as a common drink in many of the vine-growing countries and for export as a luxury in cooler lands. It is significant that although the greatest amount of wine is produced in the Mediterranean region or on its margins, some of the most valuable kinds are obtained from near the northern limit of the vine, e.g. in Champagne in France and by the middle Rhine and its tributaries in Germany.

The olive, the most characteristic tree of lands with the Mediterranean type of climate, yields oil which is locally used to supply fat in the diet as butter is utilized in the cooler cattle-rearing countries. Citrus fruits, mainly oranges and lemons, need higher temperatures for ripening than generally occur in the northern part of the Mediterranean region ; therefore, although their limit is shown on the map to approach this margin in the Riviera district of the Gulf of Genoa, the yield here is neither so good nor so great as farther south. Indeed, the distribution of the citrus fruits indicates fairly well the extent of a " very warm," as distinct from a " warm," variety of the Mediterranean climate. As in the case of the other fruits of southern Europe, the oranges and lemons are grown partly for local use and partly for export, particularly to central and north-western Europe.

Besides citrus fruits, olives and grapes, many other fruits are cultivated in the Mediterranean region, e.g. apricots, peaches and edible nuts, such as almonds and walnuts.

So important is fruit growing, and so much of the work of the people is directly or indirectly bound up with it, that the area of the Mediterranean climate may almost be labelled as the fruit-growing region of Europe.

QUESTIONS

1. Describe the *transitions* between tundra, forest, steppe and desert in Russia.

2. Show how the natural vegetation is adapted to the climatic conditions of the " Mediterranean " region.

3. Give a description of the typical " black earth " of Russia, and account for its characteristics.

4. Distinguish between the various types of pastoral work in Europe, and give reasons for the differences.

5. To what extent, and in what ways, is the cultivation of wheat related to climatic conditions.

6. Explain how the differences between types of forest found in Europe are related to climatic differences.

7. Describe the nature and distribution of the podzols of Europe, and show how they are interrelated with both climate and natural vegetation.

8. Discuss the truth of the statement: "Natural vegetation regions are also regions of characteristic types of farming."

GEOGRAPHICAL REGIONS

IN the preceding chapters we have considered separately the most important factors in the geography of Europe, viz. relief and structure, climate, natural vegetation, soils and the use of the land ; in connexion with each of these factors a map has shown its special regions. Now, as geography concerns itself with the interaction of the various factors, we shall indicate regions, each of which has a character depending upon a special grouping and a special form of interaction of all the factors. These regions we call " geographical," preferring that term to " natural," which is likely to be regarded as equivalent to " physical," because here the human factors are also considered ; indeed, in some of these geographical regions man has very greatly modified, and even transformed, the natural conditions.

The geographical regions form definite and distinct environments of man, where people work in certain ways and in which they have developed characteristic modes of life ; in one sense, however, the regions are more than environments, for man himself is an essential element in them.

From the preceding chapters it will have become evident that climatic conditions occupy a pivotal position in this study of Europe ; in the first place, they depend upon the position and the relief of the constituent areas of the continent, and, secondly, climate very largely determines the natural vegetation, the soils and the use that is made of the land. Hence it is not surprising that the larger geographical regions correspond very closely with the climatic regions, as may be seen by comparing the maps in Figs. 15 and 19. That is true of the major geographical regions, but within these there are minor geographical regions which are distinguished from one another sometimes by minor climatic differences, and sometimes by other differences, particularly those of relief and structure.

Because the climatic conditions in the east and south of Europe extend over the adjoining parts of Asia and Africa, the major regions of eastern and southern Europe stretch far

beyond the limits of this continent; the map in Fig. 75 should be studied to see the relation between Europe and the other continents in this respect.

The Arctic Region.—The Arctic Region is primarily characterized by its cold climate, which has already been described, and it is to be noted that the region is considered as including both the tundra lands within the Arctic Circle and also the higher areas of the Scandinavian Highlands. When the minor regions of Arctic Europe are studied separately, the differences between these two parts must be taken into account. It may here be pointed out that the common climatic conditions of extremely long, cold and dark winters, with very short and cool summers, in both parts of the Arctic Region have resulted in similar conditions as regards the soil, which is wet in summer on the surface, but below this is permanently frozen. Consequently the natural vegetation is mainly of small growths, such as mosses, lichens and low shrubs, and man has been able to make little use of the region.

To the southern part of the Scandinavian Highlands cattle are driven in summer from the neighbouring lowland areas of Norway, while the northern part of these uplands and the tundra region are traversed by reindeer, which seek as food the sparse pastures of "reindeer moss," growing so slowly that it needs several years to form a fresh pasture after it has been cropped by a herd. The people who own the reindeer are necessarily nomadic and few in number; they retire in winter to the forest, where hunting is possible, and in summer advance to the coast, where fishing adds to their scanty resources. Since this region offers little which can be exchanged for the products of other regions, and since its position is so remote and the means of communication are so poor, there is very little contact with the rest of Europe, and the inhabitants live in a relatively primitive manner.

The Boreal Forest.—This is the region with the Boreal type of climate and with a natural vegetation cover of coniferous forest; the soils have been in general strongly leached and the surface is often swampy. Largely because of the unfavourable physical conditions, only small clearings have been made in the forests. This is most markedly the case in the east, where the winters are coldest and longest, and where the rivers, which offer the easiest routes, drain to the Arctic Sea. During the

winter the snow accumulates on the land, but with the rapid rise in temperature in spring it melts and floods the country; in this region the thaw occurs in the southern part while the lower courses of the northward-flowing rivers are still ice-bound. The inundations are therefore serious, and work on the land and traffic on the rivers are both delayed; the effective period of activity in summer is thus curtailed, and agriculture, pastoral work and trade are further handicapped.

In the north vegetables are the main crop; in the south barley is grown, and some oats and rye; some cattle, sheep and horses are reared, but the amount of farming is very small in relation to the great extent of the region. The maps in Figs. 18 and 19 show that only along parts of the southern margin have crop-lands extended into the Boreal Forest region.

In the main, forestry is still the characteristic occupation, and even this is largely limited to the southern part and to the neighbourhood of the rivers. Another resource is the hunting and trapping of the fur-bearing animals, though these have now been much reduced in numbers. With the exception of some towns situated on the rivers, and mostly either by the northern seas or near the southern margin, the settlements are small and widely scattered, and the population is scanty.

On the eastern margin of the region in Europe, the Hercynian block of the Urals yields mineral ores which have made possible industrial development.

The western part of the Boreal Forest region, in Finland and Sweden, is made more accessible by the existence of the Gulf of Bothnia, towards which the rivers drain; here there has been more development in connexion with all the resources of the lands and the waters. This is especially the case at the mouths of the rivers and around the coasts of the Gulf of Bothnia, where agriculture and pastoral work gain from some amelioration of the climate, and where the timber from the forests is worked up in saw mills and factories run by water-power from the streams. Moreover, in this western area the ancient rocks of the Baltic Shield emerge from below the sedimentary deposits of the Russian Platform; some minerals are obtained, and by the Gulf of Bothnia a little iron-working utilizes ore from inland mines. The population following these occupations is therefore more considerable in this narrow coastal belt than elsewhere in the Boreal Forest region.

The Sub-boreal Farmed Forest.—The more favourable conditions of the Sub-boreal climate region are reflected in the "mixed" character of the natural vegetation and the less thorough leaching of the soils. To these conditions is added greater accessibility from central Europe, whence came the greater developments in regard to the use of the land. Consequently the clearings have been more extensive than farther north, and now the region may be conveniently labelled "farmed



FIG. 19.—GEOGRAPHICAL REGIONS OF EUROPE.

forest." There are considerable areas of still virgin forest where timber is cut for export, but most of the region may be regarded as crop-land, oats and rye being the chief grain crops.

In the Baltic Shield area in Sweden there has been a development of mining and manufacturing, and around the shores of the Baltic Sea there have grown up a number of towns and cities dependent upon the agricultural and industrial occupations and the associated commerce. In the Russian area are the past and present capitals, Leningrad and Moscow, while industries and trade have grown up at a number of other large centres.

Yet in general the Sub-boreal Farmed Forest region is predominantly agricultural, and it is one of the less densely populated regions of the continent, with the exception of the Tundra, the Boreal Forest and the arid Caspian depression. The map of the geographical regions should be compared with that in Fig. 82, showing the density of population in Europe.

The Steppe Lands.—The steppe lands offer greater returns to agriculture than the forests situated north of them, because of their easier working and the greater fertility of their soils, especially in the belt of the black earth. The climate, too, is more favourable, with its longer summers and the higher temperatures in the growing season, except where the supply of water is scanty, as on the south-eastern margin. Although agriculture has only relatively recently superseded a primitive form of pastoral work, and although modern scientific methods of cultivation have still more recently been introduced, nevertheless this region has a wide range of products and is capable of giving high yields. This is particularly true in the western part of the steppe-lands, where the more valuable grains, maize and wheat, are grown in great amount, together with beet, flax and other industrial crops, and where the vine and other fruit trees are cultivated.

Towards the east the variety of products is reduced by the more extreme temperatures and the poorer supply of water; also the normal yield of the crops is less, and the keeping of animals is relatively more important than in the west. Moreover, the rainfall is more variable in the eastern steppe-lands and failure of the harvests is a serious menace. For these reasons, the population dependent upon agriculture is considerable in the west, but decreases greatly towards the east.

Mineral resources are associated with the two areas where the older rocks come to the surface in southern Russia. Within the eastward bend of the Dnieper the ancient rocks yield ores of iron and manganese, and where the river cuts through the resistant outcrop the rapids give enormous water-power, which is used for the production of electricity. In the Hercynian block of the Donetz region is a large coalfield which has also led to the growth of industries in southern Russia. There are oilfields on the margins of the Carpathians in the south-west, and of the Caucasus in the south-east, of the steppe-lands.

In spite of various drawbacks to navigation, the rivers, as

well as roads and railways, carry traffic through the steppe-lands between the Black Sea and the interior of Russia and Rumania.

With these varied resources and activities, the western part of the steppe-lands has much urban as well as rural development, and the density of population is greater than in any other part of eastern Europe. Indeed, the manner of life of the people is becoming similar to that of the central countries of the continent.

At its south-eastern margin, the region adjoins the Caucasus Mountains, which are geographically more closely related to the highlands of south-western Asia than to the neighbouring regions of Europe.

The Arid Caspian Lowland.—The low and irregular rainfall, the infertility of the soils, the lack of other resources and the remoteness of the position combine to make this extreme south-east of Europe a region of difficulty to man, and comparable in this respect with the extreme north-east of the continent. The lower valley of the Volga, with its port, Astrakhan, is the main exception to this rule.

The Mediterranean Lands.—To its position on the globe this region owes both its general climatic conditions of a mild, moist winter and a hot, dry summer, and also its general structural characteristics of fold-mountains enclosing sea-filled subsidence basins, as a result of which there are commonly narrow coastal lowlands rising rather steeply to hills or mountain ranges.

In the eastern part of the Mediterranean lands of Europe the climate tends to dryness and there is relatively little lowland ; here the growing of the characteristic fruits is one of the main occupations of the people, who have terraced the lower slopes for this purpose, while at higher levels there is little more than poor pasturage.

Around the western basin of the Mediterranean Sea and by the Atlantic coast in the same latitude, there is generally a better rainfall or better possibilities of irrigation, while there is also a greater area of lowland. Consequently there is a wider range of products, and grain and vegetables, in addition to fruits, are grown to a considerable extent.

The interior of the Iberian Peninsula is largely plateau, and while some higher ranges are well watered and bear a vegetation cover of woodland, much of the remainder tends to aridity

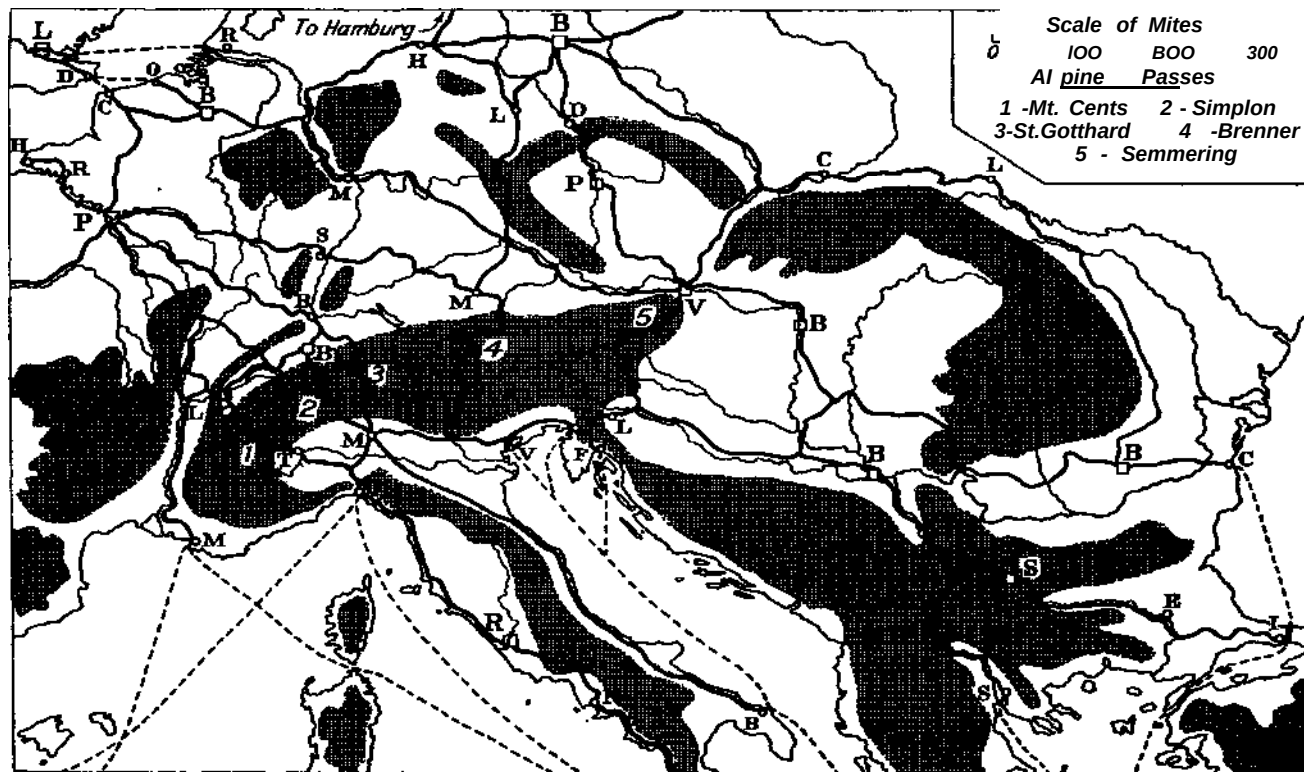


FIG. 20.—RAILWAY ROUTES AND COMMERCIAL CENTRES.

and is dependent upon an artificial water-supply for its utilization.

Coal deposits are lacking, and only in scattered areas are there other forms of mineral wealth, and in the Mediterranean region industrial development is mainly limited to certain ports at or near river-mouths.

The Mediterranean Sea and its extensions, the Adriatic, Ægean and Black Seas, give access from the ocean to a great part of southern Europe, and with the cutting of the Suez Canal the Mediterranean Sea links Europe with the Indian Ocean and the Far East. But the mountain-folds encircling the sea impede communications between the Mediterranean lands and those of the remaining part of the continent, and land traffic is restricted to a few breaks or passes in the mountain barriers ; hence in a few ports on the northern shores is concentrated a considerable amount of commerce, both in local products and in goods of wider origin. (The situation of the chief ports and their relation to the routes leading to central and north-western Europe is shown in the map in Fig. 20.) Trading is therefore important in certain parts of the Mediterranean region, and this occupation and the intensive agriculture and horticulture of the larger coastal lowlands have together given rise to some great cities and some areas of dense population.

Temperate Europe.—The region with a temperate climate is the only major geographical region which is entirely European, with the exception of the adjacent Sub-boreal Farmed Forest, for all the other major regions extend far beyond the limits of the continent. As shown on the map of Europe in Fig. 19, this temperate-climate region appears very extensive, but the map in Fig. 75 of the major regions of Europe and north-western Asia shows that its area is not remarkably great as compared with those which overlap the continents.

It has within it, however, such a variety of relief and structure that its constituent areas vary considerably, and no single descriptive label, such as " lowland " or " forest," would be applicable to it as a whole. It is, therefore, convenient to term it simply " Temperate Europe." The differences within it are so marked that it is necessary to divide it into three minor regions, as shown on the maps in Figs. 19 and 21, and these minor regions will now be separately considered.

The Atlantic Margins.—The characteristic feature of the

climate of Temperate Europe is the influence of oceanic winds during the whole year. This influence is particularly marked along the Atlantic Margins from the north of the Iberian Peninsula to the northernmost part of the continent, and throughout this extent it produces a very equable and rainy climate.

Also, along this marginal belt, the earth's crust has suffered dislocations which have resulted in the drowning of large areas and the upraising of most of the remainder, and hence the lands have a considerable elevation. Their altitude combines with the rainy character of the climate and the associated leaching of the soils to handicap agriculture. Forests, moors and heaths cover the highland and upland areas, and the relatively small areas of lowland are mainly given over to grass ; with the rather higher temperatures of the southern part, however, there is more cultivation.

There are scattered deposits of minerals, but only the coal of the British portion has served as the basis of manufacturing to any extent. Elsewhere, besides farming the chief resource is fishing, for the region is too remote from the busier districts of the continent for trading to be important. Hence the population is, with small exceptions, rather scanty. Even in Britain, as was explained in Volume I of this series, the Atlantic Margins differ markedly from the English Lowland, which belongs to the next minor region.

The Developed Lowlands and Wooded Uplands.—The map of climate regions in Fig. 15 shows that within this minor region there are modifications in the climate, particularly noticeable in an approach to extreme conditions towards the east. Moreover, a relief map shows that, apart from the Alps, there are in Central Europe considerable upland areas which are high enough to have distinctly cooler and wetter conditions than the adjoining lowlands ; these uplands areas are indicated also on the map of structural regions in Fig. 1 as belonging to the Hercynian group or as due to foldings of the Alpine type.

Putting these facts together, it will be seen that this minor region of Temperate Europe comprises (a) lowlands of sedimentary material, and (b) uplands of generally older and more resistant rock, and that each of these groups is composed of a number of relatively small areas with climatic differences corresponding to their respective positions (see Fig. 21).

The former group is here labelled as " developed lowlands,"

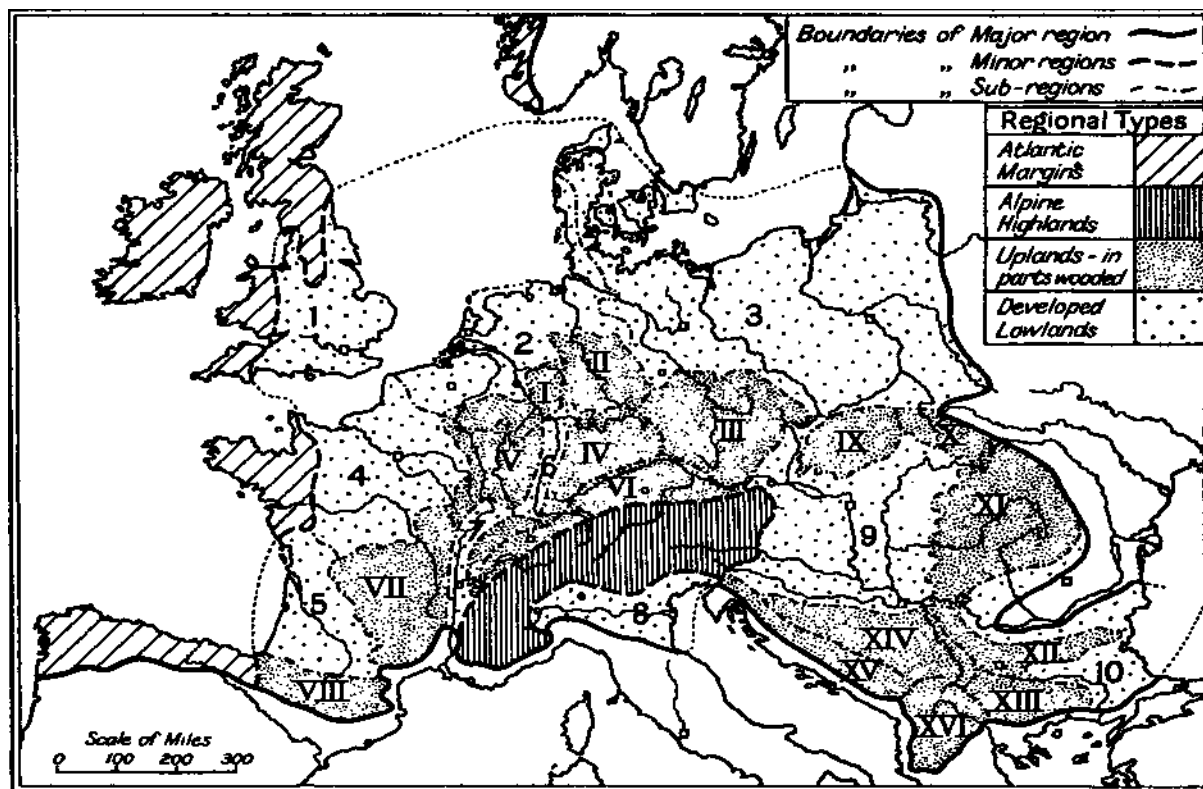


FIG. 21.—REGIONAL TYPES OF TEMPERATE EUROPE.

because their resources have been very thoroughly exploited and in them a number of districts have been largely transformed by human agency. In general, the climate and soil favoured early settlement, and for centuries men have used and improved the natural conditions, while even less-favoured parts, such as the marsh areas near the delta of the Rhine, have for various reasons also attracted settlers, who have converted them into productive lands.

Practically the whole of the lowlands are farmed, and much of the area is cultivated in an intensive manner, with a high yield as well as a great variety of products. According to the varying climatic conditions, rye, barley, wheat and maize are characteristic in different localities, generally associated in a rotation with other grains, industrial crops or fodder crops. Pastoral work in many parts is carried on in its most remunerative form, viz. dairy farming, to meet the needs of large urban populations. Minerals, too, have been exploited where they exist, particularly where coalfields dip down from the Hercynian Uplands under the margins of the lowlands, and some of the greatest and most densely populated industrial regions of the world have grown up in these lowlands.

The "drowning" of the continental margin has brought the sea far into the region, and from much of the interior of Europe the rivers bring traffic to the English Channel, the North Sea and the Baltic Sea. Because of the great amount of manufactured goods produced in the region, and the need of the dense populations for raw materials and food, commerce has developed here as in few other parts of the world and many important trade routes meet in the lowlands, as is shown in Fig. 20; there are also great ports, especially near the mouths of the rivers on the continental and English shores of the North Sea. Manufacturing and trading have thus led to immense urban development in the more northerly of the lowlands, viz. the English Lowland (numbered 1 on the map in Fig. 21), the North Sea Lowlands (2), the South-West Baltic Lowlands (3), and the North French Lowland (4).

On the other hand, some of the more southerly regions have more favourable climatic conditions and give a greater return to agriculture, as is exemplified in the Basin of Aquitaine in France (5), the Rhine Rift Valley (6), the Rh6ne-Sa6ne Trough (7) and the North Italian Plain (8). On the eastern side a lack

of rain may be a handicap in the Middle Danubian Lowlands (9), while a transition to steppe-like conditions is observed in the drier South-eastern Lowlands (10), which include the Walachian Hill-lands and the East Balkan Lowlands.

Each of these ten areas has sufficient unity within it, and sufficient difference from its neighbours, to be regarded as a distinct sub-region of the " Developed Lowlands and Wooded Uplands " of Temperate Europe.

The uplands of Temperate Europe, with their cooler and wetter weather, are less suited to crop growing ; they have considerable areas given to pasturage, but their characteristic vegetation-cover is forest. There is quite a variety of trees, and forestry is one of the chief occupations. The minerals, which in a number of districts first attracted settlers, have in several cases been largely worked out, and only relatively small industries are based upon them. Trade naturally avoids the higher areas (again see Fig. 20), and because of these combined conditions, the uplands are, in general, the homes of much smaller populations than the lowlands.

These uplands form a number of distinct sub-regions, which may be grouped according to their position. The Central Uplands of Europe comprise the Rhine Plateau (marked I in Fig. 21), the Weser-Saale Hill Country (II), the Bohemian Diamond and its margins (III), the East Rhine Scarp-lands (IV), the West Rhine Scarp-lands (V), the Jura Mountains and the Alpine Foreland (VI). In western Europe are the Central Plateau of France (VII) and the Pyrenees (VIII). On the eastern side are the three Carpathian sub-regions (IX, X and XI), and five more constitute a great part of the Balkan Peninsula (XII—XVI).

The Alpine Lands.—The great differences in elevation make it difficult to summarize the characteristics even of this relatively small minor region. It may be briefly said that the valleys provide sites for settlement, and offer opportunities of farming and other occupations which support the comparatively small numbers of inhabitants, while through some of the valleys pass routes connecting central and north-western Europe with the Mediterranean region. At higher altitudes forests supply timber, and still higher are summer pastures to which animals and people migrate for a few months. Above this habitable zone, dwarf shrubs, low cushion-like growths, lichens and other forms of alpine flora appear in summer and recall, in the heart of

Temperate Europe, the plant-life of the Arctic Region ; in the highest zone of all, only steep slopes and culminating peaks of bare rock emerge from snow-fields.

Peninsular and Trunk Europe.—We may regard Peninsular Europe as that part of the continent which adjoins the Atlantic Ocean and has been given peninsular form by the penetration of the North and Baltic Seas on the north and the Mediterranean Sea on the south. It may be broadly limited eastward by a line drawn through the Gulf of Bothnia and the Baltic Sea to near the mouth of the Niemen (Memel) River where Temperate Europe adjoins the Sub-boreal Farmed Forest Region, and thence the limit approximately follows the boundary of Temperate Europe to near the delta of the Danube.

By such a division, both Peninsular and Trunk Europe include portions of several geographical regions, but the former is more open to maritime and western influences, while the latter has a continental and eastern orientation. The physical causes of the differences have now been shown ; corresponding contrasts in the human geography of the two areas will be brought out in several sections of the next chapter.

QUESTIONS

1. Define the limits of the " Arctic " region of Europe, and show how the geographical factors within it interact with one another.

2. What justification is there for regarding the Boreal Forest region as a geographical unit ?

3. Describe the common characteristics of the Mediterranean geographical region, apart from its climate.

4. Discuss whether it would be better to incorporate the region here termed " Sub-boreal Farmed Forest " into one or more of the neighbouring regions.

5. Consider whether the areas marked as " Atlantic Margins " should be distinguished as a separate minor region of " Temperate Europe."

6. It is difficult to find short names which well denote geographical regions. Discuss, and suggest alternatives to, two names adopted here for major regions, which seem rather unsatisfactory.

7. Discuss the possibility of dividing Europe simply into two great regions, " Peninsular " and " Trunk," on the basis of their general character.

THE PEOPLES OF EUROPE

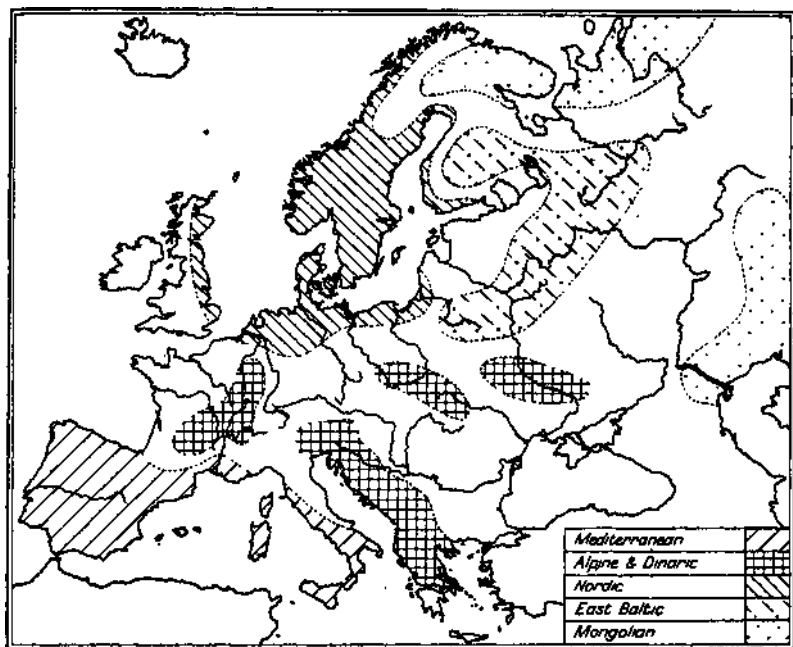
IN the preceding chapters the people who live in the various parts of the continent have been referred to mainly in relation to their respective environments ; we will now consider the peoples themselves.

The Racial Elements.—The physical characters of people are fundamentally determined by their descent, being handed down from generation to generation, and are therefore taken as indications of the race to which people belong. It is important to restrict the term " race " to groups of people who have in common a number of physical characters due to a more or less common ancestry, and never to use the term to denote groups who, although speaking the same language, or having the same religion, or being members of the same political State, nevertheless differ from one another physically because they have a mixed ancestry.

Anthropologists classify the greater part of mankind into three main racial or ethnic groups, distinguished from one another by the structure of the hair and the colour of the skin. These three groups are : (i) that of the negroes with woolly hair and black or very dark skin ; (ii) that represented by the Chinese and other Mongolians with straight, lank hair and yellowish skin ; (iii) the group to which the peoples of Europe mainly belong, with wavy or curly, yet smooth and not woolly hair, and with skins which are more or less white or light brown.

Among the Europeans, the various shades of skin colour are often, but by no means always, associated with the colour of the hair and eyes : a fair skin is in many cases accompanied by light-brown or even yellow hair and by blue or grey eyes, while the rather darker-skinned people commonly have dark-brown eyes and black hair. These contrasts between fair and dark are very clearly seen by comparing the typical Scandinavians showing the former characters with the inhabitants of southern Italy showing the latter, and they are so marked that they are taken as indicating distinct racial or ethnic stocks, to which the terms

"Nordic" and "Mediterranean" are respectively applied. People belonging to the Nordic type constitute a considerable proportion of the inhabitants of the northern plains of Europe west of Russia, and those of the Mediterranean type form a majority of the population of the western Mediterranean lands (see Fig. 22). Between them, in the highlands and uplands of Central Europe, most of the people have an intermediate



After Giinther.

• FIG. 22.—DISTRIBUTION OF PREDOMINATING RACIAL TYPES.

Note.—The shaded areas are those in which the respective racial types are common. In the intervening areas the mingling is so great that no type can be regarded as characteristic.

grade of coloration with chestnut-brown to black hair, and hazel-grey to brown eyes. Moreover, the people of the Nordic stock are generally tall, those of the Mediterranean stock are relatively short, while those of the central uplands and highlands are of medium height.

Yet these intermediate conditions of coloration and stature do not result from a mixing of the other two racial stocks, for they are commonly associated with a quite different shape of the head. Both the Nordic and the Mediterranean stocks are

characterized by " long " heads, that is, the length of the skull from front to back is markedly greater than the breadth from side to side, whereas the inhabitants of the central uplands and highlands usually have rather broader heads. Hence the peoples here are representatives of another racial stock, and to these people the name " Alpine " is applied.

Closely associated with these Alpine peoples are another group who are also broad-skulled, but do not resemble them in appearance, for they have a greater stature, a more slender figure and a longer face. They are numerous in the coastlands north-east of the Adriatic Sea, and for that reason this group is known as " Dinaric " or " Illyrian." Judging by the physical criteria, members of this stock spread northwards and now form one of the important racial elements in the plains of Silesia and south Poland.

The three ethnic groups—Mediterranean, Alpine-Dinaric and Nordic—together comprise the greater part of the population of Europe, and it is therefore commonly stated that there exist these three European races.

The ancestors of these groups worked their way into Europe thousands of years ago, displacing or mingling with the scattered hunting peoples who had occupied the south of the continent during the Ice Age and had moved northward as the climate improved and the ice retreated.

Of the three main races, the Mediterranean stock peoples were the first comers. It was probably before 4000 B.C. that they settled on the warm and fertile shores of the great sea ; there they had opportunities for growing grain and fruit, and for extending westward in Europe the civilization which had arisen in Egypt, Mesopotamia and the lands around the eastern part of the Mediterranean. In course of time they passed around the Iberian Peninsula to the Atlantic coasts, and thus reached the west of France and the British Isles (see Fig. 23).

Later, when climatic conditions in central Europe had become more favourable, the Alpine peoples migrated from Asia Minor and extended their settlements along the uplands and the neighbouring lowlands drained by the Danube. The loess areas of central Europe, fertile and free from forest, favoured the agriculture and pastoral work upon which they depended. They gradually worked their way westward into the valleys of the Alps and over the upland areas of what are now southern

and central Germany, Belgium and central France. The related Dinaric peoples followed those of the Alpine stock by much the same routes through the Balkan Peninsula and into central Europe, but they did not penetrate so far westward.

At a very much later date one branch of the Alpine stock spread from the Carpathian region into the adjoining plains to the north and east which now form part of Poland and Russia. These peoples are known as Slavs, and their descendants form a considerable proportion of the Russian people. A further migration southward gave rise to another group, the South Slavs or Yugoslavs, who occupied much of the Balkan Peninsula.

The ancestors of the Nordic peoples seem to have entered Europe after the Mediterranean and Alpine immigrants; originally pastoralists, they migrated across the plains of southern Russia, and eventually settled in the lands around the Baltic Sea.

Associated with the greater stature of the Nordics is usually greater physical strength than that of the peoples of the other stocks, and this doubtless helped them, at a much later date, to spread southwards and, in many instances, to conquer other peoples and to occupy parts of western, central and even southern Europe. For example, there were the settlements in Britain by the Angles, Saxons, Jutes and Norsemen, the incursions of the Goths into the Balkan Peninsula and Italy, and the penetration by the Vandals into the Iberian Peninsula and even into northern Africa.

Besides these peoples who have been so long established in this continent that they are regarded as truly "European," there are others whose origins are more recently Asiatic, and who are related to the Mongolian races of Asia. The Samoyeds have migrated from Asia into the northern forests and tundra of Russia, and the Lapps have spread even into the north of Scandinavia. They belong to the Ugrian racial group, who are characterized by broad heads and rather short stature, and often have a flat face and prominent cheek-bones ; the slanting eyes which are shown most strikingly among the Chinese and Japanese appear among the Samoyeds, and occasionally among the Lapps.

Allied to the Ugrian folk are the Finnish group of peoples who had earlier worked their way across the Ural Mountains into

northern Europe, and now occupy the greater part of Finland and the adjoining region of Karelia across the Russian border. Yet the Finns of the present day do not show the characteristic Mongolian features to the same degree as the Lapps or the Samoyeds, probably because the original Finnish immigrants here settled in an already populated area. It frequently happens that a group of intruders may dominate an area and intermarry with the inhabitants, upon whom they impose their name,

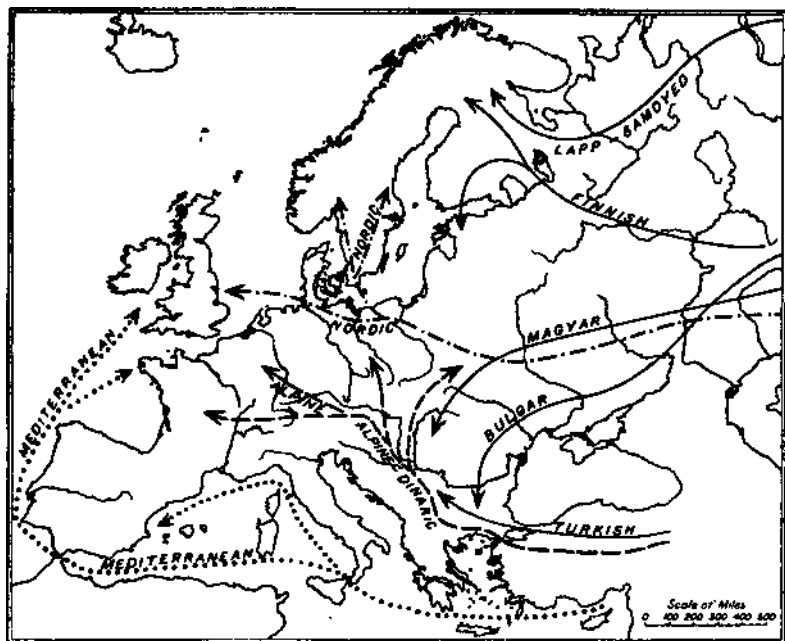


FIG. 23.—RACIAL MIGRATIONS INTO EUROPE.

language and traditions ; yet, if these subject people are relatively numerous, in the course of generations the blood of the dominating group becomes progressively diluted, as it were*. Hence, anthropologists are frequently faced with the fact that the name and speech of a people suggest one origin, and their physical features another. In the case of Finland it is certain that, in spite of the absence of Mongolian features, some of the ancestors of the present Finns migrated from northern Asia.

South of the Gulf of Finland are the Ests or Esths of Estonia, who are closely related to their Finnish neighbours. Moreover, in all the East Baltic region there are many individuals of a

type which seems to have resulted from a mingling of stocks of northern Asiatic and Nordic origin. These people are regarded as having by now been welded into a distinct ethnic sub-group, called East Baltic (see Fig. 22), and they form part of the population of a very wide area extending into Prussia on the west, Russia on the east, Finland on the north, and Latvia, Lithuania and Poland on the south.

Rather more recent immigrants from Asia of definitely Mongolian origin and speaking Ugrian languages came by a more southerly route along the steppe-lands. The Bulgars were nomadic horsemen, who in the seventh century A.D. crossed the lower Danube, conquered the Slav inhabitants and gave their name to Bulgaria. But though their name and some of the traditions of the invaders have survived, the language of the Bulgarians is now in the main Slavonic, and the people show little of the original physical characters of the immigrants.

A century or two later, other Asiatic tribes swept across the steppes, and some of these worked their way across the Carpathian Mountains into the Pannonian or Hungarian Basin. One group of these invaders spoke a language which was compounded of two Asiatic elements, the Ugrian and the Turki; the people of this speech were the Magyars, and the present inhabitants of Hungary still retain the name Magyars and speak the Magyar language, though their physical appearance shows that they have altered but little the predominating Alpine stock of the Slavs whom they conquered.

At about the same time that south-eastern Europe was thus invaded, the Moors of northern Africa crossed into the Iberian Peninsula and for a time ruled much of that region; yet they did not make great changes in the racial composition or the language of the people of the Peninsula, and the results of their occupation will be referred to in later sections.

The last of the great invasions was that of the Turks, i.e. tribes speaking a Turki language; they came from central Asia, and one group, the Osmanli Turks, overran Asia Minor, occupied Constantinople in A.D. 1453, and forced themselves as masters upon the people of the Balkan Peninsula. But throughout their long and victorious advance, they freely intermarried with their subjects, and accepted as "Turks" many who adopted their Moslem religion. Thus the Turkish State known as the Ottoman Empire spread from south-western Asia over much

of the Balkan Peninsula, and imposed its rule upon that region, but, nevertheless, the Balkan peoples still remained mainly of Alpine, Dinaric or Mediterranean descent and retained Slavonic, Albanian or Greek languages.

Other movements of peoples have occurred, some of which must be referred to in the next section in connexion with the spread of languages, but it may already be realized that the contacts and conflicts of the various migrant peoples have resulted in a mingling of the population in such a way that few districts show a uniformity of type.

Languages.—To use the words "Aryan race" for the Nordic ethnic group is doubly misleading, for in the first place the word Aryan applies only to languages, and in the second place it denotes a widespread group spoken by the great majority of Europeans (see Fig. 24). The Aryan languages have extended over almost the whole of the continent of Europe and through south-western Asia into India. Hence they are also known as Indo-Germanic, though they include not only the German or Teutonic family of languages, but also Greek, the Romance languages which have derived from Latin, the Slavonic family and the Celtic languages, as well as others spoken by some of the smaller communities.

Although in some areas, as in Wales, two languages exist side by side and many individuals may speak both, it is nevertheless possible to show the broad distribution on a map. This is done in a generalized form in Fig. 24, and in more detail for the central part of Europe in the end-paper map within the back cover of this book.

It is not possible to say what were the languages of the earliest folk who came into Europe; only the later movements of people, during historical times, can be definitely associated with the spread of the present-day languages.

By the generally westward migrations of conquering tribes the pre-Aryan languages became extinct, the one striking exception being the Basque speech, which has survived in the mountainous borderland of South-western France and Northern Spain. With the language there have remained old customs and traditions, and even a feeling of a distinct nationality among the Basque folk; nevertheless, the physical characteristics of the people do not show a uniformity of racial origin.

Another early language which has survived in the west of

Europe is the Celtic tongue. It is a member of the Aryan group carried across Europe in successive waves of settlement about 1000 years B.C. by folk probably of mixed descent ; later these people were themselves displaced or forced to adopt the languages, Teutonic or Romance, of other conquerors. Hence Celtic is now found, in several varieties, only in the peninsulas and islands of the Atlantic Margins in Brittany, Wales, north-western Scotland and Ireland.

The Greek language is spoken in the southern part of the Balkan Peninsula, and on the islands of the *Mgesm* Sea and Krete.

The Romance languages have a very wide distribution, for their spread resulted from the great extension of the Roman Empire. Italian is most directly derived from Latin, and is now spoken in the Italian Peninsula, the islands of Sicily and Sardinia, the North Italian Plain and some of the coast-lands north-east of the Adriatic ; it is also spoken in the part of Switzerland which projects southward to the edge of the North Italian Plain between Lakes Maggiore and Como.

East of Lake Como there are several small areas of the Alps in which the inhabitants of the mountain valleys speak distinct Romance dialects : Romansch or Rhaetic, Ladin and Friulian,

In the Iberian Peninsula, apart from Basque, are several languages belonging to the Romance family. The difference between them may be related to the invasion by the Moors, who at one time occupied all the Peninsula except the northern mountain regions, where the Christians held out and whence they reconquered the land. One line of reconquest spread the dialect of the north-west corner, Galicia, southward along the Atlantic region, thus leading to the growth of a distinctive language in all this western part of the Peninsula. Later, most of this area formed the independent State of Portugal, in which evolved the present Portuguese language. Hence the Galicians, or Gallegos, speak a dialect akin to Portuguese and markedly different from the Spanish language.

Spain was mainly reconquered from the north by way of the plateaus of Castile ; the Castilian rulers gradually extended their power over the whole of Spain, and thus Castilian became the standard form of the Spanish language.

In the north-east of the Peninsula the defeat of the Moors allowed the return to Spain of refugees from France who brought

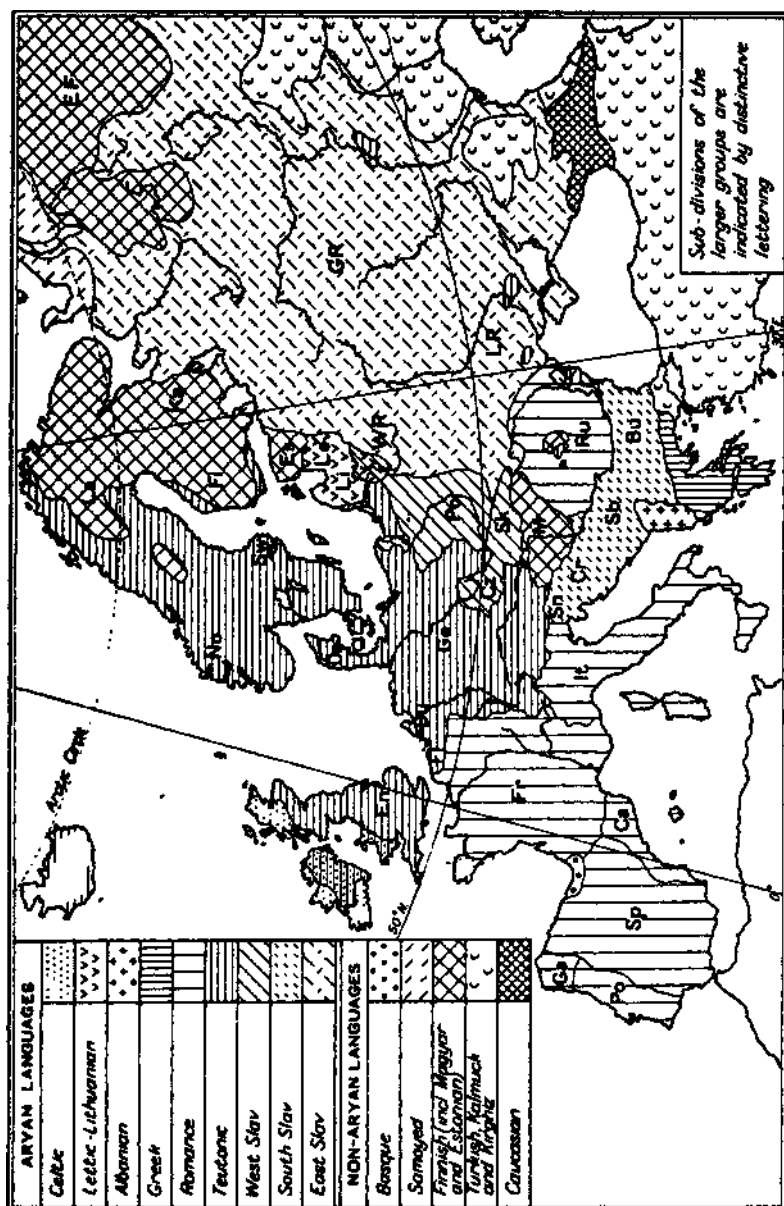


FIG. 24.—DISTRIBUTION OF LANGUAGES.

with them a dialect of the " Languedoc " spoken in the south of that country and akin to the modern French dialect Provençal; in eastern Spain this language became Catalan, and has spread to the Balearic Islands. In Catalonia, the north-eastern part of the Iberian Peninsula, the Catalan language has developed a considerable literature, and the distinctive language, traditions and literature have made the Catalonian people conscious of possessing a unity among themselves, and differing from the other peoples of the Peninsula.

The extent of the French language does not coincide with the territory of the French State, for while on the west Breton is spoken together with French, on the east the boundaries of the language and of the State diverge at several points. This is especially the case in three areas : (i) where the French speech extends into Switzerland, being spoken by about one-fifth of the population of that country ; (ii) where German-speaking peoples live in French territory in Alsace and Lorraine ; (iii) where French is the language of the Walloon people who form the population of the southern part of Belgium, viz. south of a line running approximately from east to west a little south of Brussels.

Rumanian is derived from the Roman language, as is clearly suggested by the native spelling of the name of the country—" Romania." It has been handed down from the provincials of this north-eastern outpost of the Roman Empire, but it has been greatly modified by the Slav-speaking and other peoples who have since then occupied the country. In most other parts of the eastern portion of the Roman Empire in Europe the later invaders have imposed their Slavonic speech, with the exception of Greece and Albania. In the latter mountainous country the Albanian language appears to be a survival of a primitive Aryan tongue.

The Teutonic family of languages probably had its home among the Nordic folk living in the plains around the west of the Baltic Sea and the south-east of the North Sea ; thence settlements and conquests in all directions led to the development of distinct Teutonic languages among peoples of varied origin. In the north there are the Scandinavian languages, of which Danish and Norwegian are almost identical; Swedish is closely related to the other two.

The English language is based in the main upon the speech

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VOLUME II

EUROPE

BY

J. F. UNSTEAD, M.A., D.Sc.

FORMERLY PROFESSOR OF GEOGRAPHY IN THE
(UNIVERSITY OF LONDON

WITH NUMEROUS MAPS AND
DIAGRAMS SPECIALLY PREPARED
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PREFACE

THIS study of the lands and peoples of Europe is written primarily for the use of students taking " Intermediate " or " General " courses towards a University degree, " Higher School " examinations, or courses in Training Colleges.

It aims at providing a twofold training : in the first place it not only presents facts but points out their significance and how they may be correlated ; in the second place, it shows the interaction between the facts of geography and those human affairs, economic and political, which are the concern of all.

From both points of view a study of Europe is important. To the geographer, this continent offers a great variety of conditions within an area small enough to be studied in some detail and with some approach to actuality. To every man, the economic and political affairs of Europe influence his own life whether he lives within the borders of the continent or beyond the seas.

Yet a study of Europe involves considerable difficulties, for it is scarcely too much to say that it confronts one with a mosaic of geographical units, a jig-saw puzzle of nationalities and a kaleidoscopic picture of States ; one has to work out a method of recognizing order and causation in this complexity, for the three factors cited above overlap and conflict in a most confusing manner. In many cases, the natural unit of the geographer, e.g. the Rhine Rift Valley, the Alpine Highland or the Lower Hungarian Plain, is inhabited by people of more than one nationality and divided among two or more States ; again, the fact that the limits of the nationalities by no means correspond with those of the political divisions is the origin of some of the most serious problems of Europe.

Because the various States bear so little relationship to geographical regions, and also are liable to sudden and catastrophic changes, it seems to the writer impracticable to arrange a study of Europe according to the political divisions ; hence this book has three parts.

Part I makes a general survey of the continent as a whole—its relief and structure, its climates, soils and vegetation, the

types of land-utilization and production and, by combining these factors, the major geographical regions; at this stage, also, a general survey of the peoples and States of Europe is given. The broad pattern of the distribution of the physical and human elements is thus brought out.

Part II presents a more detailed study on the basis of the natural or geographical regions which comprise the continent : the major and minor regions and, except in eastern Europe, the sub-regions. These are treated as units, and in each the interrelations of the physical and human factors are considered. This is the longest section of the book, and in it the economic conditions are given special attention.

In Part III each of the States is dealt with in turn. Their physical and economic foundations are reviewed, the peoples who form their populations are considered, and an examination is made of the boundary changes of recent years and of those international problems which are either influenced by geographical factors or have geographical effects. In this section, facts are stated without prejudice, causes and consequences are pointed out, but judgments are deliberately withheld as unsuitable to a geographical text-book.

The relative space allotted to the various parts of the continent has been determined partly according to their importance as the homes and work-places of large populations or of characteristic groups of people, and partly according to the nearness to Britain.

A large number of maps have been specially drawn to illustrate the text. These deal with all aspects of the geography, but the available space has been used to supplement, not to duplicate, the maps to be found in atlases; it is assumed that an atlas will be constantly used with this book.

Questions have been added, in many cases designed to require a reconsideration of the facts and ideas already given and to promote individual thought.

The writer cordially thanks Mr. L. Brooks, M.A., Mr. G. J. Cons, M.A., Professor C. B. Fawcett, Dr. H. A. Matthews and Dr. S. W. Wooldridge, who have each read the draft of parts of the book and have given advice which has been gratefully accepted.

J. F. U.

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NOTE

IN March, 1939, while this book was being printed, the State of Czecho-Slovakia was dismembered ; Germany established one Protectorate over Bohemia and Moravia and another over Slovakia, while Hungary annexed Ruthenia (Carpatho-Ukraine). The political boundaries on the end-paper maps have been altered to conform with these changes, and on pages 344 and 345 the geographical consequences are described in such a way as to bring Part III of the book up to date. The statements made in Chapter XIX regarding the States of Germany and Hungary must therefore be modified by the facts given on pages 344 and 345.

The account in Chapter XIX of the conditions of Czecho-slovakia, as it was just before March, 1939, explains the fundamental political and economic factors in the problems and relationships of the three States ; many of these factors, though modified in certain respects, still remain and are still important in the human geography of Central Europe. Similarly, the map of the earlier boundary changes in Czecho-Slovakia (Fig. 80) is still useful in showing important features of the areas which have now passed into the possession of Germany and Hungary.

In April, 1939, following disagreement between the governments of Italy and Albania, Italian troops overran Albania. The King fled, a group of Albanians offered the Crown to the King of Italy, and the two States were thus united.

April, 1939.

PART I

EUROPE AS A WHOLE

CHAPTER I

RELIEF AND STRUCTURE

Introduction.—If we want to understand the nature of any region and the manner of life of its people, and we trace back to the reasons for the facts, we find that the most fundamental consideration is the position of the region in the world—its situation on the globe.

That position has, in the past, determined the way in which the region has shared in the great earth movements which have, for example, raised some areas to broad highlands, subjected some to foldings producing mountain systems, or lowered others, in some cases even below sea-level; in other words, the position has determined the broad features of the relief and structure of the region.

The main characteristics of the climate are similarly due to its position on the globe, which exposes the area to the influence of the sun and to that of one or more great wind-systems, while the relief also influences the climatic conditions.

Climate and relief together are directly or indirectly the chief factors conditioning the type of vegetation which can live in the region, and this in turn has a great influence on the agricultural and pastoral work by which many of the people get their living.

Of course, the environment of a people does not *determine* their work, nor their particular manner of life, for different peoples are at different stages of development and have different traditions and habits. Yet the position of a region in relation to other regions, either near at hand or far away, has been one of the main factors in aiding the immigration of peoples and ideas, and so affecting the character of the population and their mode of life. Moreover, the incentives and opportunities which their environment may offer influence their further development.

The position of regions may therefore be regarded from several points of view, and in each of the earlier chapters of this book, which deal with the general characteristics of Europe and its peoples, we shall examine the position of the continent from the particular aspect with which we are concerned. Accordingly, we will now consider how the varied relief and structure of the continent are related to the situation of its constituent regions.

A relief map of Europe shows at once a marked contrast between the relatively level and unbroken east, and the remaining part of the continent which is diversified by many uplands and lowlands and, moreover, is divided by invasions of the Atlantic waters and by inland seas. This fundamental distinction as to relief and outline affects practically all aspects of the physical and human geography of the two contrasted regions, known sometimes as "Trunk Europe" (because it forms part of the great trunk of the Euro-Asiatic land-mass) and "Peninsular Europe" respectively. The cause of the contrast lies in the fact that whereas eastern Europe is situated in a part of the globe which has been relatively stable through much of its geological history, the rest of the continent has been involved in repeated disturbances and dislocations of the crust of the earth.

In Peninsular Europe, on the north-west margin of the continent, one group of highlands stands out clearly and will be first considered.

The North-western Highlands.—The Highlands of Scotland-and-the north of Ireland resemble in many ways, though on a smaller scale, the Highlands of Scandinavia because they have shared the same geological history."

Some of the rocks comprising these regions were formed before the Palaeozoic Era, i.e. before any life appeared upon the earth ; even at that time the surface was contorted, and these earliest rocks were folded into great mountain ranges, but of these denudation has by now removed all but the deepest roots.¹

During the Palaeozoic Era other rocks were formed, and in the Devonian Period there occurred a series of dislocations of the earth's crust which were called the " Caledonian " earth-movements because their effects were studied in the structure of Scotland. At this period the rocks were subjected to great

¹ A time-sequence of the geological periods and the great earth-movements is given in Appendix I.

foldings in a general south-west to north-east direction. As a result the Caledonian mountain system arose, which extended over all the region now forming the north-western margins of Europe (see Fig. 1), including Spitsbergen far to the north of Scandinavia. In the course of these disturbances much of the rock was metamorphosed into crystalline forms, including schists and gneisses, while there are also large areas of granite, gabbro and other resistant igneous rocks.

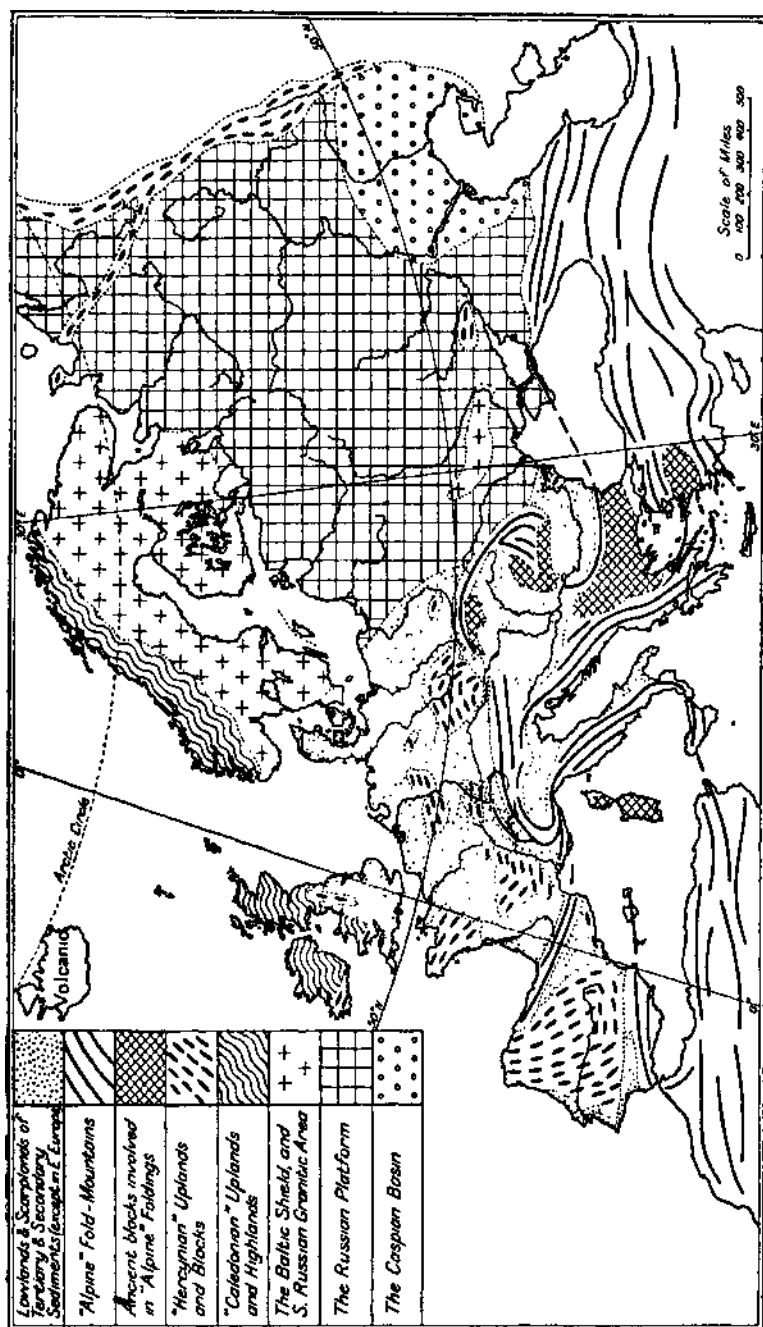
From this period onward through the Secondary Era the great mountain system was worn down to the condition of a peneplain, and only its stumps remained. Then, in the "Alpine" earth-movements of the Tertiary Era, the region again suffered disturbance, this time by faulting and the uplift of some of the resultant dislocated blocks and the subsidence of others. At this time, too, that part of the earth's surface now under the Atlantic waters was detached from the continental platform from which the lands of Europe rise, and the present shape of this margin of Europe was determined.

On the continental side, the blocks were raised probably in more than one stage, so that a low terrace-like step was formed between the sea and the great plateaus which in the Dovre Fjeld now reach over 7,500 feet and in the Jotun Fjeld over 8,000 feet (see Fig. 2). Moreover, the area was dislocated by faults running in several directions, and along these cracks there occurred both subsidences and also lines of weakness along which rivers eroded deep valleys in the plateaus.

Through such cracks and vents in the earth's crust, the pressures associated with the Alpine disturbances forced volcanic material in a number of places, and the Faroe Islands and Iceland in the far north-west are almost entirely formed of these volcanic accumulations.

In the Ice Age, snow accumulated on the high plateaus and ice was formed which worked its way down the valleys, deepening them and changing their section from V-shape to U-shape. In many other ways, too, glaciation played a part in producing the present relief; and its general importance is so great that we may at this point consider it further, although its influence extended far beyond the limits of the North-west Highlands.

At one stage the climate was so cold and precipitation was so great that the great ice-sheet from the Scandinavian Highlands and the smaller ones from the British Highlands extended south-



ward as far as the broken line marked as the maximum extension of the ice on the map showing the distribution of glaciation (Fig. 3). After this period, the climate became warmer, the southern part of the ice-sheet gradually melted and its edge lay progressively farther north ; this continued until the climatic improvement ceased and the margin of the sheet remained in the same position. Here lines of terminal moraine, composed of boulders, gravels, sands and clays, marked the end of this stage in the retreat of the ice. In the area between the outer margin of the earlier ice-sheet and the terminal moraines, there was now visible a layer of boulder-clay, the ground moraine formed below the ice in its wider extension. Also, melted ice-water washed away clayey and sandy material from the later terminal moraines, and much of this was deposited upon parts of the ground moraine ; occasionally such sheets of gravel and sand covered considerable areas. At later periods, with other climatic changes, the ice-edge withdrew farther, and the various stages in the retreat of the ice are therefore marked by alternations of lines of very irregular and often hilly terminal moraines, and flatter stretches of clayey or sandy character. Since the farthest southward advance of ice occurred, there has elapsed sufficient time for streams and weathering to reduce considerably, and to smooth out to some extent, the glacial deposits, but some of the later series remain so little affected that they dominate the landscape and largely control the way in which man uses the land.

An important effect of the ice was to obstruct or alter the courses of the streams, and in many parts this is now shown by rapids in the rivers and by the presence of lakes or swamps. Immature river-development and poor drainage are frequent characteristics of glaciated regions.

In general, the areas from which the ice worked its way outward are those in which its scouring action predominated, while the marginal areas of glaciation are those of deposition. Hence, over parts of the North-western Highlands region the soil was completely worn away and bare rock is the witness of the action of the ice, while in other parts are the coarse gravels and sands of the later terminal moraines. Taken as a whole, in the northern regions glaciation has made surface conditions more difficult for man's occupation and use ; on the other hand, some of the glaciated regions of central and western Europe have

benefited by the finely ground and fertile material brought from the north.

Another very important element in the evolution of the North-western Highlands was a succession of changes in the relative level of land and sea which have occurred several times since the Alpine dislocations, and are still in progress. These changes

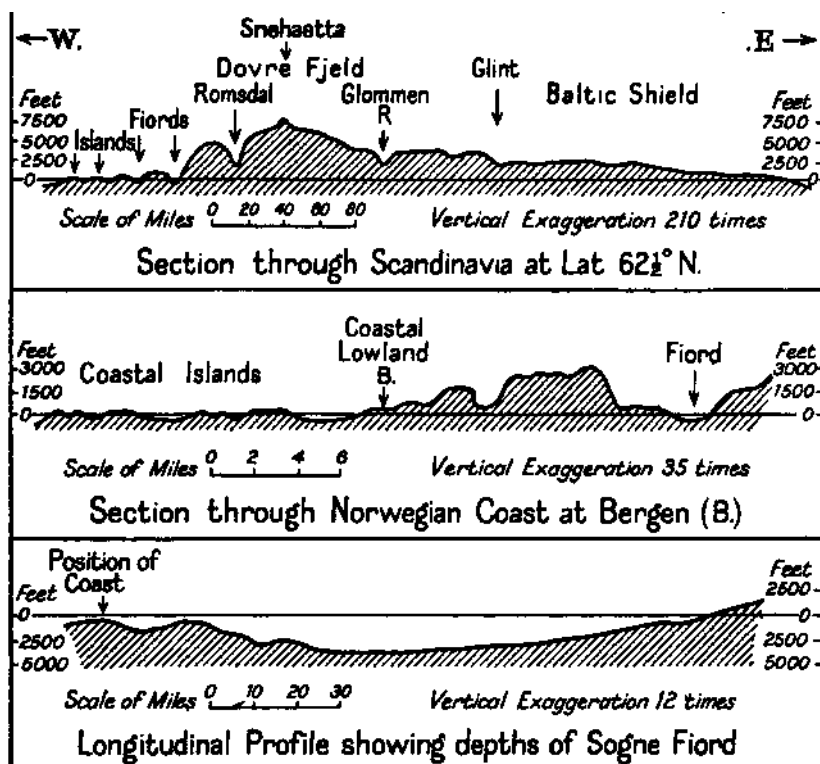


FIG. 2.—SECTIONS SHOWING RELIEF OF SCANDINAVIA.

may be due either to alterations in the level of the sea or to the slow risings, sinkings or tiltings of the land masses; in this part of the world the broad result has been a general sinking of the continental margin as compared with the Atlantic waters, and consequently the shores have been partially "drowned." The low terrace off the Norwegian coast has been reduced either to several small archipelagoes or to narrow patches of lowland extending beyond the highlands (see middle section in Fig. 2).

Also, the lower parts of the valleys, whether due to faulting, to stream erosion, to scraping and deepening by ice, or to a combination of these processes, have been invaded by sea-water and have become the wonderful fiords, with great side-branches leading inland, in some cases for scores of miles. Usually the fiords have steep or even vertical sides, rising to many hundreds of feet, while below the quiet waters are corresponding depths (see bottom section in Fig. 2). Apart from the narrow patches of coastal lowland the only habitable areas are either at the heads of the fiords or at the sides where old terraces interrupt the mountain slopes ; they give landing-places when they are at the water-level, and fields and pastures when they are a little above it.

The influence of this history and its resultant land-forms on human occupation will be considered in detail later. Yet it may be at once observed that it is in the main unfavourable, although the indented coast affords harbours for seafaring. Less obvious is the fact that the enormous amount of denudation has brought the surface of the earth down to the level of the minerals, originally formed in the depths, and now able to be reached by man ; iron and copper ores are therefore among the rather scanty resources of the Scandinavian Peninsula (see Fig. 6).

Another very important result of the geological history is the modification of climatic conditions by the upraised continental margin bordering the ocean. The precipitation of rain or snow is concentrated, as it were, along the coast and on the neighbouring mountains, while in the lee of the great barrier the Baltic lands are relatively dry. Similarly, the moderating influence of the oceanic winds is mainly limited to the Atlantic margins ; behind the highlands continental conditions at once begin, and from Sweden right across north-eastern Europe and far into northern Asia extend regions where the long, severe winters allow the growth only of the tundra or coniferous forest vegetation.

. **The Baltic Shield.**—The Scandinavian Highlands descend, often by a marked drop, known as the Glipt (see Fig. 2), to a great region which dips gently eastward under the Gulf of Bothnia and rises again in Finland, thence sinking in northern Russia till its border is largely covered by the waters of the Arctic Sea, the White Sea and Lakes Onega and Ladoga. Because this

region is slightly concave towards its centre under the northern arm of the Baltic Sea, and thereby resembles an inverted shield, it has been termed the Baltic Shield. It is one of the most ancient land surfaces on the globe, for it is composed of highly resistant granites, gneiss and crystalline schists which, although folded in the dim geological past, before life appeared upon the earth, have remained almost undisturbed during and since the Palaeozoic Era. Faultings have let down parts where relatively small areas of Palaeozoic sedimentary rocks have been preserved,

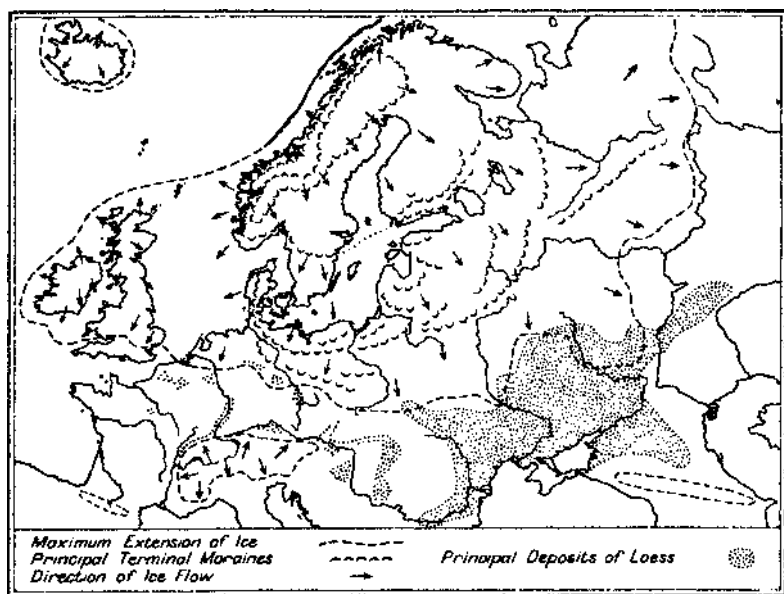


FIG. 3.—DISTRIBUTION OF GLACIATION AND LOESS.

and where the surface is rather lower than the rest, as, for example, in the " Lake Belt " of southern Sweden, in which are situated Lakes Vaner, Vatter and Malar.

For the most part the bed-rock forms undulating country in which the characteristic land-forms are due to glaciation. Near the southern margin there are long lines of hilly terminal moraines, behind which the glacial deposits are still so abundant and so recent that rivers have not been able to develop mature drainage systems. Their courses are irregular, and lakes are numerous. In central Finland, indeed, lakes and marshes cover much of the country and the roads make use of long,

narrow, winding ridges which stand above the waters; these are asar, or eskers, trains of gravel and sand deposited beneath or on the margins of the ice-sheet.

Yet over large areas the naked rock is exposed, for much of the soil was scraped away by the ice and transported to the surrounding regions ; nor was this loss remedied in the lower areas near the Baltic Sea and the Gulf of Bothnia by the deposit of sandy or clayey material when, for a time, the waters spread farther over the land.

Although the ancient rocks contain certain minerals, the Baltic Shield has proved a generally inhospitable region to man, even apart from its climatic conditions.

3. The Hercynian Uplands.—As the mountains of the north of the British Isles are akin to the Scandinavian Highlands, so the uplands of the south of Ireland and of the south-west of England and Wales are akin to a number of others scattered widely over the continent. They are known as the Hercynian Uplands because they represent fragments of mountain systems folded in the Hercynian earth-movements which occurred at the close of the Carboniferous Period. These mountains were continuous over great areas, though their traces are now found only in scattered fragments, and their folds ran in various directions. In the south-west of Britain and the adjoining region of Brittany, the general direction was about west to east with a trend to the south-east towards the centre of France, as is shown by the direction of the lines in these areas in Fig. 1 ; folds running in this direction are referred to as Armorican, from the ancient name of part of Brittany. In central Europe, however, the common direction is from south-west to north-east, termed Variscan, from the name of a tribe long ago living in the neighbourhood of the Fichtel Gebirge.¹ The Variscan direction is seen in the structure of the Rhine Plateau, which is cut across by the Rhine in its course between Bingen and Bonn, and also in the Harz Mountains, the Vosges and the Black Forest Mountains. In the Central Plateau of France both directions are seen, and still others appear in other regions, notably in the central tableland, or " Meseta " of Spain, in the " Diamond " formed

¹ Both the term " Armorican " and that of " Variscan " are sometimes used to denote all these foldings and all the regions of this type, but it seems best to restrict them as is here done, and to employ the term " Hercynian " in the general sense. " Hercynian " is derived from the old name of the Harz Mountains, one of the regions of this type.

by Bohemia and its margins, and in the Lysa Gora -Uplands of Poland. Even in eastern Europe are two similar Hercynian areas, viz. the Donetz Plateau in the south, and the Ural Mountains, with their offshoot, the Timan Uplands, on the borders of Asia.

The various mountains formed by the Hercynian movements have had a history somewhat like that of the older Caledonian mountains ; they were worn down to peneplains, so that the directions of the folds showed only in the strips of the various strata outcropping along the surface, like the graining of the wood in a sawn tree trunk. The Hercynian peneplains later suffered changes : over some areas they were depressed and upon them were laid down sedimentary rocks during the Secondary and early Tertiary Eras, and in the succeeding Alpine earth-movements they were considerably fractured, tilted, upraised or depressed.

Consequently much of what continuity they had previously shown has disappeared, only those parts which stand up above the surrounding lowlands being clearly recognizable as Hercynian Uplands of the usual type. These, which are shown as such on the map of structural regions in Fig. 1, were uplifted to plateau-like form, with more or less level surfaces, but denudation has since removed most of the overlying sedimentary rocks of Secondary and Tertiary date, and has exposed the older rocks of the peneplains with their graining ; even in this older rock the less resistant strips have been etched out so that the more resistant stand up above the general level as ridges running in the direction of the original mountain-folds.

Where an uplifted mass is bounded by clearly marked, and more or less parallel, faulted edges, it is known as a " horst," and such structures are common in the Hercynian Uplands. The converse of a raised horst is a rift-valley, which has subsided between two parallel series of faults. One very important rift-valley is that in which the Rhine flows between Basel and Mainz ; the parallel faults which bound it are shown in the map in Fig 46, and the section in Fig. 47.

In many cases, uplands due to dislocation rise steeply on one side where they are bounded by marked faults, and descend more gently in other directions ; structures of this kind are commonly known as " massifs " and are exemplified by the " Massif Central " or " Central Plateau " of France, which is fault-edged where it overlooks the Rh6ne Valley.

The dislocations which broke up the Hercynian areas allowed igneous material to be forced up along faults and through volcanic vents, and in several parts, notably in the Central Plateau of France, great sheets of lava and the remains of volcanic cones bear striking witness to this part of the history.

In the rocks of the Carboniferous Period which enter into the structure of the Hercynian regions, there were formed widely extending coal-measures containing seams of valuable coal, and these coal-measures were involved in the Hercynian foldings. Where they formed parts of the upfolds which were first denuded, the coal-measures have been worn away, but where they formed parts of downfolds or basins they have, to a certain

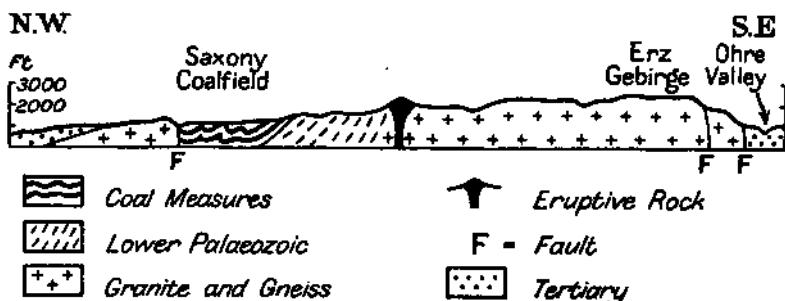


FIG. 4.—SECTION THROUGH THE SAXON UPLANDS, ERZ GEBIRGE AND EGER (OHRE) VALLEY.

extent at least, been preserved. Consequently there are important coal-fields associated with some of the Hercynian Uplands, and these, together with other mineral resources found in their exposed rocks, are the basis of mining and manufacturing industries which have attracted people to the mineral-bearing areas.

The structure of the Hercynian Uplands is illustrated in Fig. 4 by the section through the Erz Gebirge and Saxon Uplands; this area exhibits most of the elements described above.

Yet in general the Hercynian Uplands are not well populated, for they are not productive agricultural regions, since, as they stand above the surrounding lowlands, they have a relatively cool and moist climate, and also they do not usually bear fertile soils. Hence they naturally tend to be heath or moor lands or to be clothed with forests.

4. Central and Western Lowlands and Scarp-lands.—After the Hercynian earth-movements and the later wearing down of the resultant mountain systems, most of Europe, except the north, was submerged under the waters of seas or lakes. This submergence was, however, not uniform over the whole of the southern part of the present continent; some parts were beneath relatively deep seas in which was deposited the ooze from which limestones were formed, while other parts were covered by shallow seas or lakes in which clay-forming muds were laid down, while elsewhere sand was dropped which was changed to more resistant sandstones or remained in an unconsolidated form. Moreover, alterations in the depths of the various parts brought differing conditions first to one region and then to another, and thus at a given place there might occur first the formation of sandstones, then of limestones, and later perhaps of sands or clays.

Thus over wide areas of central and southern Europe there was a succession of deposits of varying composition during considerable parts of the Secondary and Tertiary Eras, and consequently thick strata of sedimentary rock covered platforms of more ancient formation.

Where, in the Alpine earth-movements, the platforms and their coverings of Secondary and Tertiary sediments were broken and upraised, the Hercynian Upland regions were formed as has been described above, but in the less-disturbed areas the strata remained at a lower elevation and the sedimentary cover was less exposed to denudation. In central and western Europe this was the case between and around the blocks of the Hercynian Uplands, where basins were formed such as those of south-eastern England and northern and south-western France, or where there were broader depressions, such as that on the southern shores of the North Sea and the Baltic Sea; in these regions the older rocks are still covered by a succession of sedimentary strata lying above one another in more or less saucer-like form or in an almost horizontal position, as is shown in the section through northern France in Fig. 38. v*

In other parts the rocks have a pronounced tilt, as in England west of the London Basin, in France west of the Vosges Mountains and in Germany east of the Black Forest Mountains; in such cases the less-resistant strata have been worn away, leaving the more resistant as long, tilted slabs, and giving to the

whole region a scarp-land character. This structure is shown in the section in Fig. 48.

Moreover, in the Ice Age, parts of these lowlands were invaded by ice, especially from the North-western Highlands, as was described above, and in such parts various deposits of clays, sands and gravels were laid down.

Frequently, fertile soils have developed upon the rocks of the lowlands and scarp-lands, and agriculture and pastoral work are carried on in such forms as the generally favourable climatic conditions have allowed.

Exceptional fertility marks the soils which have been derived from a mantle of loess covering the earlier deposits in certain parts of the central and western lowlands, and over a great area in south-eastern Europe (see Fig. 3). This loess resembles that of China in its composition ; it is fine-grained, loose and sufficiently porous to allow a free downward drainage of water after rain, and a slow upward movement by capillary-action in dry weather. Its existence in Europe is due to dry climatic conditions which occurred during and after the Ice Age, when southward-blowing winds raised clouds of dust from the finely ground particles of the moraine areas, and deposited them over the surrounding lowlands until a layer was accumulated, in the west often to a depth of scores of feet, and in the east to much greater depths. In central and western Europe the existence of the loess was specially important during the period of man's early settlement and cultivation of these regions, for loess areas were usually free from forest, easily worked and gave abundant return to the simple forms of agriculture then practised.

Minerals are not characteristic of the later sedimentary rocks, though iron ores were formed in some of the Secondary strata (again see Fig. 6), and lignite deposits are found in some of the Tertiary. Yet where the older rocks of the Hercynian Uplands dip down beneath the edges of the basins, the coalfields may extend beneath the younger strata, and therefore in several cases coal-mining has spread from the Hercynian margins some distance into the neighbouring lowlands.

Because of the subsidence of the basins and hollows, the waters of the Atlantic have invaded the lowest parts, and oceanic inlets or inland seas adjoin these lands and bring opportunities for fishing and trading. Hence the lowlands and scarp-lands of central and western Europe have varied resources, and as a

whole have become the most densely populated parts of the continent.

3. The Regions of " Alpine " Folding.—Great as were the changes brought about by the Alpine earth-movements in northern and central Europe, they were but small compared with those which entirely transformed the southern part of the present continent.

It appears that during a very long period about the middle of the Tertiary Era, the block of the earth's crust which forms northern Africa moved northwards towards the similar block forming the platform of ancient and resistant rock which in central Europe underlay the sedimentary strata of Secondary and early Tertiary date. The northward movement was irresistible: the older rock structures of central Europe were broken and displaced, while the younger, sedimentary strata of the south were contorted in a most complicated fashion.

In a general way it may be said that massive sheets of limestones and other sedimentary rocks were ridged up into folds along lines which formed great curves, as indicated in Fig. 1. These curves appear to sweep round from the south of Spain across the Strait of Gibraltar into the Atlas Mountains of northern Africa, whence they are continued across the central narrows of the Mediterranean Sea into Sicily and through the Apennine backbone of Italy into the Alps; even the Pyrenees and the Cantabrian mountains of northern Spain are linked with this system, which therefore almost completely encircles the area of the western Mediterranean. A small spur from the Alpine system is seen in the Jura Mountains.

On their eastern side the Alpine folds appear to spread out, both to the north-east in the Carpathian system and to the south-east in the Dinaric Alps, thus enclosing the lowlands of the middle Danube. The southern part of the Carpathian system swings round into the Balkan Mountains, so that between these and the southward continuation of the Dinaric Alps is another enclosed area in the neighbourhood of the northern part of the *Mæan* Sea. An eastward continuation of the Balkan Mountains is probably to be seen in the Yaila Mountains of the Crimea and in the Caucasus, while those of the southern part of the Balkan Peninsula are continued in the islands of the southern *Mæan* and curve again into the mountains of Asia Minor. Indeed, the whole system extends east-

ward across Asia on a still greater scale and culminates in the highest ranges of the world.

The term "folded" is, however, inadequate to describe the^T contortions which the strata have suffered (see Fig. 5). They have been squeezed together in most complicated ways, and on the outer side of many of the curves, sheets of rock (called "nappes") measuring hundreds or thousands of square miles in area, have been thrust bodily forward over other strata till

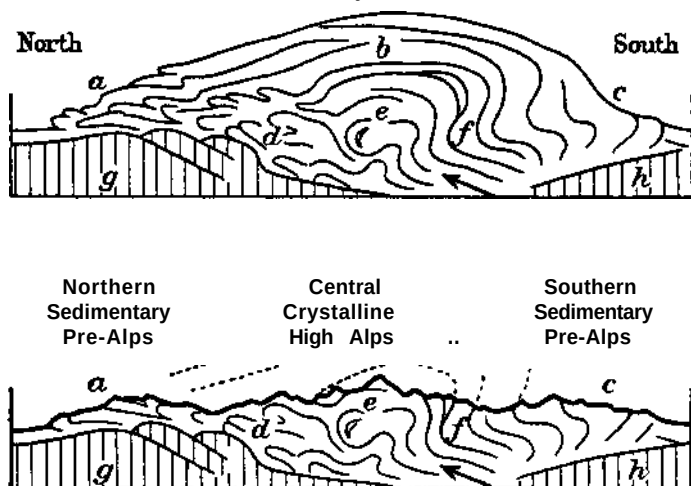


FIG. 5.—DIAGRAMMATIC SECTION THROUGH THE EASTERN ALPS.

(Vertical Scale greatly exaggerated.)

Note.—The upper diagram shows in a simplified form the contortions due to a thrust from the south. The underlying platform, *g* and *A*, is dislocated; the lower sedimentary rocks, *d*, *e* and *f*, are metamorphosed into crystalline nappes; the sedimentary nappes of the upper strata, *a*, *b* and *c*, are thrust northward (except in the extreme south), far from their roots.

The lower diagram shows the present constitution of the Eastern Alps after great denudation. In the central zone the crystalline nappes are exposed, and in the northern zone the sedimentary strata are left widely separated from their counterparts in the south.

they have been parted from their "roots" and now lie in regions far distant from those in which they were formed.

Under the pressures which have brought about such movements, some of the rock was metamorphosed into crystalline form; for example, a large part of the central Alps is composed of crystalline rocks which were thus formed. In some parts, too, molten material was forced up from the depths, and igneous rocks thus add to the complexity. Moreover, volcanoes were formed and are still to be observed, and even now earthquakes show that stability has not yet been attained in this part of the earth's surface.

The Alpine foldings have not only affected sedimentary rocks ; within them have been enclosed masses of older date and more resistant composition. For example, in the central Alps themselves are large areas, including the Mont Blanc massif, consisting of splinters of an Hercynian floor driven up into the folded pile above ; again, in the system of the Carpathians (in the wider sense of the name) is the great and ancient massif of the Transylvanian Alps as well as ancient fragments on the west of Transylvania and in parts of the Tatra Mountains.

Other blocks or massifs occur within the folded mountains of southern Europe, notably that between the Balkan Mountains proper and the western heights of the Balkan Peninsula ; here is the massif of which the Rodopi Mountains form the highest part. Again, within the curved folds of the western Mediterranean, there stand up ancient massifs forming the greater part of the islands of Corsica and Sardinia.

Another very marked, and very important, feature of the region affected by the Alpine foldings is the formation of great basins within the mountain system. These are of varying depth : in the western Mediterranean subsidences have let down the earth's surface over 10,000 feet below sea-level; the Adriatic Sea, however, is relatively shallow, especially in its northern part, and the North Italian Plain is essentially a continuation of this depression now just above the level of the sea. The iEgean Sea occupies another area of subsidence ; it is " half-drowned," and the higher parts of the previously continuous mountain chains form the islands which appear as stepping-stones between the Balkan Peninsula and Asia Minor. The southern part of the Black Sea is another well-marked basin; the north-western edge of the deeper area is the line of shallows showing the earlier connection between the Balkan Mountains and those of the Crimea.

A less-marked basin is that between the Balkan Mountains and the Transylvanian Alps where the relatively recent deposits forming the Walachian Plain stand above sea-level, and thus resemble those of the North Italian Plain.

Broadly similar in origin are the lowlands between the Alps and the great curves of the Carpathian system.

The Alps themselves, and to a less extent other parts of the great fold-mountains, reach such heights that, during the Ice Age, they bore ice-sheets which overrode the highest parts, and

in the case of the western Alps extended into neighbouring regions. The complex results of glaciation in the Alpine Lands and the Alpine Forelands will be described in later chapters.

The effects of the geological history on other conditions than structure and relief are very great; we can here only hint at a few of the results. There is the existence of the Mediterranean and Black Seas which separate Europe from Africa and southern Asia; these seas have physical influences, such as their warming influence upon the winter climate of the neighbouring lands, and influences upon human life, such as the way in which they have enabled civilization to spread all around their habitable coasts.

Corresponding to the variety in the rock structure and the relief of southern Europe is the variety of resources which include mineral deposits, Alpine pastures, mountain forests, broad inland lowlands and hill-sides facing the seas, all capable of human utilization; thus the extraordinary complexity of the geological history has been followed by an extraordinary complexity in the conditions of human life.

6. The Russian Platform.—In eastern Europe the physical development and the human history have been quite different. The ancient rocks of the Baltic Shield dip gently south-eastward, and form the substratum of the great structural region known as the Russian Platform. Apart from its margins, where there are the Hercynian areas of the Ural and Timan Mountains and the Donetz Block, the whole area between the Caledonian Highland system and the fold-mountains of the Crimea and Caucasus has remained almost unaffected by the later disturbances, and the most important movements have been relatively slight alterations in its general elevation as compared with sea-level. Because of these alterations, the area has been covered by the waters of seas of varying extent, and hence the ancient rocks which continue those of the Baltic Shield are covered in the north-west of Russia by deposits of Palaeozoic age, while farther to the south-east these are followed first by Secondary, and then by Tertiary, strata.

But because these deposits have lain almost undisturbed, they have not been subjected to pressures which would have changed their character, and in general even the oldest remain in much the same condition as those of recent formation; stone

which could be used for building or road material is a rarity over large areas of Russia.

The region is not of uniform elevation ; the Valdai Hills are over 1,100 feet above sea-level and form part of the water-parting between the rivers flowing north-west to the Arctic and Baltic Seas and those flowing south-east to the Black and Caspian Seas. The greater part of eastern Europe is less than 600 feet in height, while the land immediately north of the Caspian and the surface of that great inland lake are below the general sea-level of the globe.

Moreover, there have occurred warpings of the underlying platform which, although very slight if measured in degrees of slope, when continued over the great distances of eastern Europe have important consequences. The most marked of these warpings occurs in the south-west, where it brings up to the surface a belt of granite (Fig. 1); through this resistant mass the Dnieper River has been able to cut its southward reach only incompletely, and there are rapids which prevented navigation, but gave water-power now used for industrial purposes.

It must also be observed that all the northern part of the region has been glaciated, with results similar to those found in the plains of the central and western parts of the continent.

Because of its uneventful history, the Russian Platform has in general lacked the formation of mineral ores. Apart from some coal in the Palaeozoic strata near Moscow and iron in the granitic belt, the chief minerals are in the Hercynian areas of the Donetz and the Urals, where industrial development can utilize resources lacking over most of European Russia.

One consequence of the geological history is of the first importance. Undisturbed by the great forces which have led to such a complicated relief in the rest of Europe, the east has remained open, level country in close physical association with the similar lands of western Asia, for the Ural Mountains do not form an effective barrier of any kind. Hence the climates of western Asia are continued across " Trunk Europe " about as far as " Peninsular Europe." Similarly, the belts of natural vegetation, i.e. the tundras, the forests, the steppe-lands and the semi-deserts, extend unbroken from Asia across eastern Europe. Consequently peoples who have adapted their ways of life to each of these types of vegetation have worked their way, either westward or eastward, along almost the whole extent of the

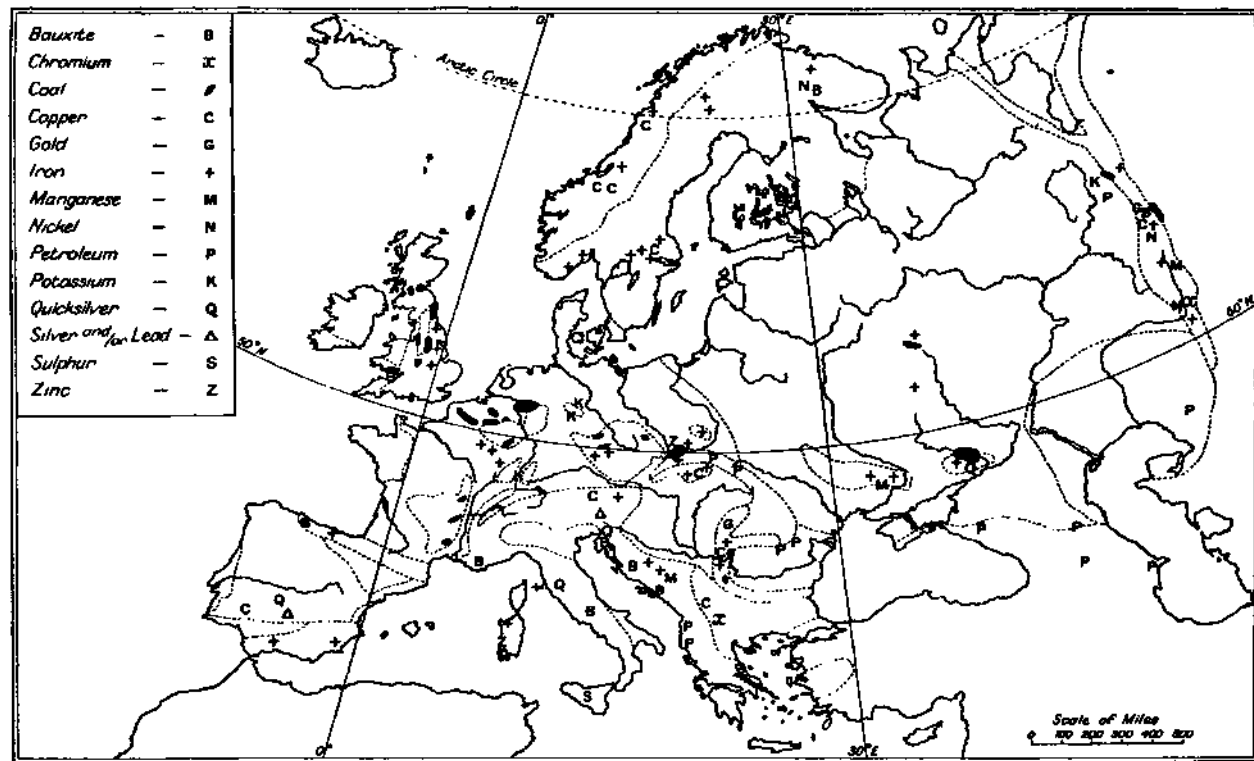


FIG. 6.—PRINCIPAL MINERAL WORKINGS.

Note.—There are also numerous lignite workings, especially in central Europe.

belts, and so kept western Asia and Trunk Europe in very close association from the human point of view.

7. The Caspian Basin.—Here is a region which is certainly more " Asiatic " than " European." It is a part of a great depression which includes the three inland seas : Caspian, Aral and Balkash. To this hollow flow the waters of the surrounding higher lands, and to the Caspian Sea the Volga brings the drainage from a large part of eastern Europe. With the water is brought down the material worn away by the rivers, and the Caspian Basin is covered partly by such recent alluvium and partly by deposits formed when a greater sea than the present one occupied the area.

Moreover, the formation of the Caspian depression, in causing the greatest river of Europe to flow, not towards the Mediterranean, but to the south-east, and to end in a lake without access to the oceans, has tended to hinder close association between eastern Europe and the remaining part of the continent.

QUESTIONS

1. How much knowledge of the Ice Age do you consider necessary in order to understand the present-day geography of the northern half of Europe ? Illustrate by reference to particular areas and their characteristics.

2. Certain parts of Europe may be referred to as being regions of " Alpine folding." Make a sketch-map showing these regions, and consider to what extent they have geographical, and not merely geological similarity.

3. What are the common structural characteristics of the " Hercynian Uplands," and how do these characteristics affect their utilization by man ?

4. Distinguish between four types of coast on account of their structure, and state their location in Europe. Give a description of any two of these types.

5. Define " Trunk " and " Peninsular " Europe respectively, and explain the fundamental causes of the contrasts between these areas.

CHAPTER II

CLIMATE

Wind Systems.—Over much of Europe, oceanic influences play a very great part in determining the climatic conditions, and the belts of wind systems which are developed over the oceans are therefore important. Since these belts lie in certain latitudes, the position of Europe as regards latitude must be first noted. On its southern margin, Europe forms the northern part of the Mediterranean area; Gibraltar is about lat. 36° N. In the north of Europe the Scandinavian peninsula extends well beyond the Arctic Circle; North Cape is about lat. 71° N.

As a consequence of this position, all the continent except the east, i.e. Peninsular Europe as distinct from Trunk Europe, comes under the influence of the great system of winds known as the "westerlies," which appear on wind maps as blowing from a more or less westerly direction, that is, from the neighbouring Atlantic Ocean, whose waters are exceptionally warm for their latitude because they have been brought from tropical regions by the Gulf Stream Drift.

It may therefore be deduced that the climate of Europe, in so far as it is determined by these westerly winds, is not only made equable, but on the average is exceptionally warm for its latitude; further, it may be deduced that these winds bring water-vapour which is precipitated as rain or snow over the land, especially on the windward side of the highlands.

But though there is truth in these ideas, there is the complication that the westerlies are not by any means constant, even in those parts where the maps show that the prevailing winds blow from the west in all seasons. In England, for example, the "prevailing" winds may be shown on a climate map as coming from the south-west, but this is the actual direction of the winds only for about 20 per cent. of the observations. Indeed, the most characteristic fact about the winds experienced in England is that they frequently change, depending upon the passage of low-pressure systems called "lows," "depressions" or, less

frequently, " cyclones," or upon the development of high-pressure systems or anticyclones.

Hence the belt of the westerlies may be usefully considered as a belt in which depressions are common and travel in a generally west-to-east direction. In these depressions are two main streams of air, one coming from a south-westerly or

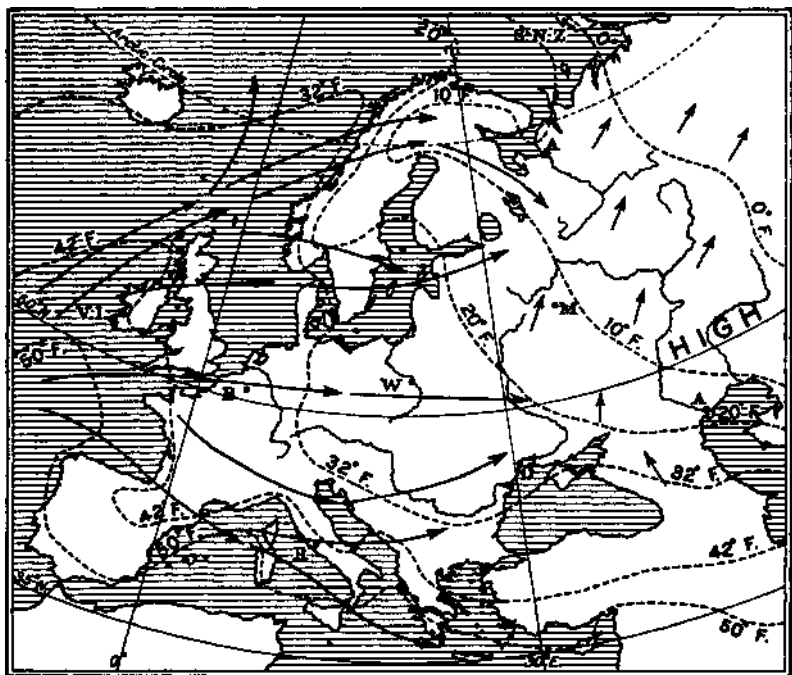


FIG. 7_JANUARY " LOW " TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean January temperatures reduced to sea-level.

southerly direction and bringing warmth and usually rain, the other coming from a north-westerly, northerly or easterly direction and bringing cool and dry weather. As the depressions pass over a given place, there are accordingly changes in the weather as the warmer and the cooler air-streams cover the area in turn ; on the whole, however, the " lows " bring rain, and on their southern side warmth, although cold weather may be found on their northern side. Since the centres pass most frequently over the northern part of Europe, it is their southern sections, with warmth and rain, which most affect the continent.

As the central parts of depressions are areas of low air-pressure, the regions over which they are most commonly found necessarily appear on maps showing the average barometric pressures as areas of lowest pressure, e.g. that between Iceland and north-western Europe.

On the contrary, anticyclonic conditions are marked by high

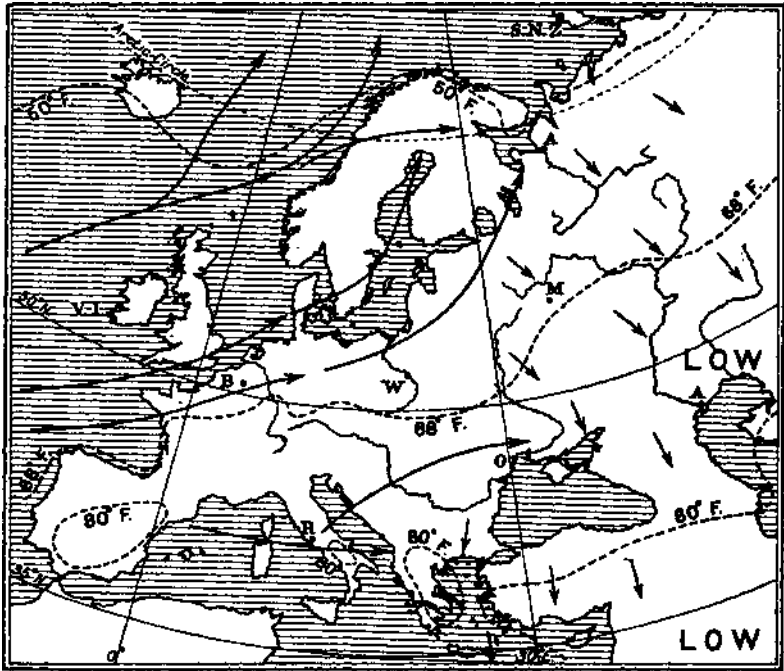


FIG. 8.—JULY "LOW" TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean July temperatures reduced to sea-level.

pressures, gentle winds or calms, and dry weather. Such conditions only occasionally develop within the belt of the westerlies, but they are more common on the southern side of this belt, that is, in the sub-tropical latitudes to the south of Europe, where the climate maps show relatively high average pressure.

Hence, one may shortly say that western Europe is in general under the influence of the belt of the cyclonic, rainy westerlies, while to the south of Europe lies the belt of sub-tropical calms and droughts.

The two belts, however, are themselves not always in the same latitudes, but shift with the sun, southward in winter and northward in summer. Consequently in winter the westerlies cover the whole of western Europe, and their depressions may fairly often pass over the Mediterranean area. In summer, on the other hand, the depressions leave the Mediterranean relatively free, especially in the east, and the south of Europe frequently experiences the calms and drought of the sub-tropical belt of high pressure.

In Figs. 7 and 8 the long arrows show the tracks commonly followed by the centres of "lows," but it must be understood that the area covered by a depression is normally very considerable ; if the centre passes over Berlin, for instance, its influence would probably extend from central Scandinavia in the north to the northern Adriatic in the south. Bearing this in mind, it will be seen from the maps that in winter cyclonic conditions characterize the whole of Peninsular Europe, while in the summer they are generally less frequent, particularly in the Mediterranean region.

In eastern or Trunk Europe the depressions have less influence, for they tend to pass over seas rather than lands, and when they do penetrate the great land-mass, they diminish in intensity. The climate of eastern Europe is therefore more closely related to that of Asia ; it is marked by a reversal of the conditions as between summer and winter which is associated with the monsoonal changes of the greater continent.

In summer the heat sets up a system of continuous low pressure over Asia towards which the winds blow inwards, though deflected, by the earth's rotation, to the right of the most direct path ; consequently in the east of Europe they commonly blow from a more or less north-westerly direction, as is shown by the short arrows in Fig. 8. Even in the eastern Mediterranean this influence is felt, and the prevailing northerly winds of this season were there known to the ancient Greeks as the " Etesian " or " annual " winds, whose onset marked the beginning of uninterrupted easy navigation for their small ships.

In winter the continental land-mass is cooled, high pressure is more continuously developed and the air tends to move outward. The winds, deflected to the right of their direct outward path, usually blow from a more or less southerly direction over most of eastern Europe (see Fig. 7), though in the Mediter-

ranean region they are more frequently interrupted by the passage of cyclones.

Temperatures.—The wind systems combine with the direct heating effect of the sun to determine the temperature conditions,

In the summer the sun's direct influence is the greater, as may be seen from Fig. 8, in which are shown the isotherms drawn from the records of the mean monthly observations of air temperatures in July. (To simplify the maps, the temperatures have been reduced to sea-level; consequently the uplands and highlands have cooler conditions than are indicated.) Where the sun is relatively high in the sky, that is, in southern Europe, the heat is greatest, and over the southern parts of the three peninsulas the lowlands have mean temperatures at, or even over, 80° F. during July. In the far north the temperatures are at about 50°. The course of the isotherm of 68° is worth noting: in the Atlantic area it is well to the south of latitude 50°, for the ocean is relatively cool; in eastern Europe it passes considerably to the north of this latitude because the continental mass is greatly heated by solar radiation; in central Europe the isotherm runs almost along the line of latitude, and places east and west of one another have about the same summer temperatures.

It is convenient to say that when the mean temperature is above 68° F. (20° C.) the climate is "hot"; when between 68° and 50° F. (20° and 10° C.) it is "warm"; when between 50° and 32° F. (10° and 0° C.) it is "cool"; and when below 32° F. (0° C.), it is "cold." Adopting these terms, we may point out that the temperature map shows that in July the climate of most of Europe south of latitude 50°, together with all south-eastern Russia, is hot, that of most of Europe north of latitude 50° is warm, but the lands adjoining the Arctic Sea are cool.

The January map indicates marked contrasts, for in the latitudes of Europe the winter sun is visible for a shorter time in the day and is lower in the sky than in the summer; consequently the sun has much less effect and the winds have relatively more influence, as they bring warm air from the Atlantic Ocean.

The isotherm of 50° is now the highest and, away from the Atlantic, only the southern Mediterranean lands have this temperature. This is due partly to the latitude and partly to the influence of the Mediterranean Sea itself, for this sea remains remarkably warm in the winter because it is shut off

TABLE OF CLIMATIC CONDITIONS

Climate Stations		Lat. N.	Height above Sea-level (Feet)	Temperatures (Deg. F.)				Precipitation (Inches)				
				Mean Monthly		Mean Annual		Annual Total	Seasonal Totals			
									Win. D.J.F.	Spr. M.A.M.	Sum. J.J.A.	Aut. S.O.N.
				Jan.	July	Min.	Max.					
Arctic	South of N. Zemlya	72	50	2	44	—	—	6	0.9	0.8	2.2	1.7
Boreal	Haparanda	66	10	11	59	—27	81	19	4.0	3.2	5.4	6.6
	Archangel	65	50	8	60	—32	84	17	2.5	2.7	6.6	5.0
Sub-boreal	Stockholm	59	150	27	62	—2	83	21	4.6	4.2	7.0	5.5
	Moscow	56	500	12	66	—17	88	21	3.5	4.6	7.7	5.2
Oceanic Temperate	Bodo	67	10	30	55	7	75	36	9.1	6.3	7.7	12.5
	Bergen	60	70	34	58	12	79	84	24.5	15.2	17.6	27.0
	Valentia Is.	52	30	45	59	28	72	56	17.3	11.4	11.8	15.2
	Brest	48	180	43	64	23	90	32	9.5	6.2	6.2	10.6
	Santiago	43	890	45	66	28	95	65	21.7	17.1	6.9	19.1
Mid-Temperate	London	51	20	39	63	18	88	25	5.6	5.2	7.3	7.0
	Brussels	51	200	34	63	14	88	30	6.6	6.0	8.7	8.3
	Paris	49	180	37	65	12	93	21	4.1	4.8	6.0	5.9
	Karlsruhe	49	390	33	66	8	91	38	7.3	8.7	12.1	9.7
	Lyons	46	570	36	70	10	95	40	7.0	8.7	10.1	11.1
	Milan	46	480	34	75	14	93	40	7.7	10.2	9.3	12.5
	Bordeaux	45	250	41	68	18	95	33	8.0	8.0	7.4	10.0
Interior	Konigsberg	55	20	27	63	—2	90	25	4.1	4.6	8.8	7.8
	Berlin	52	160	31	64	7	91	23	5.0	5.0	7.6	5.1
	Warsaw	52	440	26	66	6	90	22	3.8	4.7	8.5	5.0
	Munich	48	1,700	27	63	0	86	35	4.8	8.6	14.2	7.6
Temperate	Budapest	47	500	28	70	10	91	25	4.6	7.0	7.0	6.7
	Sona	43	1,800	27	69	2	95	26	4.3	7.1	8.0	6.2
Mediterranean	Genoa	44	180	45	75	28	90	52	13.2	11.7	6.9	20.3
	Marseilles	43	250	43	72	21	91	22	5.2	5.2	2.8	8.3
	Borne	42	160	44	77	27	95	32	9.8	7.7	3.2	11.9
	Oporto	41	270	48	67	32	93	48	15.8	13.4	3.4	15.4
	Madrid	40	2,100	40	76	18	104	16	4.0	5.4	2.1	4.9
	Valencia	39	70	49	75	32	99	19	4.5	4.8	1.6	8.2
	Palermo	38	230	50	76	39	99	29	11.7	6.7	1.5	9.3
	Athens	38	350	49	81	28	100	15	5.9	2.9	1.4	5.2
Steppe	Orenburg	52	360	4	72	—23	97	15	3.1	3.3	5.0	3.7
	Odessa	46	210	26	73	0	91	16	2.9	3.5	5.6	4.1
	Bucharest	44	280	25	73	—4	95	23	4.0	6.2	8.0	4.9
Arid	Astrakhan	46	—50	19	77	—15	97	6	1.3	1.5	1.7	1.3

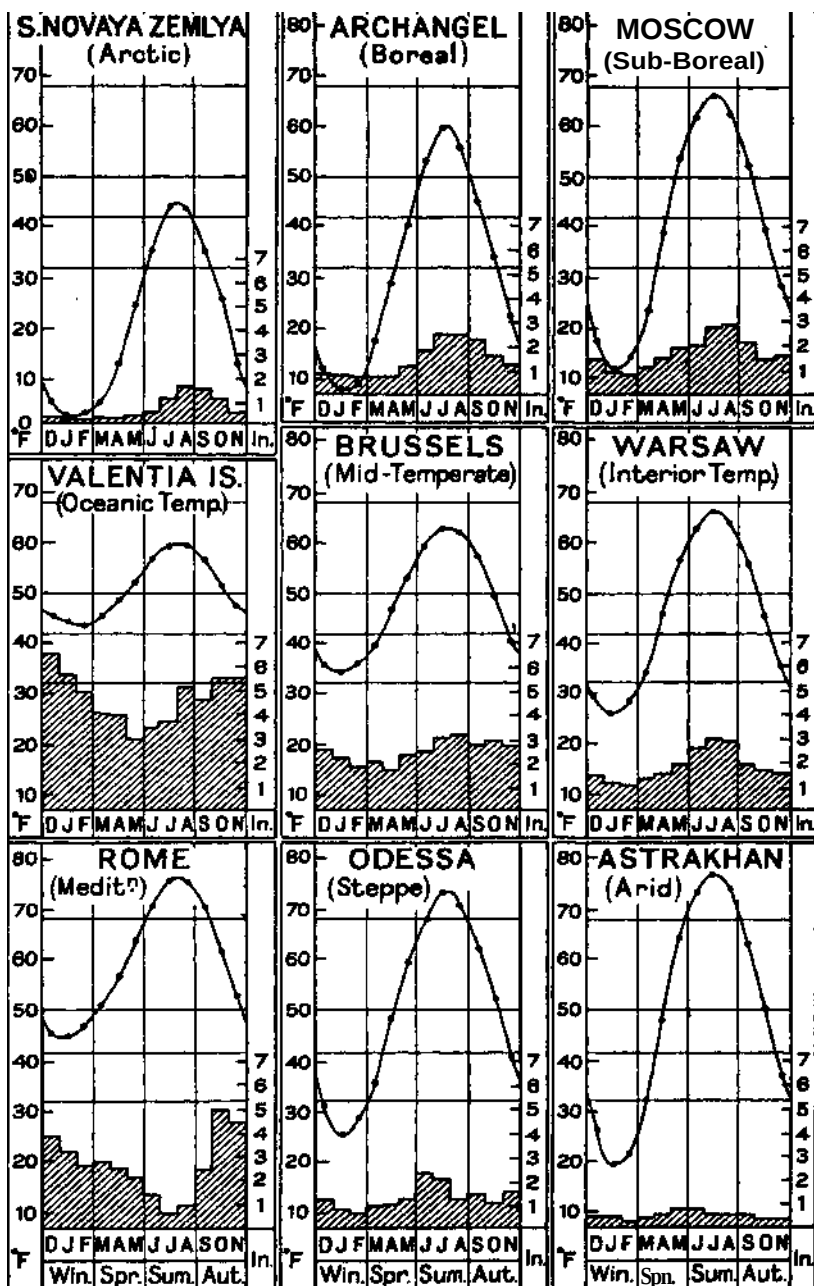


FIG. 9.—TEMPERATURE AND RAINFALL GRAPHS OF CLIMATIC TYPES.

from the cold waters in the depths of the Atlantic by the narrow and shallow entrance at the Strait of Gibraltar.

Most of the other isotherms of the January map have a course broadly similar to that of 50° : in the Atlantic area they run from north to south, showing that the oceanic west is warmer than the continental east, while towards the interior of Europe they run more from west to east because it is colder in the north, where the sun has very little effect.

The isotherm of 32° F. is of special interest, for it marks out an area to the east and north of it where, during a normal January, the average temperature is below freezing-point. As a consequence, within this area, precipitation in January normally takes the form of snow instead of rain, and if the snowfall is heavy there is a snow-cover to the land lasting for at least a month. Moreover, except in a narrow belt adjoining the course of the isotherm, inland waters are normally frozen over and harbours are closed by ice for a month or more ; the chief exception to this latter rule is that the warm Atlantic waters drifting along the coast of Norway keep the harbours of all the west coast of Scandinavia open throughout the year. The extremely cold winters in north-eastern Europe should be observed ; in the neighbourhood of the northern Ural Mountains the mean temperature in January is 0° F., i.e. 32° below freezing-point.

Employing the terms " cool," " cold," etc., as stated above, we may summarize the conditions in January by saying that in eastern Europe as a whole, together with most of Scandinavia and the eastern part of central Europe, the climate is cold ; in most of western Europe it is merely cool, while the south of the Mediterranean area has even warm conditions in this month.

By comparing the mean temperatures in January with those in July, as shown either on the maps or in the table on p. 26, it may be seen to what extent the climate of any place may be regarded as extreme or equable. Subtracting the figure for January from that for July, the annual range is obtained : e.g. for Valentia Island it is only 14° , for Warsaw it is 40° and for Moscow it is 54° . A climate with an annual range of about 30° or less may be regarded as equable, and western Europe as a whole and most of the coast-lands around the Mediterranean Sea have an equable climate. One with an annual range of over 40° is extreme, and all eastern Europe has an extreme climate.

Between these well-marked types comes central Europe, transitional in this respect.

The map of mean temperatures for January shows the average reading of the thermometer in that month, but the actual conditions are at some times above, and at other times below, this average ; hence the winter temperatures are at times more severe than the mean temperature suggests. The lowest temperature which is normally experienced in winter (i.e. the average of the lowest taken over a number of years) is called the mean annual minimum, and for certain stations is given in the table on p. 26. In this table it will be seen that, for example, while the mean January temperature at Moscow is 12° F. (20° below freezing-point), the mean annual minimum is -17° F., i.e. 29° lower (49° below freezing-point). Again, at Archangel the normally lowest reading in January is -32° F. (64° of frost).

Similarly the July map shows the mean temperatures for that month, but the summer temperatures actually rise much higher than these ; the table shows that while at Moscow, for example, the mean July temperature is 66° F., the mean annual maximum, which is the mean of the highest July readings, is 88° F. In the south of Europe the mean annual maximum at Athens is 100° , and at Madrid it reaches even 104° F.

All the conditions hitherto considered relate to those of the coldest or hottest months, but it is also important to know what is happening during other times of the year. This is to some extent shown by the graphs in Fig. 9, which indicate by dots the mean temperatures of each month and join these by curves depicting the normal " march of temperature " throughout the year. From such curves useful deductions may be made ; for instance, at Moscow the mean temperature falls below freezing-point (shown by the line at the level of 32° F.) about the beginning of November and does not rise above it until about the end of March ; we may therefore conclude that normally there is a period of frost lasting about five months. Similarly it may be deduced from the graphs that the period of frost at Archangel is about six months, while at Warsaw it is rather more than three months ; a map showing by lines the lengths of the normal period of frost in all parts of Europe is given in Fig. 10.

Another example of the deductions that can be made from graphs of the normal march of temperature is the duration of the " warm " period, i.e. the time during which the mean

temperature is above 50° F. (10° C). At Valentia Island, off south-west Ireland, the curve rises above the 50° F. line at the beginning of May, and falls below the 50° F. line again near the end of October; the warm period therefore lasts about six months; compare the curve for Archangel, where the warm period lasts only about three months. A map showing the

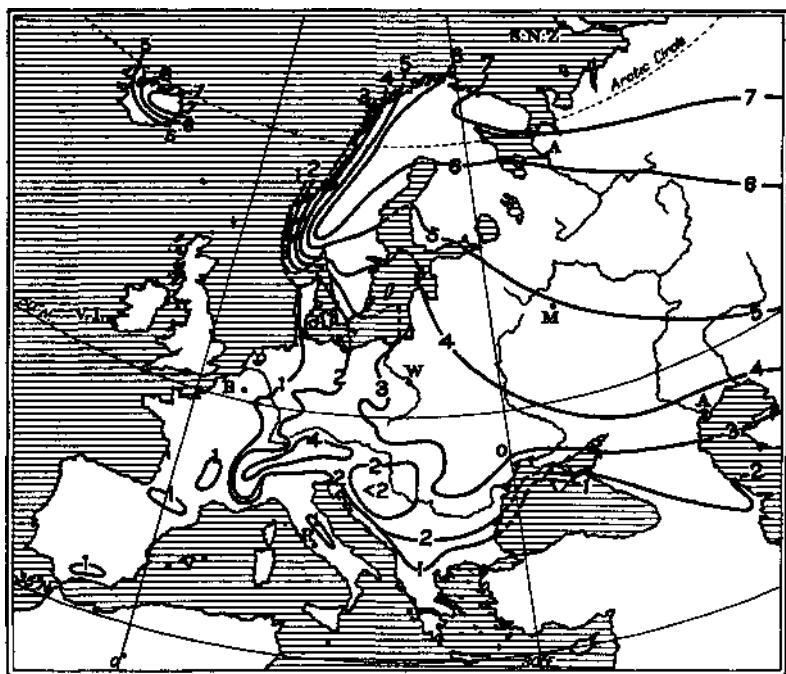


FIG. 10.—DURATION OF FROST PERIOD.

Note.—The lines show the number of months during which the mean temperature is below freezing-point (32° F., 0° C), the calculations being based on actual temperatures (not reduced to sea-level). On the Alpine margins the lines of 3 and 4 months are so close that the former has been omitted, and for a similar reason the 1-month and 2-month lines have not been separately indicated on the margins of the SE. Alps and Dinaric Alps. Note that the area of the Central Danubian Lowlands, marked < 2, has a period of less than two months of frost.

duration of the warm period in all parts of Europe is given in Fig. 11.

From the point of view of the relation of climate to plants the mean temperatures for the hottest month give a very inadequate idea of the temperature conditions which affect growth. For example, the figures for July show that the mean midsummer temperature is about the same at Valentia Island as at Archangel, and yet the graph shows that the warm period is twice as long at the former place as at the latter.

An important fact regarding the relation of climate to plant-life is that for a number of plants growth can begin only when the mean temperature rises above about 42° F. (6° C.). This level is shown by another horizontal line on the temperature graphs, and it may be deduced from the curves that, for example, wheat can begin to grow earlier at Brussels than at Moscow, although the latter place has a higher midsummer temperature.

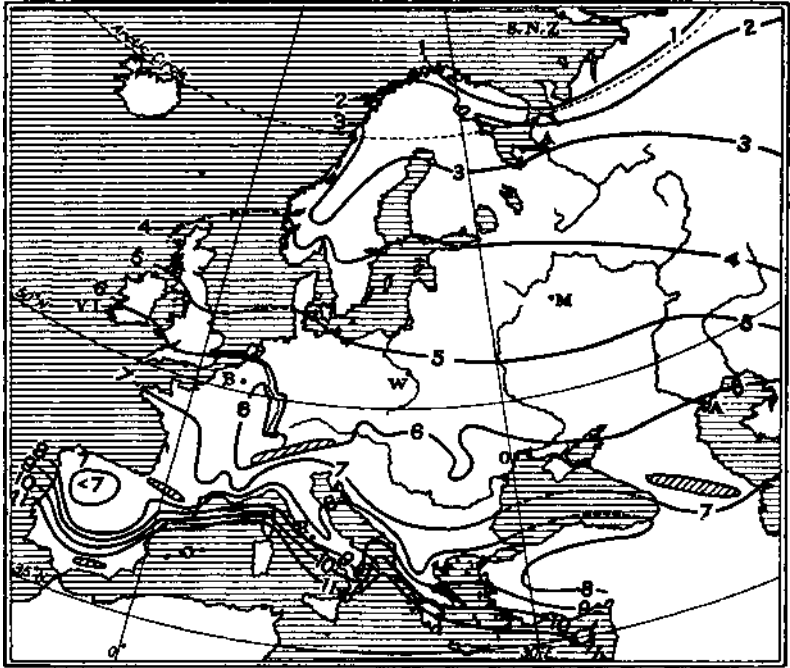


FIG. 11.—DURATION OF WARM PERIOD.

Note.—The lines show the number of months during which the mean temperature is above 50° F. (10° C.), the calculations being based on actual temperatures (not reduced to sea-level).

Conditions in the Alps and other high mountain regions vary so greatly that these areas have been excluded from the map. Note that in the interior of Spain an area marked < 7 has a period of less than seven months of warmth.

Precipitation.—The next element of climate to be considered is precipitation in the form of rain or snow, and this study may well be begun in connexion with the wind systems for July and January respectively.

In July, depressions advance from the Atlantic over northern and central Europe, and since in them the warmer air from the Atlantic rises, it is cooled and water-vapour is precipitated in the form of "cyclonic rains." In eastern Europe the prevail-

ing winds come from the north-west, and have sufficient water-vapour for rain to occur, although in less amount than in the west (see Fig. 13). The greatest precipitation is on the highlands which compel the air currents to rise and to produce "relief rains." In the Mediterranean region and in southern Russia depressions seldom occur, and cyclonic rains are therefore slight, though relief rains give a rather better water-supply

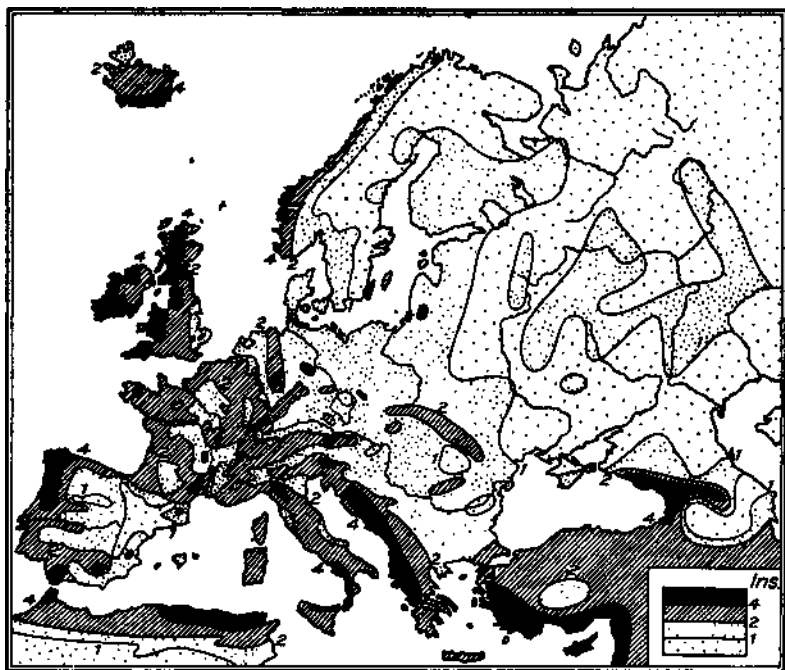


FIG. 12.—MEAN JANUARY PRECIPITATION.

to the mountains, especially to the Caucasus. In the far north there is little rainfall, even in connexion with the depressions, for the cool air can hold but little water-vapour and though the air is further cooled by ascent only a small precipitation can result.

Where cyclonic influence is weak, settled weather is the general rule, but during a period of such weather in summer there may occur thunderstorms and heavy rains, due to the relatively great heating and the consequent rising of the air in particular localities ; such " convectonal rains " account for a considerable proportion of the precipitation in central and eastern Europe.

In January, depressions normally affect the whole of the continent except the extreme east, and where the air is warm enough to contain much water-vapour, precipitation may be considerable. This is the case particularly along the Atlantic margins, where there are the heaviest rains, and in the Mediterranean region ; moreover, on the highlands relief rains add to the total (see Fig. 12). But away from the relatively warm areas adjoining the Atlantic and the Mediterranean the air is so

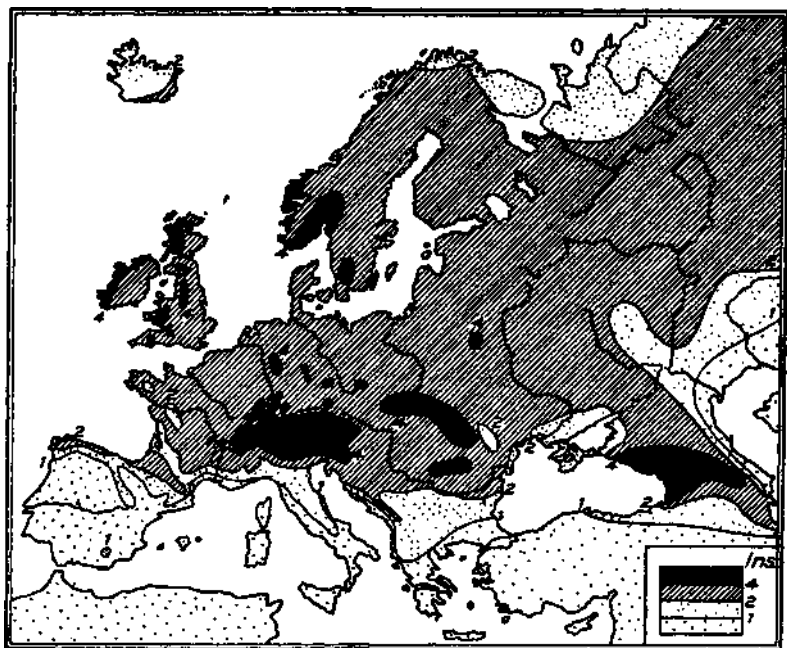


FIG. 13.—MEAN JULY PRECIPITATION.

cold that it can contain little water-vapour and precipitation is generally slight, though relief rains, or falls of snow, occur on the highlands. (In reading maps or statistics of precipitation, it must be remembered that in their compilation one foot of snow is taken as the equivalent of one inch of rain.) In eastern Russia the cold, out-blowing air from the Asiatic high-pressure area is necessarily dry, and this part of Europe would be rainless in winter but for occasional depressions.

The maps for January and July are in general indicative of the whole of the winter and summer seasons respectively ; this

can be seen by the rainfall graphs in Fig. 9, in which the three winter months of December, January and February and the three summer months of June, July and August are marked off by vertical lines.

The rains of spring and autumn are equally important, but as they are to a considerable extent transitional between the more extreme conditions of winter and summer, they are more evenly distributed over the continent. Near the Atlantic and in the Mediterranean region, however, the autumn rains are frequently heavier than those of any other season. These statements about the rainfalls of spring and autumn should be verified by examining the graphs for the stations given in Fig. 9 and the accompanying page of statistics.

A useful summary of the distribution of precipitation during the year at any particular place can be made by adding together the amounts in each group of three months to get the totals for the four seasons respectively, and this has been done for certain places in the table on p. 26. Further, the total for the whole year for the selected stations is given in the same table, and the distribution of the total annual precipitation over the continent is shown by the map in Fig. 14.

By putting together the facts given in the maps, the graphs and the table, a fairly complete idea of the precipitation can be obtained, and some of the main conclusions may be summarized as follows : (i) The regions adjoining the Atlantic have a heavy rainfall fairly well distributed through the year, although greatest in autumn and winter, (ii) Central Europe has an annual total varying according to elevation, considerable on the highlands and moderate on the lower lands ; on the whole, the rainfall is fairly evenly distributed through the year, although the greater amounts occur in summer and autumn and the tendency to a summer maximum increases towards the interior, (iii) Eastern Europe, including most of Scandinavia, has a rather small total precipitation with a summer maximum, and in the extreme north-east and south-east the amounts at all seasons are very small indeed, (iv) In the Mediterranean region the total annual rainfall varies from being very considerable on the highlands behind the Adriatic to being very slight over most of eastern Spain, but the common characteristic is that of summer drought; in the northern part of the Mediterranean region the period of drought is short, but towards

the south the period becomes longer and the intensity of the drought may be severe.

Indeed, throughout all southern Europe, including the south of Russia, the summer is normally a time of drought, for the high temperatures cause rapid evaporation, and the efficiency of what precipitation may occur is thereby greatly reduced. Conversely, in northern Europe evaporation is much less and the rainfall is correspondingly more effective.

Another important consideration is the variability of the rainfall from year to year. This variability is, in the main, greatest where the total amounts are least, and it is consequently quite considerable in the east and in some parts of the Mediterranean region. Moreover, while in a well-watered region a decrease from the average is not a serious matter, in the areas of scanty rainfall it may have calamitous results; thus, in particular years the normal summer drought of the Mediterranean may be unusually prolonged and may even become disastrous, while in southern Russia in years of sub-normal rainfall harvests fail and famines result.

One more point must be noted: when there is little rainfall either during the whole year or during one season of the year, that rainfall tends to occur in short, sharp downfalls; this is frequently the case in the Mediterranean region and with the summer thunderstorms of eastern Europe. A rapid fall means that the immediate run-off of water to the streams is great, and the plants cannot use so much of it; also, after the rain bright weather quickly follows, and evaporation may dispose of much of the water and thus further reduce the value of the already small precipitation. The rapid run-off, moreover, tends to wash away the soil, and therefore soil erosion is a serious factor in the utilization of the Mediterranean and other areas of short and sharp rainfall.

Other Climatic Elements.—The frequent passage of depressions over the Atlantic margin has effects upon the climate of that region besides the equability of the temperature and the heavy precipitation; there are, for instance, the facts that the winds are often violent and the sky covered with cloud. On the contrary, the relative absence of depressions in the Mediterranean region, even in winter, allows a clearness of the sky and an abundance of sunshine which are important factors in attracting visitors from north-western Europe. Similarly eastern Europe has in general clearer skies than the west.

The importance of the element of light in climate is, of course, great, and in this connexion latitude is the main factor. In northern Europe, which lies near and even beyond the Arctic Circle, there is a very marked contrast between winter and summer. In summer the days are very long, and within, the Arctic Circle the sun is above the horizon for the whole of the twenty-four hours during a period which at the Arctic Circle is

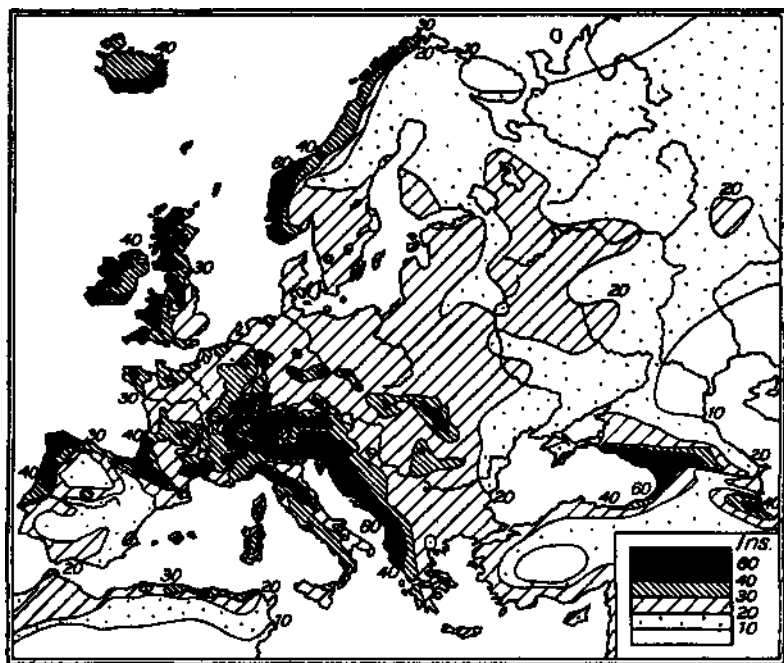


FIG. 14.—MEAN ANNUAL PRECIPITATION.

limited to one day, but at North Cape in Norway extends to over two months.

Conversely, at midwinter the sun is invisible at the Arctic Circle for twenty-four hours, and at North Cape for more than two months. Moreover, even during the short periods in winter when the sun is visible, it rises but little above the horizon.

Climate Regions.—The various elements of climate, e.g. winds, temperature, precipitation and light, of course all exist in the closest association ; they influence one another and have a combined effect upon other geographical phenomena and upon mankind. Regarded in this way, climate is seen to differ very

markedly in different parts of Europe, and it is useful to divide the continent into several regions, in each of which the climate has distinct characteristics. Yet climatic regions seldom have definite boundaries, and it must therefore be emphasized that, when maps are made like those in Fig. 15, the various regions usually "shade off" into one another and the descriptions are only generalizations which apply best to the central parts of the respective regions.

It is convenient, however, to draw lines to serve as approximate boundaries of climatic regions, and for this purpose two devices are commonly employed. In the first place, there are lines based upon meteorological records, like those drawn on the maps showing the conditions of temperature and precipitation. Such lines may be without much significance if they are based merely upon some arbitrarily selected numbers, such as 68° F. (rather than 70° F.), or a duration of frost for one month (rather than three weeks), or a rainfall of 10 inches (rather than 12 inches). It is often better, therefore, to employ the second device, i.e. the adoption of some more natural indication of the climates, and for this purpose vegetation, either natural or cultivated, is a useful guide. In the following chapter the main types of vegetation will be described, and it will there be pointed out how these types are related to climatic conditions ; in some cases it appears that the limits of the growth of particular plants correspond with a line indicating certain climatic conditions ; e.g. the northern limit of trees is found where the period of warmth (over 50° F.) decreases to one month. Hence the line indicating this condition on the map in Fig. 11 has been adopted on the map showing climatic regions (Fig. 15) as separating the "Arctic" from the "Boreal" type of climate. Similarly the other lines showing boundaries to climatic regions have been adopted because of some special significance which will be stated when the climates are described.

The conditions of the climates of Europe may now be summarized in the following paragraphs :

The Arctic climate is experienced around the Arctic Sea, and in the main within the Arctic Circle. Its "winter" is very long, with about seven months of frost, very cold, and for a considerable period almost sunless ; for most of the year the ground is covered with snow, and the subsoil is always frozen. The "summer" is correspondingly short, and although at mid-

summer the daylight is practically continuous, the sun is low in the sky; consequently the mean temperatures rise little above the limit of plant growth, and that only for a short period. Most of the scanty precipitation comes during the time of relative warmth, and is therefore available for plant-life; moreover, evaporation is little and the "effectiveness" of the precipitation is considerable.

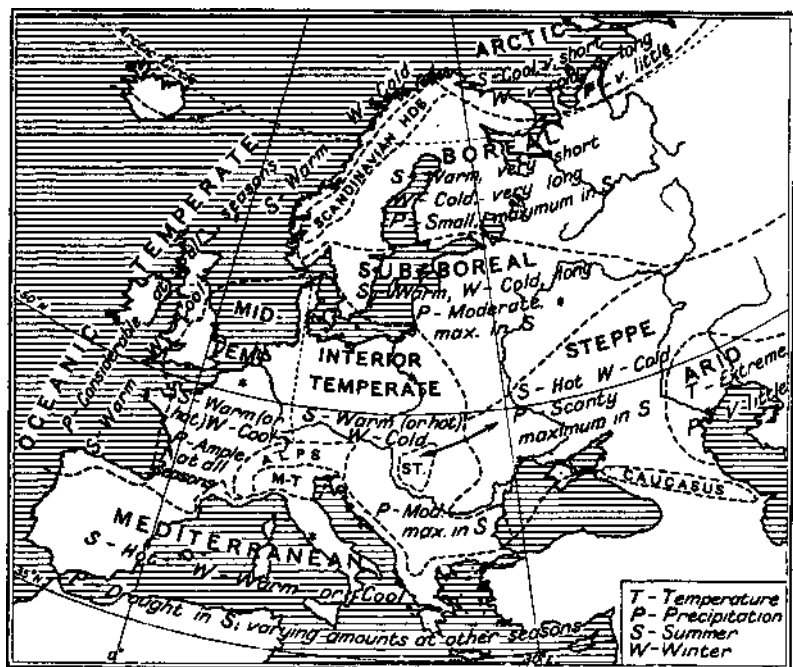


FIG. 15.—CLIMATE REGIONS OF EUROPE.

Note.—In all regions, the uplands or highlands show modifications of the general conditions, but the Alps, Caucasus and Scandinavian Highlands are shown as independent regions.

Except in areas of very marked relief, the boundary lines represent transitional belts rather than definite divisions between the regions. The asterisks indicate the situation of the stations for which graphs are given in Fig. 9.

The Boreal climate, or northern climate, is so called because it extends over much of the northern lands of the world which border upon the Arctic Circle; in Europe the belt begins immediately behind the Scandinavian Highlands, which largely exclude it from Atlantic influences. The cold is about as severe as in the Arctic climatic region at midwinter, but it has a shorter duration, and the thick cover of snow due to the winter precipitation lasts for less than half the year. In spring there is a

rapid rise of temperature above the limit of plant-growth, and the summer has from one to four months of warmth, with a small but effective rainfall. The contrast between the light conditions in summer and winter is very marked, though not so extreme as in the Arctic region.

The Sub-boreal climate is transitional between those of markedly continental character and those largely influenced by the Atlantic Ocean; it is experienced in a region in which Atlantic influence can just penetrate into eastern Europe, between the barriers of the Scandinavian Highlands on the north and the Alps and Carpathians on the south. The annual range of temperature is not much less than that of the European part of the boreal climatic region, but both in summer and in winter the temperatures are higher. The period of warmth lasts four months along the northern limit of this region, and increases southward. Also, during this period as well as during the rest of the year there is greater precipitation than in the boreal region. Hence conditions are more favourable for plant-growth, and for the utilization of the resources by man, than under the boreal type of climate.

The Steppe climate is a convenient label to apply to those conditions under which have developed the various forms of steppe vegetation which will be described in the next chapter. This type of climate, like all the others of eastern Europe except the transitional sub-boreal type, is definitely continental and extends far into Asia. It is exceptionally complex, especially as regards the interaction of the temperature and the precipitation, and demands a separate consideration of each of the four seasons.

For about three months or more there is a winter during which the mean temperature is below freezing-point, and for a considerable period the ground is covered by snow. In spring there is a rapid rise of temperature above the limit of plant-growth, and this growth is aided by the melting of the snow-cover and by a moderate amount of rain. In summer the precipitation as recorded by a rain-gauge is greater, but it tends to occur in heavy and short showers, while the weather becomes "hot" (over 68° F.) for about three months; consequently evaporation is great, the effectiveness of the rainfall is small, and the summer is a season of drought during which plant-growth ceases. In autumn, as in spring, the temperatures are moderate,

and the rainfall is consequently more effective ; yet it falls upon parched ground, and a reawakening of vegetable life is soon followed by the cold of winter.

As the complex climatic conditions are closely reflected in the periods of growth and rest which are characteristic of steppe vegetation, the approximate limits of this vegetation are here taken as the boundaries of the region.

In addition to southern Russia, there is an area in the central Danubian Lowlands which has a climate of this type, and may therefore be regarded as an " exclave " of the main steppe region.

The Arid climate is characteristic of the Caspian-Aral depression in the heart of the Eurasian continent, and is therefore only experienced on the south-eastern margin of Europe.

While in the north of the continent it is low temperatures which cause limitation of certain forms of life and activities, and while in the steppe region both the cold in winter and also the drought in summer are the critical phenomena, here in the Caspian-Aral region the precipitation is so scanty, irregular and ineffective, that aridity is the characteristic of the region during the whole year.

That is not to say that the temperature conditions are negligible. In the first place, the ineffectiveness of the precipitation is due to the high summer temperature, for a rainfall of less than 10 inches per annum, which here marks out the arid region, is accompanied by wet surface conditions in summer in north-eastern Europe. In the second place, the extreme character of the climate is in itself of geographical importance ; during the year a " cold " winter, which lasts about three months, is followed by a spring in which the climate rapidly passes through the " cool " and " warm " stages to a summer during which the weather is " hot " for three months, while the mean and maximum temperatures are among the highest in Europe.

The Temperate climate.—None of the regions of eastern Europe has climatic conditions which can be considered " temperate,"¹ for they all experience either considerable heat or considerable cold at some season of the year. In the south-east, moreover, there is a period of deficient moisture, and this characteristic of seasonal drought exists also in the Mediterranean lands.

¹ In accordance with the dictionary definition: " temperate = moderate in degree of any quality . . . cool, mild, moderate in temperature...."

Only in north-western and central Europe is there a comparative moderation of climatic conditions throughout the year ; hence the term " temperate " is restricted to the climate of this region. Within this region, however, conditions are by no means uniform, and three varieties of the temperate climate may be distinguished in Europe.

The Oceanic Temperate climate of the Atlantic margins of north-western Europe is markedly affected by depressions, accompanied by strong or even violent winds and by precipitation which, though heaviest in winter and autumn, is abundant at all seasons. The frequency of winds from the warm waters of the Gulf Stream Drift results in the warmth of the winters and the marked equability of the climate.

The extent of the region thus affected by the westerlies at all seasons is great from south to north ; hence there are considerable differences, especially as regards temperature, between the areas bordering on the Mediterranean climatic region at the one end, and those beyond the Arctic Circle at the other. Contrast the figures given in the table on p. 26, for Santiago in Spain, for Valentia Island, and for Bodo just within the Arctic Circle on the Norwegian coast.

The region which may be termed oceanic is clearly limited inland by the Scandinavian Highlands in the north, and almost as clearly by the uplands of the Iberian Peninsula ; but between these extremes there is a more gradual transition towards central Europe. In the British Isles the English lowland is less equable and less rainy than the uplands of the west and north, and may be better classed with the region next treated.

The Mid-Temperate climate has rather warmer summers, and the winters are so much less influenced by the maritime influences that there is a period during which plant-growth is checked ; also the precipitation is not so heavy. Except in the winter the conditions of heat and water-supply are sufficiently favourable to allow a considerable variety in the forms of plant-life which can here develop.

The North Italian Plain may be grouped with the warmest part of the Mid-Temperate climatic region, for its temperature and rainfall conditions closely resemble those of the nearest part of this region, viz. the Rhone Valley just below Lyons. (Compare the figures for Milan and Lyons in the table on p. 26.)

The Interior Temperate climate shows a further reduction in

the effects of proximity to the ocean. Apart from the higher areas, on which the temperatures are necessarily lower, a line drawn southward from the peninsula of Jutland separates the regions south of the North Sea, where in the coldest month the mean temperature is above freezing-point, from those south of the Baltic Sea, where the winters have a cold period lasting one, two or three months. Also, the precipitation is lower, and has a maximum in summer.

Eastward, conditions gradually approach those of the sub-boreal and steppe climatic regions, and it is convenient to take as the eastward boundary the approximate limit of the beech, which, because of its need for a fairly long vegetative period, is often regarded as a criterion of temperate as distinct from continental conditions.

The region extends far to the south-east, the main modification being a lengthening of the warm period and an increase in the midsummer heat, as may be seen by comparing the July temperatures at Berlin and Budapest.

The Mediterranean climate requires separate consideration for each season. In winter the temperature is almost everywhere above the limit of growth, and in the southern part it is definitely warm, while the rainfall is considerable ; hence neither plant-growth nor the outdoor activities of man need cease. In spring there is everywhere warmth, and in most parts there is sufficient rainfall for the processes of plant-life, enabling flowering, fruiting and ripening to continue. In summer there is a period of three months or more of heat (above 68° F.), and the maximum may be very high ; the rainfall becomes scanty or even fails, and with the high temperature this season is one of drought in which plant-growth ceases, except for deep-rooted types. In the autumn there is still warmth, and usually sufficient rainfall for a resumption of the growth of vegetation ; indeed, in much of the European part of the region the autumn is the season of maximum precipitation.

It is convenient to summarize the more striking features of the Mediterranean type of climate as "winter warmth and summer drought," but, as in the case of the steppe type, no simple meteorological formula can adequately express its character. For this reason the limit of the growth of the olive,, the most typical plant, is adopted as the northern boundary of the Mediterranean region save where, as in the interior of the

Iberian Peninsula, altitude modifies the climatic conditions and prevents the growth of this plant. (Compare the map showing the distribution of the olive in Fig. 18 with that of the climate regions.) It should be noted that, apart from the special case of the interior of the Iberian Peninsula (which will be discussed in a later chapter), the Mediterranean climate in Europe is rather closely restricted to the coast-lands of the Mediterranean Sea, together with the southern shores of the Crimean Peninsula.

Uplands and Highlands.—To simplify matters, it is lowland conditions which have been indicated in the text and in the map of climatic regions. In some parts, however, there are considerable complications, due to the lower temperatures and the greater precipitation which occur with higher altitudes. Such modifications will be taken into account in the more detailed regional studies which will follow, but here, and on the map in Fig. 15, attention can only be briefly drawn to the outstanding highland regions of the Alps and in Scandinavia. In several respects the latter highlands continue southward the characters of the Arctic climate, while conditions in the Alpine region are so complex that they must be specially described in a later chapter.

QUESTIONS

1. State the characteristics of the wind-belts which affect Europe. Explain how they influence different parts of the continent.
2. Draw a graph showing the annual "march of temperature" at any one place you name. Show (*a*) what deductions you can make from the graph, and (*b*) its incompleteness as a record of the temperatures.
3. For any one selected part of Europe, state and account for the essential characteristics of its rainfall.
4. Discuss whether it is possible to find and express definite limits to climatic regions.
5. Examine the truth of the statement that the critical element of climate in Europe is temperature in the north, and rainfall in the south.
6. "The Mediterranean climate has a mild winter and dry summer." Show in what ways this dictum is too simple.
7. Trace the normal succession of climatic conditions through the seasons in the steppe-lands of Europe.
8. Show by reference to one or more particular regions how the various elements of climate interact with one another.
9. To what extent can the climate of "Peninsular Europe" be regarded as a contrast to that of "Trunk Europe"?

CHAPTER I I I

VEGETATION, SOILS AND LAND- UTILIZATION

NATURAL VEGETATION

IN England and in other parts of Europe which have long been settled, the natural vegetation has been either greatly modified or entirely superseded by cultivated plants, but over other parts of the continent the natural vegetation still dominates the landscape and greatly influences mankind.

It assumes many forms, according to the climate, soil and other factors which determine its growth, but certain main types may be perceived ; we will consider each of these in turn, beginning with those of eastern Europe, where the contrasts are clearly displayed.

Tundra and Alpine Vegetation.—In the preceding chapter it was pointed out that trees cannot grow where the period of warmth is less than one month. The Arctic climate, therefore, with its cool and very short vegetative season, can support low woody shrubs only on the margin of the forest, and the characteristic vegetation of the tundra region consists of mosses and lichens, in addition to many kinds of small flowering and berry-bearing plants. On the drier parts of the tundra lichens grow together so as to form close mats ; in wetter situations mosses grow in abundance, and peat accumulates from dead vegetation and may form hillocks covered with living moss. Wet meadows occur, and swamps with cotton-grass and sedges occupy hollow places.

The region formed by the Scandinavian Highlands, known as the Fjeld, continues Arctic-like conditions southward, the change of latitude being largely offset by increasing altitude ; consequently, below the ice-fields of the highest parts, the mountain flora closely resembles that of the tundra, and may be considered as of the same type.

There are, however, considerable areas on the Scandinavian Highlands, where in the summer there is a thick growth of grasses and herbaceous plants, which afford a fairly rich pasture of the Alpine type. This pasture is so named from the

zone of the Alps situated above the tree-line but below that of perpetual snow ; it is found also on other mountain regions—for example, on the Urals, Carpathians and Pyrenees.

It is impossible to show such a zonal arrangement of vegetation, varying according to altitude, on a small-scale map, and consequently only the type which occupies the greatest area has been indicated in Fig. 16. Thus, while the northern Urals and the Fjeld have been marked as belonging to the tundra and Alpine type, the other mountain regions have been shown as being mainly forested, but with Alpine pasture.

The Coniferous Forest.—Between the tundra and lowland forest is no sharp line of demarcation. Outposts of forest extend northwards into the tundra region, and patches of tundra vegetation are found within the limits of the forest. The dwarf birch which grows on the borders of the Arctic region is replaced by a larger kind farther south, while the spruce and pine increase southwards in number and size till they form the dominant trees in the great unbroken region of the coniferous forests.

In the eastern part of this region, extending into Siberia, the forest is known as the taiga ; here Siberian species of spruce and pine are found, and fir and larch are subordinate members of the plant associations. In the west, the forest is composed of European species ; the pine is that often known as Norway pine or Scots pine, and a zone of birch frequently forms the boundary towards the tundra or the fjeld. Throughout the coniferous forest, on the drier soils the pine predominates, and on the damper soils the spruce, while in the areas of poorest drainage moors with sphagnum moss are common.

Adaptation to the climate, with its short period of warmth, is shown by the needle-like form and leathery surface of the leaves. They are thus protected against the cold winds, and against the loss of moisture by transpiration at seasons when the water in the soil is frozen and there is therefore a time of " physiological drought." Yet the leaves do not fall in winter and are ready to take advantage of every spell of growing-weather ; the forest, therefore, is evergreen. A store of food in the form of starch in the tissues of the wood is another adaptation to the climatic conditions, and the coniferous forests supply timber which is " soft," as compared with the " hard " woods of the deciduous forests.

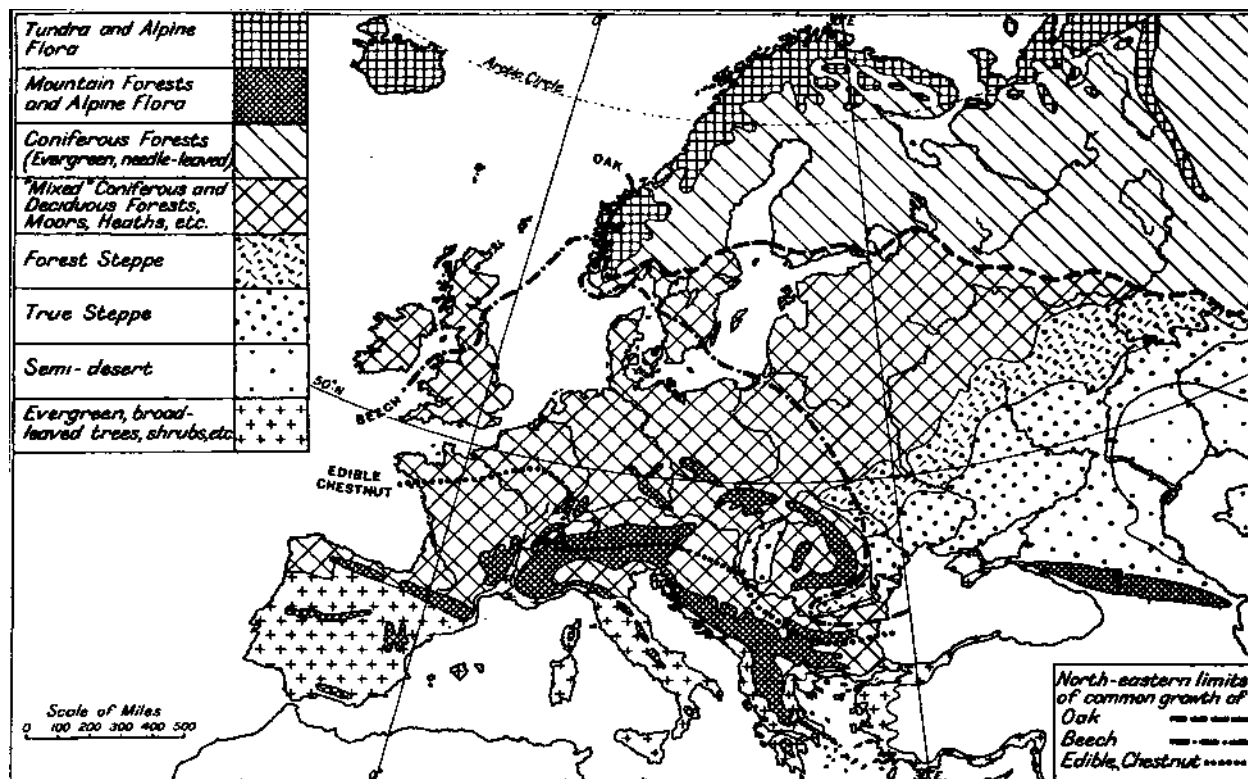


FIG. 16.—NATURAL VEGETATION REGIONS OF EUROPE.

The trees rise tall and straight, almost like poles, from a carpet of fallen needles, for there is little undergrowth in the coniferous forest. Factors which hinder the development of undergrowth are the lack of light beneath the high canopy of leafy branches, and the frequent freezing and thawing of the soil in spring and autumn, with the consequent injury to rootlets.

The "Mixed" Forest.—Even in the coniferous forests, there are representatives of the deciduous broad-leaved trees—for example, the birch, alder and poplar—and in more southerly regions these become more abundant, while others, such as the oak, appear and at last become common. Indeed, the occurrence of the oak is commonly taken as indicating the limit of the forests known as "mixed," and this criterion is here adopted on the map of natural vegetation. Yet the limits of even one species of tree cannot be accurately shown by a definite line, and those of the oak, beech, etc., shown on the map are necessary simplifications.

The annual leaf-fall of the deciduous trees is a protection against the cold and the consequent physiological drought of the winter, but this adaptation can occur only where the summer vegetative period is long enough, first for the growth of the new leaves, and then for their functioning. It appears that for this purpose it is necessary that the mean temperature should be above 42° F. for over five months.

The increasing length and warmth of the summers towards the south-west allow the growth of other species of trees which add to the variety, and in some cases to the value, of the deciduous forests. On the map in Fig. 16 this is illustrated by lines showing the approximate limits of the areas within which the beech and the edible chestnut are widely grown.

The varying nature of the mixed forests of coniferous and deciduous trees depends partly on the climate of the particular localities. In this respect, altitude, with the accompanying modifications of temperature and precipitation, is the main factor in causing the uplands and highlands to have forests of distinctive character; in central Europe the lower slopes are largely covered with deciduous trees and the upper with conifers, until the limit of forest growth is reached. Soil conditions as well as relief affect the character of the natural vegetation, and upland heaths and moors and lowland fens occupy considerable areas.

Over the greater part of the mixed forest region man has modified or transformed the original tree-cover. This has been done either intentionally, by cutting down the trees for timber or to clear the ground for agriculture, or unintentionally by fire or by allowing the young shoots to be eaten by goats[#] and other animals. Once destroyed, forests may be gradually replaced by a natural extension from neighbouring regions ; more commonly, however, new species are deliberately planted, in some parts forming woods of particular broad-leaved trees, and in other parts woods of conifers. In the main, however, cleared forest land has been utilized for agriculture or pasture.

On its southern margin, a climatic limit is set to the deciduous forest by an interruption of the period of summer growth. In the south-west and south this interruption is caused by the summer drought of the Mediterranean region, though the greater precipitation on the higher lands of that region allows trees to extend along the mountains far into the southern peninsulas of Europe.

In the south-east of the continent the hot and dry summer prevents tree growth in general, though there are tongues of forest stretching down the river valleys and " islands " of woodland or scattered trees in the damper places beyond the general limit. Indeed, the transition is so gradual that the northern belt of the steppe region is often known as the forest-steppe.

The Steppe Vegetation.—South-east of this transitional belt is the extensive region of the true steppes in which grasses and herbaceous plants, either annual or biennial, form the characteristic vegetation. As stated in the preceding chapter, the spring is the main season of plant activity ; the grasses and herbs appear above ground, grow rapidly, flower and produce their seeds in the short period between the winter cold and the drought of midsummer. Then they die down, and life is hidden beneath the surface, where, in tubers, bulbs, etc., a store of food is formed and preserved in readiness for the next season. A second short and less pronounced period of plant activity occurs in the autumn, but for most of the year until the next spring the ground appears bare.

According to differences of climate and soil within the steppe region, there are differences in the kinds, and the abundance, of the plant-forms. In the better-watered, northern and western parts of the true steppe there are areas of " meadow

steppe," of tall tufted grasses and gay flowering plants such as campanula and clover, which make a continuous thick cover to the ground ; even in a natural state, this can be mown to obtain a rich harvest of hay for use in the dry and cold seasons. In the less-watered districts, less succulent grasses and herbs which grow closer to the ground and are rather sparsely scattered form the greater part of the vegetation ; this can be utilized for grazing rather than for the cutting of hay.

As in the case of the more fertile forest regions, so here on the steppes the more productive areas have been much changed by man, both by pastoralists mowing or grazing the natural growths, and by agriculturalists cultivating the land for crops.

The Semi-desert Vegetation.—In the poorer steppe lands there appear some shrubs which have deep and long roots to obtain as much water as possible, and whitish, felted leaves from which the moisture is but slowly transpired ; there are also plants which are protected against the wind and the resultant loss of moisture by growing close to the surface of the ground. In the semi-desert, such forms of life adapted to an arid climate represent an increasing proportion of the vegetation as the grasses and herbaceous plants become fewer ; the amount of vegetation of any kind is but small and the bare soil is everywhere visible. As protection against still greater aridity, the woody growths commonly have their leaves reduced to spines. Also, as the conditions approach those of the deserts in which there are only occasional rains, the annual plants remain dormant below the surface for longer periods ; but whenever in the summer the soil receives a supply of water, they may appear, and pass rapidly through their very short vegetative period.

In the small areas in the extreme south-east which may properly be called desert, the vegetation is very scanty indeed, and only the " halophytes " adapted to living in salty soils, or plants which can find sufficient moisture in the sand-dunes, can exist.

The "Mediterranean" Vegetation.—As the winter temperatures are generally above the limit of growth, trees and woody shrubs which live throughout the year are the characteristic plant-forms ; they are protected against the loss of water in the dry summer by various devices, including deep and wide root development, a thick, rough bark, such as cork, and leaves of a different kind from those of the more northerly forest trees.

As the winter allows growth, there is no common period of leaf-

fall, nor need there be the extreme adaptation of a reduction of the leaves to needle-form ; the trees are evergreen and the leaves are broad, but their glossy and hard surface prevents rapid transpiration. The evergreen oak, cork oak, olive, holly, laurel and myrtle are of this kind and are typical of the region, although some of them may grow also in the south-western parts of the deciduous forest region where the winters are sufficiently warm.

Yet these broad-leaved evergreen trees are not the Only plants which can live under Mediterranean conditions, and an important group consists of low shrubs : e.g. heaths which are evergreen but have small and narrow leaves ; thyme, lavender and other aromatic shrubs ; the brightly flowering cistus, and many others.

Originally the Mediterranean region was largely forested, but these forests have almost disappeared ; now the natural vegetation, in the sense of that not deliberately planted by man, is only exceptionally forest or woodland, and that is found mainly on mountains or uplands where the temperatures are lower and the rainfall is greater than is normal. In such situations there are woods of evergreen oak or cork oak, as in the Iberian Peninsula, and there are also areas where the trees are those which are more common in other vegetation regions, such as the beech and edible chestnut, which extend southwards along the mountains of Italy, or the pines which grow on the uplands of the Balkan Peninsula.

Much more extensive are the thickets of evergreen shrubs which have replaced most of the original forests ; these growths may include low trees, such as the laurel and myrtle, and bushy plants, such as tree-heaths, cistus, broom and juniper. Such thickets are known as maquis in France, macchia in Italy and monte bajo in Spain.

Still poorer growths of lower bushes are formed of thyme, sage, lavender, small heaths, etc., with thistles and various flowering herbs, such as the asphodel and iris. These associations show bare earth between the plants; they are widely developed on the drier soils and are known as garrigues in France, tomillares in Spain and phrygana in Greece.

Meadows of the north-western European type are rare ; in well-watered situations there are associations of grasses and bulbous plants which give pasture, but these commonly dry up in the summer.

On the other hand, in very dry areas, such as the interior plateaus and the south-eastern lowlands of Spain, the climatic conditions and the vegetation approach those of the steppes of eastern Europe ; here grasses may predominate, and esparto grass is still the vegetation cover of some districts in Spain.

The natural or semi-natural vegetation is now found mainly on the higher parts, the steeper slopes and the poorer soils of the Mediterranean region ; most of the lowland and much of the hill-country has been taken in for cultivation.

SOILS

It might be expected that the nature of the soil is largely determined by the geological factor—the rock from which it is derived, for in England differences between soils often correspond to differences of the parent material. This view was generally held until Russian scientists, studying the soils of their vast country, which has such contrasted climates, realized that the climatic conditions are the main cause of the striking contrasts in the soils. To appreciate this, as well as to understand the essential character of the soils and their relation to agriculture, we may examine in turn the main soil types and soil regions of Europe, beginning with those of eastern Europe.

The Podsoles.—Beneath a thin superficial layer formed of fibrous vegetable material, the podsoles have an upper level, or "horizon," of an ashen-grey colour from which they were named (Russian : pod = under, zola = ash). This upper horizon has a loose structure, and consists of sandy and gravelly material. Both colour and structure are due to the washing down, or leaching, of the soluble salts, the lime constituent (calcium carbonate) and the clay from the uppermost to the second horizon, situated a foot or more beneath the surface. This second horizon, because of the materials washed into it, is usually compact, and often contains a layer cemented together by iron into an impermeable "pan." The essential process of leaching is the consequence of the downward drainage of water, and this occurs when the precipitation exceeds the combined loss by evaporation, the surface run-off and the transpiration of water by plants.

Hence climate is the main control of the development of the podsoles, and, moreover, the degree to which soils are leached is, directly and indirectly, due to the climate. The map in Fig. 17

shows the distribution of two types, the strongly leached and the moderately leached. The former extends widely over north-eastern Europe (excluding the tundra and mountain areas, which will be considered later), where the summer warmth is not enough to cause great evaporation. Also, the climate has here an indirect effect, since it allows the growth only of the coniferous forest, of which the vegetable residues tend to accumulate as a peaty layer, giving almost permanently wet conditions. The abundantly watered western side of Scandinavia also has soils of the same type. Farther south the coast-lands around the south-eastern corner of the North Sea have similar conditions, for the predominantly sandy character of the subsoil allows easy downward movement of the rain-water.

Soil conditions react upon the vegetation ; for example, the northern limit of the oak is partly determined by climate and partly by the difficulty with which this tree grows on the more strongly leached podsoles. Moreover, these strongly leached podsoles, having lost much of their plant-food constituents from the upper horizon, are unfavourable for cultivation ; to be productive, they need to be supplied with a considerable amount of lime and other manures and to be very thoroughly tilled.

The moderately leached podsoles are found in warmer well-watered regions, and in these the less-marked grey colour of the upper soil and the usual absence of a compact and cemented lower horizon bear witness to the retention of more of the plant-foods in a condition available for plant-life. The deciduous forests, too, supply an annual leaf-fall which is incorporated with the soil.

The map shows that the moderately leached podsoles extend over the deciduous forest regions of eastern Europe and over much of the north-western coast-lands of the continent, excepting the mountain areas ; they are also found on interior uplands. As there are no definite limits to climatic conditions and seldom sharp changes in the vegetation, so the resultant soil types usually merge into one another.

In areas of abundant water together with poor drainage, the podsol regions are characterized by the development of peaty soils. Moorland peats form acid soils of little value to man, but since the fen peats found in lower situations form less acid soils and contain more plant-food, they may prove productive when drained.

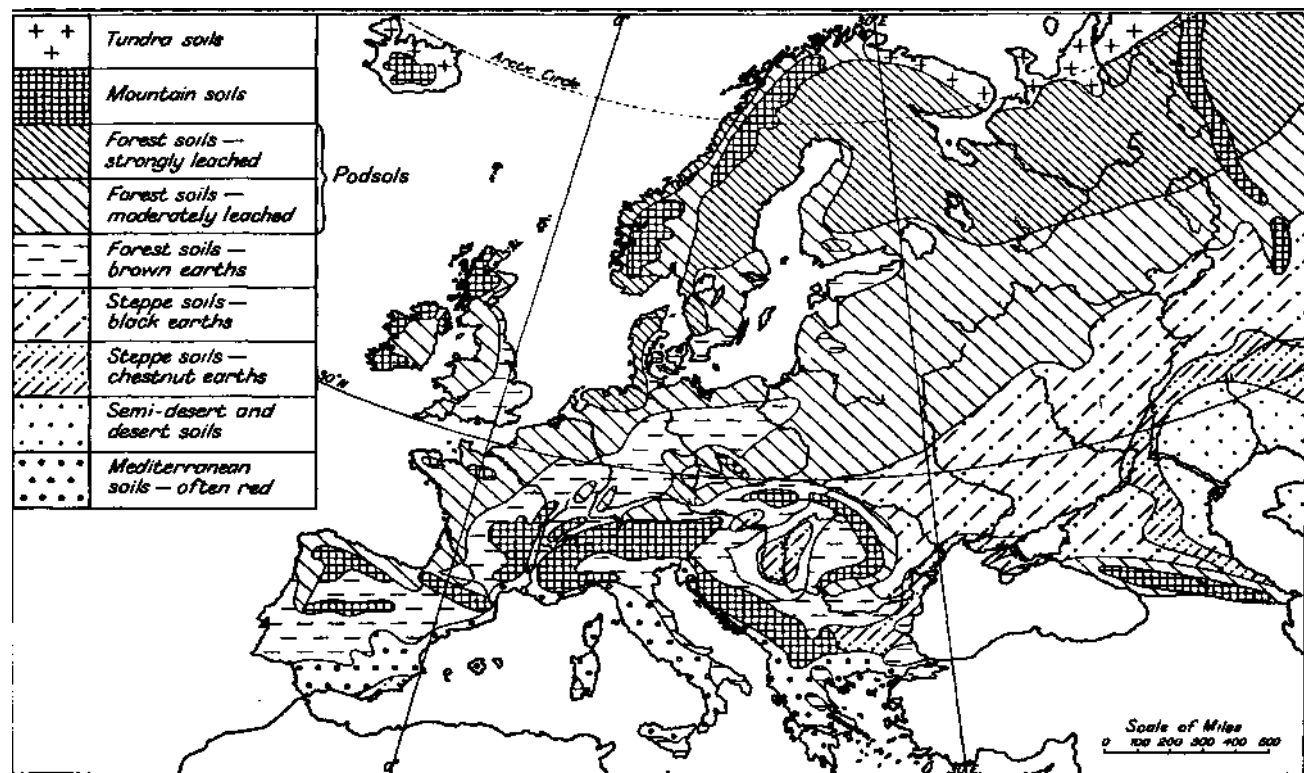


FIG. 17.—SOIL REGIONS OF EUROPE.

The Tundra Soils.—These soils of the far north are largely the result of their water-logged condition and the low temperatures. Evaporation is very slight and the subsoil is permanently frozen below a depth of 2 or 3 feet. Humus, the partially decomposed organic matter formed from plant residues, remains as a surface layer, for downward leaching is impossible, and the low temperatures hinder chemical or other changes ; peat is commonly formed.

It thus appears that an abundance or an excess of water is the main factor in determining the soil conditions in all the northern part of eastern Europe. In the south-eastern part, on the contrary, seasonal or permanent aridity is the controlling factor.

The Black Earths are the characteristic soils of most of the steppe areas, where they are known as chernozem. The black colour is due to a large proportion of humus in the upper horizon, which is usually about 3 feet in depth, and at the base of this there is an accumulation of calcium carbonate, before a transition to the parent material. This parent material is often, but not always, loess.

The humus is derived from the annual addition of vegetable matter from the grasses and herbaceous plants ; the decomposition remains incomplete, because it depends upon the activity of bacteria and other soil-organisms, which is limited, like that of the vegetation, by winter cold and summer drought.

Of great importance is the occurrence of rains and the melting of snow in spring followed in summer by heat and drought. In spring the calcium carbonate is washed down from the surface ; in summer the surface soil becomes dry, and by capillarity the water rises from below and brings up soluble matter, including calcium carbonate, which is then deposited as the water evaporates. There is thus an accumulation of the calcium carbonate at the base of the upper horizon—an indication of a balance in this black earth region between the downward leaching of the well-watered north and the upward movement which becomes most important in the arid south-east.

In the black earths there is an abundance of plant food, and cultivation is made easy by the crumbly structure of the humus-bearing layer ; consequently the black earths stand among the best of the world's soils from the point of view of fertility.

The Chestnut-coloured Soils.—On the northern side the

black earths pass through grades of greyness to the ashy soils of the forest regions ; on the south-eastern side they change to a light-brown, chestnut colour, since the dark humus decreases in amount as the plant-life from which it is derived becomes more scanty. Because of the increasing aridity there is still less leaching than in the black earths, and there is more calcium carbonate in the upper horizon. In themselves, these soils are nearly as valuable as the black earths, but the climate is not so propitious to agriculture.

It should be noted that the steppe soils, besides covering most of south-eastern Europe, are found in the middle Danubian lowlands and in other areas of central Europe too small to be shown on the map.

The Semi-desert and Desert Soils.—The marked aridity in the Caspian Depression continues the change just described, and the upper horizons of the soils progressively contain less humus and more calcium carbonate. Their colour changes through brown to grey, and their fertility decreases. In the most desert-like areas, blown sand is accumulated and even heaped up in dunes. Also, in some parts there appear upon the surface thin crusts, or efflorescences. These are formed by water from the occasional rains sinking some distance into the soil, which then again dries ; the water, after a period during which it dissolves the salts in the soil, works upward by capillarity and evaporates on the surface, where it leaves saline or alkaline deposits.

In these arid regions soil conditions combine with climate to make them inhospitable to man.

Brown Forest Earths.—From the point of view of the formation of productive soils, northern Russia suffers from an excess, and southern Russia from a deficit, of water ; the best balance occurs in the central Russian regions. A similar balance as regards the water-supply occurs in much of central and western Europe, and here it is associated with less severe temperature conditions than in the eastern part of the continent.

Consequently in these regions there is less leaching than in the case of the podsoles, while a greater activity of the soil organisms reduces the amount of humus as compared with that of the black earths. With a natural vegetation of deciduous forest, there is an annual leaf-fall which UNIVERSITY LIBRA

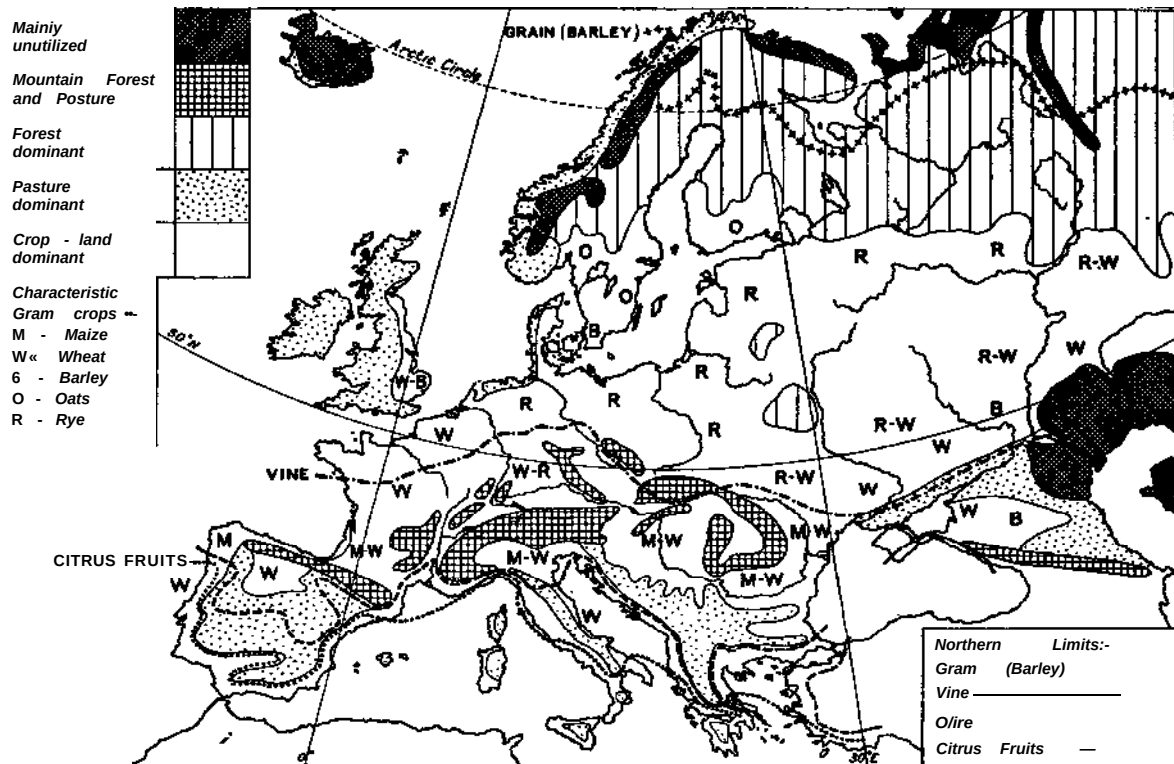


FIG. 18.—LAND-USE REGIONS OF EUROPE.

[Adapted from Jonasson.

the soils for cultivation, and their generally crumbly structure aids tillage.

This group of soils is a large one, and there are many differences in the colour and the other conditions, partly because with this "balanced" type of climate differences in the nature of the parent rock show themselves in the soils, as is well illustrated in the case of south-eastern England.

Moreover, since these soils are generally quite remunerative and have been worked by farmers for centuries, they have often been transformed from a natural to an artificial state.

Mediterranean Soils.—These are varied in character, but frequently have a reddish colour, and although they are often derived from limestone, they are typically fairly heavy clays; unfortunately soil science has not advanced far enough to reach an unquestioned explanation of their mode of origin. In several parts of the Mediterranean lands the red clays provide "oases" of cultivable land in otherwise almost barren limestone areas.

Mountain Soils.—Because of the low temperatures the weathering of the soils of mountain regions has been largely physical, and their development has not in general proceeded far. In the soils of areas above the forest limit there may be a humus layer, recalling that of the tundra, and below this a tendency to a podsol character shows itself. On the slopes there is usually only a thin covering of coarse rock fragments, while the finer material may be deposited as a deeper, and sometimes fertile, soil in the valleys.

LAND-USE AND CULTIVATION

The use that men make of the land depends partly on their desire for particular necessities and comforts, partly on their knowledge and equipment for obtaining these, and partly on natural conditions of climate, vegetation and soil.

Hence the map showing the main forms of land-use (see Fig. 18) shows certain broad similarities with the maps showing the climatic regions, the natural vegetation and the soil types.

Like those maps, that of land-use regions has had to be generalized, and the respective forms of utilization overlap considerably, but the following regions can be distinguished.

The "Mainly Unutilized" Areas.—In the cold north there are the tundra lands which offer practically nothing except a little pasturage for reindeer, the northern Urals and the parts of

the Scandinavian Mountains to which at best cattle may be driven for a few weeks in the year, and the greater part of Iceland, in which there are some areas of summer feeding for sheep. In the arid south-east of Europe there are only poor exclaves of the steppe-lands and small areas where irrigation is possible.

Dominant Forest areas are those of the coniferous forests in the broad belt of country forming the northern portions of Sweden, Finland and Russia. They are still mainly unbroken, although there are occasional clearings in which some agriculture and pastoral work are carried on. In the extreme north only vegetables can be grown, but in the remaining area barley, the grain crop which can ripen in the shortest vegetative period, is cultivated. . It should be noted that this grain is the " six-row " barley which is used for man's food ; it is an entirely different plant from the much more productive " two-row " barley which is grown in England mainly for malt, and in the south-west Baltic lands also as food for pigs. Farther south there are many " islands " of uncleared forest in the region marked on the map as dominant crop-land ; two of these are diagrammatically shown, one being the lake-studded area where Latvia, Lithuania and Russia adjoin, and the other the great Pripet Marshes.

Mountain Forest and Pasture.—These regions are the uplands and highlands of Central Europe and the Caucasus Mountains. In general, they are characterized by having deciduous forest with coniferous forest at higher levels, and then alpine pastures, and in some cases these are succeeded by culminating areas of bare rock and perpetual snow ; only in the valleys is cultivation possible. The use of the land varies from region to region, as will be explained in more detail in later chapters.

Dominant Pasture areas are those in which the main occupation of the people is the keeping of animals and in which a high proportion of the land is used for growing hay or for grazing, although there may be some crops grown either for fodder or for human use, and there may also be forests, moors or heaths. These largely pastoral areas fall into three main groups :

(i) Over much of north-western Europe, including the southern coast of Iceland, the climate is too wet for grain growing to be the most remunerative form of farming. In

Iceland sheep are reared ; in Britain both sheep and cattle are kept; in Norway, and in parts of the North Sea Lowlands, the keeping of cattle and the production of milk, butter and cheese are the main objects of farming. Grasses, clover and root crops are therefore grown and, as food for men, potatoes and oats—a grain which can ripen in relatively cool and wet summers.

(ii) In the Mediterranean region poor pasture has to a considerable extent superseded the forests of the uplands, while in parts woods of evergreen oak yield acorns as mast for animals. Not all the upland areas are used for pasture, however, for there are woods of cork oak, as well as of chestnut and other trees which yield their fruit. Sheep and goats are the animals most commonly kept, and in the Balkan Peninsula swine, too, are numerous. In the northern uplands of this peninsula, where the climate is not of the Mediterranean type, the forests have been so largely cut that even here pastoral work is now dominant ; cattle are relatively more important in these Balkan regions than in the other two southern peninsulas of Europe.

(iii) In the steppe-lands of south-eastern Europe the growing of crops gradually becomes less, and the work of the people becomes more restricted to the keeping of animals, towards the south-east. Cattle are reared in the rather better-watered part of the predominantly pastoral area around the Sea of Azov, and sheep mainly on the still drier country draining to the Caspian Sea.

Dominant Crop-land areas form the largest, as well as the most productive, group of agricultural regions of Europe. They are very varied in type, and one useful way of distinguishing them is according to the grain which is most commonly grown, although almost everywhere the keeping of animals is one aim of the farming, and generally vegetables are a product of considerable importance.

Grain Crops.—*Oats*, as stated above, form the characteristic crop over much of the pasture-lands of the north-west, and the crop-land in which they are predominant extends over southern Scandinavia to the lands north of the Gulf of Finland. Yet other grains, as well as root crops, are grown in the same area, and the two-rowed barley is particularly important in the region around the entry to the Baltic Sea. In eastern England, too, barley is largely grown, and here it rivals wheat as regards the amount of land devoted to it.

Rye.—The rye belt stretches from central Europe south of the North Sea and Baltic Sea across the middle of Russia as far as the Ural Mountains. Although rye requires a longer vegetative period than barley, and drier conditions for ripening than oats, it is a hardy grain and is largely grown on the inhospitable podsols of Russia and the glaciated areas of Germany and Poland. Rye bread has now been displaced by wheaten bread in western Europe, but it is still largely used in central Europe, and remains the staple food in the east. In Russia buckwheat and oats are also grown in the region in which rye is dominant.

Wheat.—The wheat zone is the most extensive, for its northern margin forms a great curve stretching from eastern England into central Europe and across Russia south of the rye belt, while it is largely grown in the warmer parts of central Europe and in the Mediterranean region. Thus wheat overlaps with barley in England, with rye in the Rhine-lands and in the black-earth areas of Russia, and with maize in the southern part of central and western Europe. Comparing the map of crop distributions in Fig. 18 with that of the duration of warmth in Fig. 11, it will be noticed that the northern part of the rye belt has a warm period lasting about four months, that of the wheat belt about five months and that of the maize belt over six months.

Yet the climatic conditions are, of course, by no means uniform over the whole range of wheat production of Europe, and the methods of cultivation consequently vary. In the west "winter wheat" is cultivated; that is to say, the grain is sown in autumn, remains dormant during the winter, grows as soon as the vegetative period begins in spring and is harvested in late summer. In the east the winters are too severe for this type of wheat, and "spring wheat" takes its place; though it is not sown until well in the spring, the hot summers allow a rapid growth and the harvest occurs rather late. In the Mediterranean region the wheat is sown in autumn, slowly continues its growth during the winter and ripens in the dry weather of the early summer.

On the map showing the crops, wheat is marked as the "characteristic" grain of certain regions, either with or without others indicated on this map, but it is almost always only one of several crops grown in rotation in successive years.

Maize.—In its climatic requirements this is the most exacting of the common grain crops of Europe, for it requires both con-

siderable heat and also a good supply of moisture ; hence it is grown in the parts of temperate Europe which have the warmest summers, but not commonly in the Mediterranean region nor in the eastern part of the steppe-lands, where there is a lack of rain in summer.

Barley.—Barley, and particularly the six-rowed varieties, can mature with little heat and with little moisture. Accordingly, barley is the marginal crop, not only in the cold north, but also in the dry south-east ; here and in the neighbouring parts of Asia it is the grain grown by the semi-nomadic peoples in the areas dividing " the desert " from " the sown."

Other Crops.—Space does not permit a separate comment on the distribution of all the other crops. Some are grown as food for men or animals, including grains such as rice, buckwheat and millet, potatoes, root crops, and vegetables of many other kinds. Other are " industrial " crops from which other products are obtained ; e.g. sugar-beet, flax and tobacco. Among these, the sugar-beet is largely grown over an area which almost coincides with the northern part of the wheat belt, that is, from eastern England across the north of France into Belgium and Germany, and thence across Poland and Czechoslovakia into the black-earth region of Russia. Flax is another important industrial plant, from which the fibre is used for manufacturing linen and the seed is crushed for oil and cattle - food. It has a fairly wide climatic range and is cultivated in districts as far apart as northern Ireland, and northern and southern Russia.

Fruits.—The northern part of the area shown as crop-land can allow the growth only of the more hardy kinds of fruit, notably apples and cherries ; in the central part appear others, such as pears and plums ; in the south there is an increasingly great variety. The northern limits of three fruits of considerable importance are drawn on the map. The vine is very widely cultivated, and the wine made from it is used both as a common drink in many of the vine-growing countries and for export as a luxury in cooler lands. It is significant that although the greatest amount of wine is produced in the Mediterranean region or on its margins, some of the most valuable kinds are obtained from near the northern limit of the vine, e.g. in Champagne in France and by the middle Rhine and its tributaries in Germany.

The olive, the most characteristic tree of lands with the Mediterranean type of climate, yields oil which is locally used to supply fat in the diet as butter is utilized in the cooler cattle-rearing countries. Citrus fruits, mainly oranges and lemons, need higher temperatures for ripening than generally occur in the northern part of the Mediterranean region ; therefore, although their limit is shown on the map to approach this margin in the Riviera district of the Gulf of Genoa, the yield here is neither so good nor so great as farther south. Indeed, the distribution of the citrus fruits indicates fairly well the extent of a " very warm," as distinct from a " warm," variety of the Mediterranean climate. As in the case of the other fruits of southern Europe, the oranges and lemons are grown partly for local use and partly for export, particularly to central and north-western Europe.

Besides citrus fruits, olives and grapes, many other fruits are cultivated in the Mediterranean region, e.g. apricots, peaches and edible nuts, such as almonds and walnuts.

So important is fruit growing, and so much of the work of the people is directly or indirectly bound up with it, that the area of the Mediterranean climate may almost be labelled as the fruit-growing region of Europe.

QUESTIONS

1. Describe the *transitions* between tundra, forest, steppe and desert in Russia.

2. Show how the natural vegetation is adapted to the climatic conditions of the " Mediterranean " region.

3. Give a description of the typical " black earth " of Russia, and account for its characteristics.

4. Distinguish between the various types of pastoral work in Europe, and give reasons for the differences.

5. To what extent, and in what ways, is the cultivation of wheat related to climatic conditions.

6. Explain how the differences between types of forest found in Europe are related to climatic differences.

7. Describe the nature and distribution of the podzols of Europe, and show how they are interrelated with both climate and natural vegetation.

8. Discuss the truth of the statement: "Natural vegetation regions are also regions of characteristic types of farming."

GEOGRAPHICAL REGIONS

IN the preceding chapters we have considered separately the most important factors in the geography of Europe, viz. relief and structure, climate, natural vegetation, soils and the use of the land ; in connexion with each of these factors a map has shown its special regions. Now, as geography concerns itself with the interaction of the various factors, we shall indicate regions, each of which has a character depending upon a special grouping and a special form of interaction of all the factors. These regions we call " geographical," preferring that term to " natural," which is likely to be regarded as equivalent to " physical," because here the human factors are also considered ; indeed, in some of these geographical regions man has very greatly modified, and even transformed, the natural conditions.

The geographical regions form definite and distinct environments of man, where people work in certain ways and in which they have developed characteristic modes of life ; in one sense, however, the regions are more than environments, for man himself is an essential element in them.

From the preceding chapters it will have become evident that climatic conditions occupy a pivotal position in this study of Europe ; in the first place, they depend upon the position and the relief of the constituent areas of the continent, and, secondly, climate very largely determines the natural vegetation, the soils and the use that is made of the land. Hence it is not surprising that the larger geographical regions correspond very closely with the climatic regions, as may be seen by comparing the maps in Figs. 15 and 19. That is true of the major geographical regions, but within these there are minor geographical regions which are distinguished from one another sometimes by minor climatic differences, and sometimes by other differences, particularly those of relief and structure.

Because the climatic conditions in the east and south of Europe extend over the adjoining parts of Asia and Africa, the major regions of eastern and southern Europe stretch far

beyond the limits of this continent; the map in Fig. 75 should be studied to see the relation between Europe and the other continents in this respect.

The Arctic Region.—The Arctic Region is primarily characterized by its cold climate, which has already been described, and it is to be noted that the region is considered as including both the tundra lands within the Arctic Circle and also the higher areas of the Scandinavian Highlands. When the minor regions of Arctic Europe are studied separately, the differences between these two parts must be taken into account. It may here be pointed out that the common climatic conditions of extremely long, cold and dark winters, with very short and cool summers, in both parts of the Arctic Region have resulted in similar conditions as regards the soil, which is wet in summer on the surface, but below this is permanently frozen. Consequently the natural vegetation is mainly of small growths, such as mosses, lichens and low shrubs, and man has been able to make little use of the region.

To the southern part of the Scandinavian Highlands cattle are driven in summer from the neighbouring lowland areas of Norway, while the northern part of these uplands and the tundra region are traversed by reindeer, which seek as food the sparse pastures of "reindeer moss," growing so slowly that it needs several years to form a fresh pasture after it has been cropped by a herd. The people who own the reindeer are necessarily nomadic and few in number; they retire in winter to the forest, where hunting is possible, and in summer advance to the coast, where fishing adds to their scanty resources. Since this region offers little which can be exchanged for the products of other regions, and since its position is so remote and the means of communication are so poor, there is very little contact with the rest of Europe, and the inhabitants live in a relatively primitive manner.

The Boreal Forest.—This is the region with the Boreal type of climate and with a natural vegetation cover of coniferous forest; the soils have been in general strongly leached and the surface is often swampy. Largely because of the unfavourable physical conditions, only small clearings have been made in the forests. This is most markedly the case in the east, where the winters are coldest and longest, and where the rivers, which offer the easiest routes, drain to the Arctic Sea. During the

winter the snow accumulates on the land, but with the rapid rise in temperature in spring it melts and floods the country; in this region the thaw occurs in the southern part while the lower courses of the northward-flowing rivers are still ice-bound. The inundations are therefore serious, and work on the land and traffic on the rivers are both delayed; the effective period of activity in summer is thus curtailed, and agriculture, pastoral work and trade are further handicapped.

In the north vegetables are the main crop; in the south barley is grown, and some oats and rye; some cattle, sheep and horses are reared, but the amount of farming is very small in relation to the great extent of the region. The maps in Figs. 18 and 19 show that only along parts of the southern margin have crop-lands extended into the Boreal Forest region.

In the main, forestry is still the characteristic occupation, and even this is largely limited to the southern part and to the neighbourhood of the rivers. Another resource is the hunting and trapping of the fur-bearing animals, though these have now been much reduced in numbers. With the exception of some towns situated on the rivers, and mostly either by the northern seas or near the southern margin, the settlements are small and widely scattered, and the population is scanty.

On the eastern margin of the region in Europe, the Hercynian block of the Urals yields mineral ores which have made possible industrial development.

The western part of the Boreal Forest region, in Finland and Sweden, is made more accessible by the existence of the Gulf of Bothnia, towards which the rivers drain; here there has been more development in connexion with all the resources of the lands and the waters. This is especially the case at the mouths of the rivers and around the coasts of the Gulf of Bothnia, where agriculture and pastoral work gain from some amelioration of the climate, and where the timber from the forests is worked up in saw mills and factories run by water-power from the streams. Moreover, in this western area the ancient rocks of the Baltic Shield emerge from below the sedimentary deposits of the Russian Platform; some minerals are obtained, and by the Gulf of Bothnia a little iron-working utilizes ore from inland mines. The population following these occupations is therefore more considerable in this narrow coastal belt than elsewhere in the Boreal Forest region.

The Sub-boreal Farmed Forest.—The more favourable conditions of the Sub-boreal climate region are reflected in the "mixed" character of the natural vegetation and the less thorough leaching of the soils. To these conditions is added greater accessibility from central Europe, whence came the greater developments in regard to the use of the land. Consequently the clearings have been more extensive than farther north, and now the region may be conveniently labelled "farmed



FIG. 19.—GEOGRAPHICAL REGIONS OF EUROPE.

forest." There are considerable areas of still virgin forest where timber is cut for export, but most of the region may be regarded as crop-land, oats and rye being the chief grain crops.

In the Baltic Shield area in Sweden there has been a development of mining and manufacturing, and around the shores of the Baltic Sea there have grown up a number of towns and cities dependent upon the agricultural and industrial occupations and the associated commerce. In the Russian area are the past and present capitals, Leningrad and Moscow, while industries and trade have grown up at a number of other large centres.

Yet in general the Sub-boreal Farmed Forest region is predominantly agricultural, and it is one of the less densely populated regions of the continent, with the exception of the Tundra, the Boreal Forest and the arid Caspian depression. The map of the geographical regions should be compared with that in Fig. 82, showing the density of population in Europe.

The Steppe Lands.—The steppe lands offer greater returns to agriculture than the forests situated north of them, because of their easier working and the greater fertility of their soils, especially in the belt of the black earth. The climate, too, is more favourable, with its longer summers and the higher temperatures in the growing season, except where the supply of water is scanty, as on the south-eastern margin. Although agriculture has only relatively recently superseded a primitive form of pastoral work, and although modern scientific methods of cultivation have still more recently been introduced, nevertheless this region has a wide range of products and is capable of giving high yields. This is particularly true in the western part of the steppe-lands, where the more valuable grains, maize and wheat, are grown in great amount, together with beet, flax and other industrial crops, and where the vine and other fruit trees are cultivated.

Towards the east the variety of products is reduced by the more extreme temperatures and the poorer supply of water; also the normal yield of the crops is less, and the keeping of animals is relatively more important than in the west. Moreover, the rainfall is more variable in the eastern steppe-lands and failure of the harvests is a serious menace. For these reasons, the population dependent upon agriculture is considerable in the west, but decreases greatly towards the east.

Mineral resources are associated with the two areas where the older rocks come to the surface in southern Russia. Within the eastward bend of the Dnieper the ancient rocks yield ores of iron and manganese, and where the river cuts through the resistant outcrop the rapids give enormous water-power, which is used for the production of electricity. In the Hercynian block of the Donetz region is a large coalfield which has also led to the growth of industries in southern Russia. There are oilfields on the margins of the Carpathians in the south-west, and of the Caucasus in the south-east, of the steppe-lands.

In spite of various drawbacks to navigation, the rivers, as

well as roads and railways, carry traffic through the steppe-lands between the Black Sea and the interior of Russia and Rumania.

With these varied resources and activities, the western part of the steppe-lands has much urban as well as rural development, and the density of population is greater than in any other part of eastern Europe. Indeed, the manner of life of the people is becoming similar to that of the central countries of the continent.

At its south-eastern margin, the region adjoins the Caucasus Mountains, which are geographically more closely related to the highlands of south-western Asia than to the neighbouring regions of Europe.

The Arid Caspian Lowland.—The low and irregular rainfall, the infertility of the soils, the lack of other resources and the remoteness of the position combine to make this extreme south-east of Europe a region of difficulty to man, and comparable in this respect with the extreme north-east of the continent. The lower valley of the Volga, with its port, Astrakhan, is the main exception to this rule.

The Mediterranean Lands.—To its position on the globe this region owes both its general climatic conditions of a mild, moist winter and a hot, dry summer, and also its general structural characteristics of fold-mountains enclosing sea-filled subsidence basins, as a result of which there are commonly narrow coastal lowlands rising rather steeply to hills or mountain ranges.

In the eastern part of the Mediterranean lands of Europe the climate tends to dryness and there is relatively little lowland ; here the growing of the characteristic fruits is one of the main occupations of the people, who have terraced the lower slopes for this purpose, while at higher levels there is little more than poor pasturage.

Around the western basin of the Mediterranean Sea and by the Atlantic coast in the same latitude, there is generally a better rainfall or better possibilities of irrigation, while there is also a greater area of lowland. Consequently there is a wider range of products, and grain and vegetables, in addition to fruits, are grown to a considerable extent.

The interior of the Iberian Peninsula is largely plateau, and while some higher ranges are well watered and bear a vegetation cover of woodland, much of the remainder tends to aridity

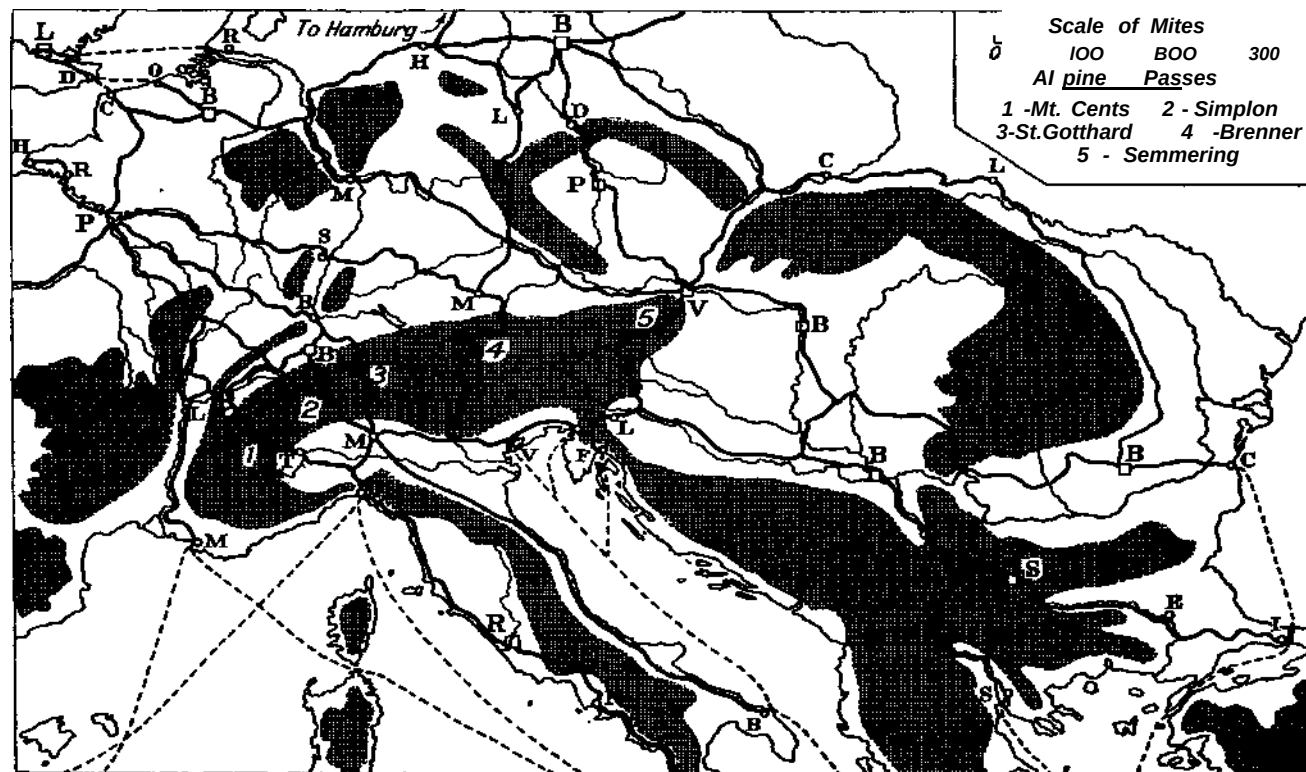


FIG. 20.—RAILWAY ROUTES AND COMMERCIAL CENTRES.

and is dependent upon an artificial water-supply for its utilization.

Coal deposits are lacking, and only in scattered areas are there other forms of mineral wealth, and in the Mediterranean region industrial development is mainly limited to certain ports at or near river-mouths.

The Mediterranean Sea and its extensions, the Adriatic, Ægean and Black Seas, give access from the ocean to a great part of southern Europe, and with the cutting of the Suez Canal the Mediterranean Sea links Europe with the Indian Ocean and the Far East. But the mountain-folds encircling the sea impede communications between the Mediterranean lands and those of the remaining part of the continent, and land traffic is restricted to a few breaks or passes in the mountain barriers ; hence in a few ports on the northern shores is concentrated a considerable amount of commerce, both in local products and in goods of wider origin. (The situation of the chief ports and their relation to the routes leading to central and north-western Europe is shown in the map in Fig. 20.) Trading is therefore important in certain parts of the Mediterranean region, and this occupation and the intensive agriculture and horticulture of the larger coastal lowlands have together given rise to some great cities and some areas of dense population.

Temperate Europe.—The region with a temperate climate is the only major geographical region which is entirely European, with the exception of the adjacent Sub-boreal Farmed Forest, for all the other major regions extend far beyond the limits of the continent. As shown on the map of Europe in Fig. 19, this temperate-climate region appears very extensive, but the map in Fig. 75 of the major regions of Europe and north-western Asia shows that its area is not remarkably great as compared with those which overlap the continents.

It has within it, however, such a variety of relief and structure that its constituent areas vary considerably, and no single descriptive label, such as " lowland " or " forest," would be applicable to it as a whole. It is, therefore, convenient to term it simply " Temperate Europe." The differences within it are so marked that it is necessary to divide it into three minor regions, as shown on the maps in Figs. 19 and 21, and these minor regions will now be separately considered.

The Atlantic Margins.—The characteristic feature of the

climate of Temperate Europe is the influence of oceanic winds during the whole year. This influence is particularly marked along the Atlantic Margins from the north of the Iberian Peninsula to the northernmost part of the continent, and throughout this extent it produces a very equable and rainy climate.

Also, along this marginal belt, the earth's crust has suffered dislocations which have resulted in the drowning of large areas and the upraising of most of the remainder, and hence the lands have a considerable elevation. Their altitude combines with the rainy character of the climate and the associated leaching of the soils to handicap agriculture. Forests, moors and heaths cover the highland and upland areas, and the relatively small areas of lowland are mainly given over to grass ; with the rather higher temperatures of the southern part, however, there is more cultivation.

There are scattered deposits of minerals, but only the coal of the British portion has served as the basis of manufacturing to any extent. Elsewhere, besides farming the chief resource is fishing, for the region is too remote from the busier districts of the continent for trading to be important. Hence the population is, with small exceptions, rather scanty. Even in Britain, as was explained in Volume I of this series, the Atlantic Margins differ markedly from the English Lowland, which belongs to the next minor region.

The Developed Lowlands and Wooded Uplands.—The map of climate regions in Fig. 15 shows that within this minor region there are modifications in the climate, particularly noticeable in an approach to extreme conditions towards the east. Moreover, a relief map shows that, apart from the Alps, there are in Central Europe considerable upland areas which are high enough to have distinctly cooler and wetter conditions than the adjoining lowlands ; these uplands areas are indicated also on the map of structural regions in Fig. 1 as belonging to the Hercynian group or as due to foldings of the Alpine type.

Putting these facts together, it will be seen that this minor region of Temperate Europe comprises (a) lowlands of sedimentary material, and (b) uplands of generally older and more resistant rock, and that each of these groups is composed of a number of relatively small areas with climatic differences corresponding to their respective positions (see Fig. 21).

The former group is here labelled as " developed lowlands,"

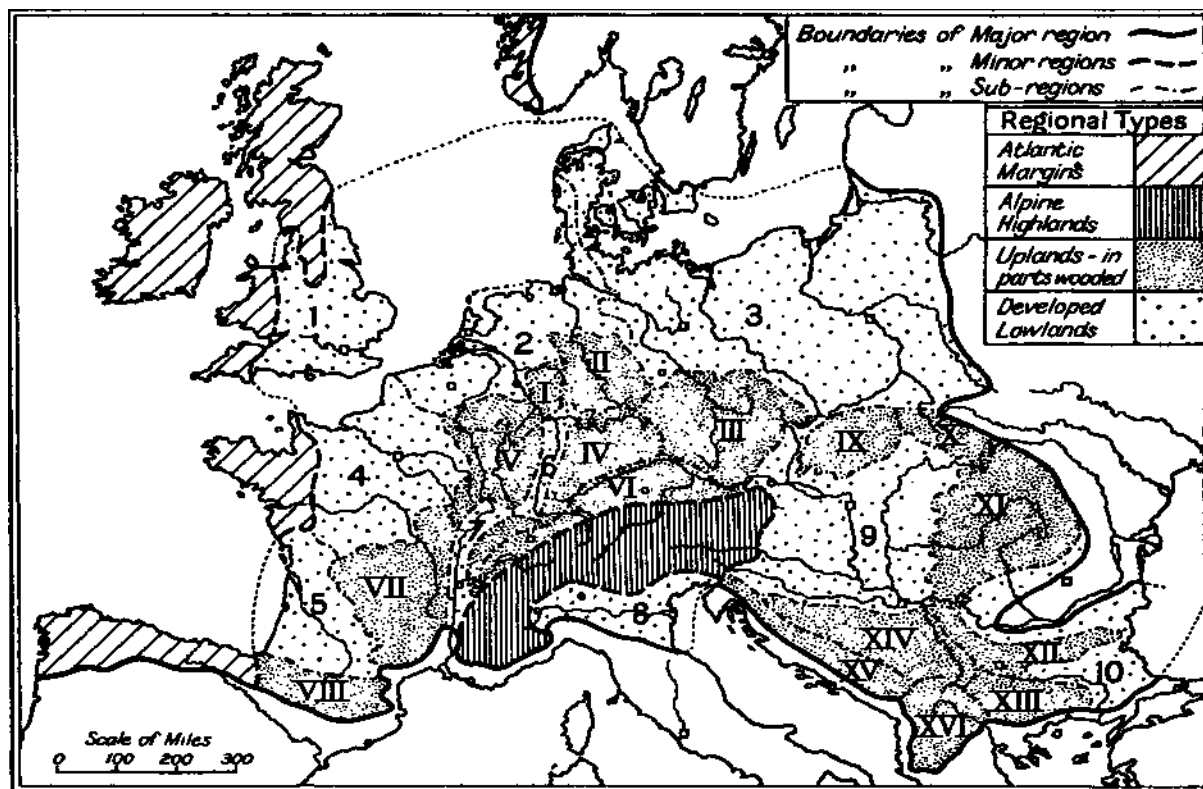


FIG. 21.—REGIONAL TYPES OF TEMPERATE EUROPE.

because their resources have been very thoroughly exploited and in them a number of districts have been largely transformed by human agency. In general, the climate and soil favoured early settlement, and for centuries men have used and improved the natural conditions, while even less-favoured parts, such as the marsh areas near the delta of the Rhine, have for various reasons also attracted settlers, who have converted them into productive lands.

Practically the whole of the lowlands are farmed, and much of the area is cultivated in an intensive manner, with a high yield as well as a great variety of products. According to the varying climatic conditions, rye, barley, wheat and maize are characteristic in different localities, generally associated in a rotation with other grains, industrial crops or fodder crops. Pastoral work in many parts is carried on in its most remunerative form, viz. dairy farming, to meet the needs of large urban populations. Minerals, too, have been exploited where they exist, particularly where coalfields dip down from the Hercynian Uplands under the margins of the lowlands, and some of the greatest and most densely populated industrial regions of the world have grown up in these lowlands.

The "drowning" of the continental margin has brought the sea far into the region, and from much of the interior of Europe the rivers bring traffic to the English Channel, the North Sea and the Baltic Sea. Because of the great amount of manufactured goods produced in the region, and the need of the dense populations for raw materials and food, commerce has developed here as in few other parts of the world and many important trade routes meet in the lowlands, as is shown in Fig. 20; there are also great ports, especially near the mouths of the rivers on the continental and English shores of the North Sea. Manufacturing and trading have thus led to immense urban development in the more northerly of the lowlands, viz. the English Lowland (numbered 1 on the map in Fig. 21), the North Sea Lowlands (2), the South-West Baltic Lowlands (3), and the North French Lowland (4).

On the other hand, some of the more southerly regions have more favourable climatic conditions and give a greater return to agriculture, as is exemplified in the Basin of Aquitaine in France (5), the Rhine Rift Valley (6), the Rh6ne-Sa6ne Trough (7) and the North Italian Plain (8). On the eastern side a lack

of rain may be a handicap in the Middle Danubian Lowlands (9), while a transition to steppe-like conditions is observed in the drier South-eastern Lowlands (10), which include the Walachian Hill-lands and the East Balkan Lowlands.

Each of these ten areas has sufficient unity within it, and sufficient difference from its neighbours, to be regarded as a distinct sub-region of the " Developed Lowlands and Wooded Uplands " of Temperate Europe.

The uplands of Temperate Europe, with their cooler and wetter weather, are less suited to crop growing ; they have considerable areas given to pasturage, but their characteristic vegetation-cover is forest. There is quite a variety of trees, and forestry is one of the chief occupations. The minerals, which in a number of districts first attracted settlers, have in several cases been largely worked out, and only relatively small industries are based upon them. Trade naturally avoids the higher areas (again see Fig. 20), and because of these combined conditions, the uplands are, in general, the homes of much smaller populations than the lowlands.

These uplands form a number of distinct sub-regions, which may be grouped according to their position. The Central Uplands of Europe comprise the Rhine Plateau (marked I in Fig. 21), the Weser-Saale Hill Country (II), the Bohemian Diamond and its margins (III), the East Rhine Scarp-lands (IV), the West Rhine Scarp-lands (V), the Jura Mountains and the Alpine Foreland (VI). In western Europe are the Central Plateau of France (VII) and the Pyrenees (VIII). On the eastern side are the three Carpathian sub-regions (IX, X and XI), and five more constitute a great part of the Balkan Peninsula (XII—XVI).

The Alpine Lands.—The great differences in elevation make it difficult to summarize the characteristics even of this relatively small minor region. It may be briefly said that the valleys provide sites for settlement, and offer opportunities of farming and other occupations which support the comparatively small numbers of inhabitants, while through some of the valleys pass routes connecting central and north-western Europe with the Mediterranean region. At higher altitudes forests supply timber, and still higher are summer pastures to which animals and people migrate for a few months. Above this habitable zone, dwarf shrubs, low cushion-like growths, lichens and other forms of alpine flora appear in summer and recall, in the heart of

Temperate Europe, the plant-life of the Arctic Region ; in the highest zone of all, only steep slopes and culminating peaks of bare rock emerge from snow-fields.

Peninsular and Trunk Europe.—We may regard Peninsular Europe as that part of the continent which adjoins the Atlantic Ocean and has been given peninsular form by the penetration of the North and Baltic Seas on the north and the Mediterranean Sea on the south. It may be broadly limited eastward by a line drawn through the Gulf of Bothnia and the Baltic Sea to near the mouth of the Niemen (Memel) River where Temperate Europe adjoins the Sub-boreal Farmed Forest Region, and thence the limit approximately follows the boundary of Temperate Europe to near the delta of the Danube.

By such a division, both Peninsular and Trunk Europe include portions of several geographical regions, but the former is more open to maritime and western influences, while the latter has a continental and eastern orientation. The physical causes of the differences have now been shown ; corresponding contrasts in the human geography of the two areas will be brought out in several sections of the next chapter.

QUESTIONS

1. Define the limits of the " Arctic " region of Europe, and show how the geographical factors within it interact with one another.

2. What justification is there for regarding the Boreal Forest region as a geographical unit ?

3. Describe the common characteristics of the Mediterranean geographical region, apart from its climate.

4. Discuss whether it would be better to incorporate the region here termed " Sub-boreal Farmed Forest " into one or more of the neighbouring regions.

5. Consider whether the areas marked as " Atlantic Margins " should be distinguished as a separate minor region of " Temperate Europe."

6. It is difficult to find short names which well denote geographical regions. Discuss, and suggest alternatives to, two names adopted here for major regions, which seem rather unsatisfactory.

7. Discuss the possibility of dividing Europe simply into two great regions, " Peninsular " and " Trunk," on the basis of their general character.

THE PEOPLES OF EUROPE

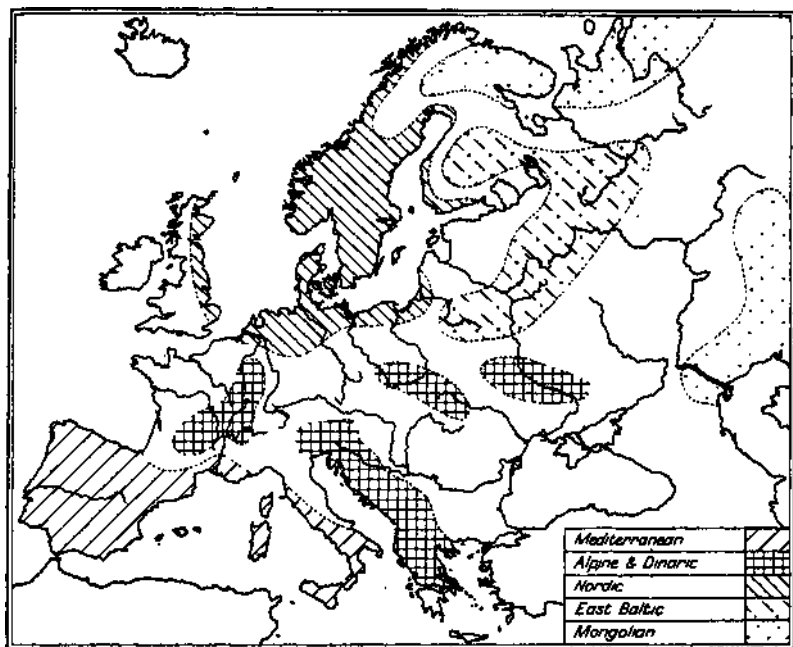
IN the preceding chapters the people who live in the various parts of the continent have been referred to mainly in relation to their respective environments ; we will now consider the peoples themselves.

The Racial Elements.—The physical characters of people are fundamentally determined by their descent, being handed down from generation to generation, and are therefore taken as indications of the race to which people belong. It is important to restrict the term " race " to groups of people who have in common a number of physical characters due to a more or less common ancestry, and never to use the term to denote groups who, although speaking the same language, or having the same religion, or being members of the same political State, nevertheless differ from one another physically because they have a mixed ancestry.

Anthropologists classify the greater part of mankind into three main racial or ethnic groups, distinguished from one another by the structure of the hair and the colour of the skin. These three groups are : (i) that of the negroes with woolly hair and black or very dark skin ; (ii) that represented by the Chinese and other Mongolians with straight, lank hair and yellowish skin ; (iii) the group to which the peoples of Europe mainly belong, with wavy or curly, yet smooth and not woolly hair, and with skins which are more or less white or light brown.

Among the Europeans, the various shades of skin colour are often, but by no means always, associated with the colour of the hair and eyes : a fair skin is in many cases accompanied by light-brown or even yellow hair and by blue or grey eyes, while the rather darker-skinned people commonly have dark-brown eyes and black hair. These contrasts between fair and dark are very clearly seen by comparing the typical Scandinavians showing the former characters with the inhabitants of southern Italy showing the latter, and they are so marked that they are taken as indicating distinct racial or ethnic stocks, to which the terms

"Nordic" and "Mediterranean" are respectively applied. People belonging to the Nordic type constitute a considerable proportion of the inhabitants of the northern plains of Europe west of Russia, and those of the Mediterranean type form a majority of the population of the western Mediterranean lands (see Fig. 22). Between them, in the highlands and uplands of Central Europe, most of the people have an intermediate



After Giinther.

• FIG. 22.—DISTRIBUTION OF PREDOMINATING RACIAL TYPES.

Note.—The shaded areas are those in which the respective racial types are common. In the intervening areas the mingling is so great that no type can be regarded as characteristic.

grade of coloration with chestnut-brown to black hair, and hazel-grey to brown eyes. Moreover, the people of the Nordic stock are generally tall, those of the Mediterranean stock are relatively short, while those of the central uplands and highlands are of medium height.

Yet these intermediate conditions of coloration and stature do not result from a mixing of the other two racial stocks, for they are commonly associated with a quite different shape of the head. Both the Nordic and the Mediterranean stocks are

characterized by " long " heads, that is, the length of the skull from front to back is markedly greater than the breadth from side to side, whereas the inhabitants of the central uplands and highlands usually have rather broader heads. Hence the peoples here are representatives of another racial stock, and to these people the name " Alpine " is applied.

Closely associated with these Alpine peoples are another group who are also broad-skulled, but do not resemble them in appearance, for they have a greater stature, a more slender figure and a longer face. They are numerous in the coastlands north-east of the Adriatic Sea, and for that reason this group is known as " Dinaric " or " Illyrian." Judging by the physical criteria, members of this stock spread northwards and now form one of the important racial elements in the plains of Silesia and south Poland.

The three ethnic groups—Mediterranean, Alpine-Dinaric and Nordic—together comprise the greater part of the population of Europe, and it is therefore commonly stated that there exist these three European races.

The ancestors of these groups worked their way into Europe thousands of years ago, displacing or mingling with the scattered hunting peoples who had occupied the south of the continent during the Ice Age and had moved northward as the climate improved and the ice retreated.

Of the three main races, the Mediterranean stock peoples were the first comers. It was probably before 4000 B.C. that they settled on the warm and fertile shores of the great sea ; there they had opportunities for growing grain and fruit, and for extending westward in Europe the civilization which had arisen in Egypt, Mesopotamia and the lands around the eastern part of the Mediterranean. In course of time they passed around the Iberian Peninsula to the Atlantic coasts, and thus reached the west of France and the British Isles (see Fig. 23).

Later, when climatic conditions in central Europe had become more favourable, the Alpine peoples migrated from Asia Minor and extended their settlements along the uplands and the neighbouring lowlands drained by the Danube. The loess areas of central Europe, fertile and free from forest, favoured the agriculture and pastoral work upon which they depended. They gradually worked their way westward into the valleys of the Alps and over the upland areas of what are now southern

and central Germany, Belgium and central France. The related Dinaric peoples followed those of the Alpine stock by much the same routes through the Balkan Peninsula and into central Europe, but they did not penetrate so far westward.

At a very much later date one branch of the Alpine stock spread from the Carpathian region into the adjoining plains to the north and east which now form part of Poland and Russia. These peoples are known as Slavs, and their descendants form a considerable proportion of the Russian people. A further migration southward gave rise to another group, the South Slavs or Yugoslavs, who occupied much of the Balkan Peninsula.

The ancestors of the Nordic peoples seem to have entered Europe after the Mediterranean and Alpine immigrants; originally pastoralists, they migrated across the plains of southern Russia, and eventually settled in the lands around the Baltic Sea.

Associated with the greater stature of the Nordics is usually greater physical strength than that of the peoples of the other stocks, and this doubtless helped them, at a much later date, to spread southwards and, in many instances, to conquer other peoples and to occupy parts of western, central and even southern Europe. For example, there were the settlements in Britain by the Angles, Saxons, Jutes and Norsemen, the incursions of the Goths into the Balkan Peninsula and Italy, and the penetration by the Vandals into the Iberian Peninsula and even into northern Africa.

Besides these peoples who have been so long established in this continent that they are regarded as truly "European," there are others whose origins are more recently Asiatic, and who are related to the Mongolian races of Asia. The Samoyeds have migrated from Asia into the northern forests and tundra of Russia, and the Lapps have spread even into the north of Scandinavia. They belong to the Ugrian racial group, who are characterized by broad heads and rather short stature, and often have a flat face and prominent cheek-bones ; the slanting eyes which are shown most strikingly among the Chinese and Japanese appear among the Samoyeds, and occasionally among the Lapps.

Allied to the Ugrian folk are the Finnish group of peoples who had earlier worked their way across the Ural Mountains into

northern Europe, and now occupy the greater part of Finland and the adjoining region of Karelia across the Russian border. Yet the Finns of the present day do not show the characteristic Mongolian features to the same degree as the Lapps or the Samoyeds, probably because the original Finnish immigrants here settled in an already populated area. It frequently happens that a group of intruders may dominate an area and intermarry with the inhabitants, upon whom they impose their name,

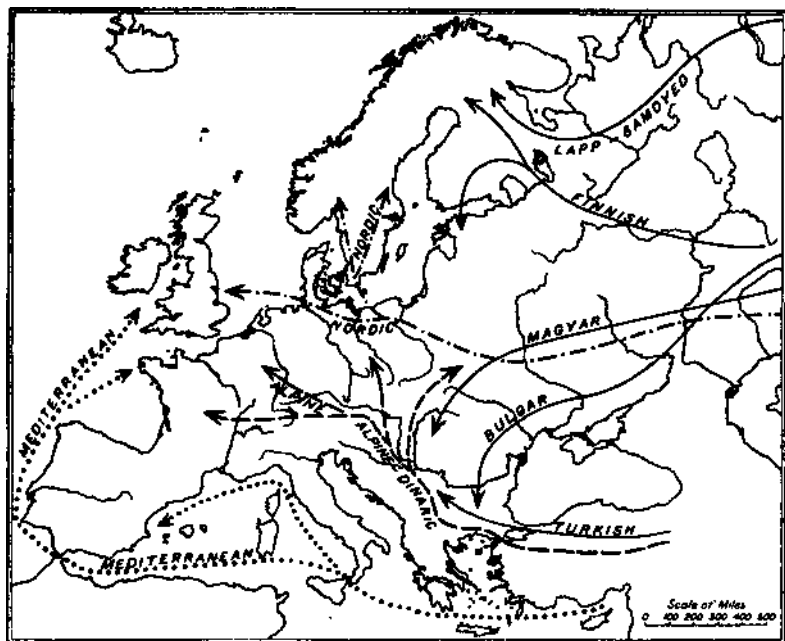


FIG. 23.—RACIAL MIGRATIONS INTO EUROPE.

language and traditions ; yet, if these subject people are relatively numerous, in the course of generations the blood of the dominating group becomes progressively diluted, as it were*. Hence, anthropologists are frequently faced with the fact that the name and speech of a people suggest one origin, and their physical features another. In the case of Finland it is certain that, in spite of the absence of Mongolian features, some of the ancestors of the present Finns migrated from northern Asia.

South of the Gulf of Finland are the Ests or Esths of Estonia, who are closely related to their Finnish neighbours. Moreover, in all the East Baltic region there are many individuals of a

type which seems to have resulted from a mingling of stocks of northern Asiatic and Nordic origin. These people are regarded as having by now been welded into a distinct ethnic sub-group, called East Baltic (see Fig. 22), and they form part of the population of a very wide area extending into Prussia on the west, Russia on the east, Finland on the north, and Latvia, Lithuania and Poland on the south.

Rather more recent immigrants from Asia of definitely Mongolian origin and speaking Ugrian languages came by a more southerly route along the steppe-lands. The Bulgars were nomadic horsemen, who in the seventh century A.D. crossed the lower Danube, conquered the Slav inhabitants and gave their name to Bulgaria. But though their name and some of the traditions of the invaders have survived, the language of the Bulgarians is now in the main Slavonic, and the people show little of the original physical characters of the immigrants.

A century or two later, other Asiatic tribes swept across the steppes, and some of these worked their way across the Carpathian Mountains into the Pannonian or Hungarian Basin. One group of these invaders spoke a language which was compounded of two Asiatic elements, the Ugrian and the Turki; the people of this speech were the Magyars, and the present inhabitants of Hungary still retain the name Magyars and speak the Magyar language, though their physical appearance shows that they have altered but little the predominating Alpine stock of the Slavs whom they conquered.

At about the same time that south-eastern Europe was thus invaded, the Moors of northern Africa crossed into the Iberian Peninsula and for a time ruled much of that region; yet they did not make great changes in the racial composition or the language of the people of the Peninsula, and the results of their occupation will be referred to in later sections.

The last of the great invasions was that of the Turks, i.e. tribes speaking a Turki language; they came from central Asia, and one group, the Osmanli Turks, overran Asia Minor, occupied Constantinople in A.D. 1453, and forced themselves as masters upon the people of the Balkan Peninsula. But throughout their long and victorious advance, they freely intermarried with their subjects, and accepted as "Turks" many who adopted their Moslem religion. Thus the Turkish State known as the Ottoman Empire spread from south-western Asia over much

of the Balkan Peninsula, and imposed its rule upon that region, but, nevertheless, the Balkan peoples still remained mainly of Alpine, Dinaric or Mediterranean descent and retained Slavonic, Albanian or Greek languages.

Other movements of peoples have occurred, some of which must be referred to in the next section in connexion with the spread of languages, but it may already be realized that the contacts and conflicts of the various migrant peoples have resulted in a mingling of the population in such a way that few districts show a uniformity of type.

Languages.—To use the words "Aryan race" for the Nordic ethnic group is doubly misleading, for in the first place the word Aryan applies only to languages, and in the second place it denotes a widespread group spoken by the great majority of Europeans (see Fig. 24). The Aryan languages have extended over almost the whole of the continent of Europe and through south-western Asia into India. Hence they are also known as Indo-Germanic, though they include not only the German or Teutonic family of languages, but also Greek, the Romance languages which have derived from Latin, the Slavonic family and the Celtic languages, as well as others spoken by some of the smaller communities.

Although in some areas, as in Wales, two languages exist side by side and many individuals may speak both, it is nevertheless possible to show the broad distribution on a map. This is done in a generalized form in Fig. 24, and in more detail for the central part of Europe in the end-paper map within the back cover of this book.

It is not possible to say what were the languages of the earliest folk who came into Europe; only the later movements of people, during historical times, can be definitely associated with the spread of the present-day languages.

By the generally westward migrations of conquering tribes the pre-Aryan languages became extinct, the one striking exception being the Basque speech, which has survived in the mountainous borderland of South-western France and Northern Spain. With the language there have remained old customs and traditions, and even a feeling of a distinct nationality among the Basque folk; nevertheless, the physical characteristics of the people do not show a uniformity of racial origin.

Another early language which has survived in the west of

Europe is the Celtic tongue. It is a member of the Aryan group carried across Europe in successive waves of settlement about 1000 years B.C. by folk probably of mixed descent ; later these people were themselves displaced or forced to adopt the languages, Teutonic or Romance, of other conquerors. Hence Celtic is now found, in several varieties, only in the peninsulas and islands of the Atlantic Margins in Brittany, Wales, north-western Scotland and Ireland.

The Greek language is spoken in the southern part of the Balkan Peninsula, and on the islands of the *Mgesm* Sea and Krete.

The Romance languages have a very wide distribution, for their spread resulted from the great extension of the Roman Empire. Italian is most directly derived from Latin, and is now spoken in the Italian Peninsula, the islands of Sicily and Sardinia, the North Italian Plain and some of the coast-lands north-east of the Adriatic ; it is also spoken in the part of Switzerland which projects southward to the edge of the North Italian Plain between Lakes Maggiore and Como.

East of Lake Como there are several small areas of the Alps in which the inhabitants of the mountain valleys speak distinct Romance dialects : Romansch or Rhaetic, Ladin and Friulian,

In the Iberian Peninsula, apart from Basque, are several languages belonging to the Romance family. The difference between them may be related to the invasion by the Moors, who at one time occupied all the Peninsula except the northern mountain regions, where the Christians held out and whence they reconquered the land. One line of reconquest spread the dialect of the north-west corner, Galicia, southward along the Atlantic region, thus leading to the growth of a distinctive language in all this western part of the Peninsula. Later, most of this area formed the independent State of Portugal, in which evolved the present Portuguese language. Hence the Galicians, or Gallegos, speak a dialect akin to Portuguese and markedly different from the Spanish language.

Spain was mainly reconquered from the north by way of the plateaus of Castile ; the Castilian rulers gradually extended their power over the whole of Spain, and thus Castilian became the standard form of the Spanish language.

In the north-east of the Peninsula the defeat of the Moors allowed the return to Spain of refugees from France who brought

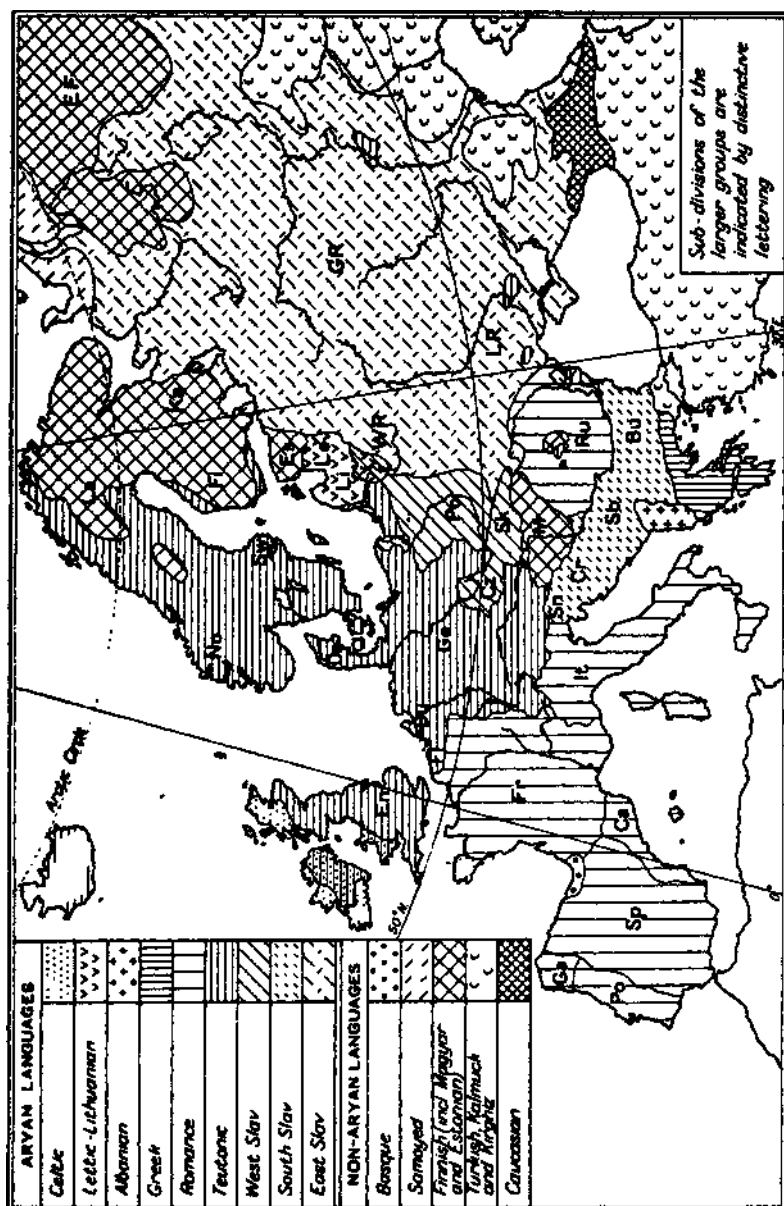


FIG. 24.—DISTRIBUTION OF LANGUAGES.

with them a dialect of the " Languedoc " spoken in the south of that country and akin to the modern French dialect Provençal; in eastern Spain this language became Catalan, and has spread to the Balearic Islands. In Catalonia, the north-eastern part of the Iberian Peninsula, the Catalan language has developed a considerable literature, and the distinctive language, traditions and literature have made the Catalonian people conscious of possessing a unity among themselves, and differing from the other peoples of the Peninsula.

The extent of the French language does not coincide with the territory of the French State, for while on the west Breton is spoken together with French, on the east the boundaries of the language and of the State diverge at several points. This is especially the case in three areas : (i) where the French speech extends into Switzerland, being spoken by about one-fifth of the population of that country ; (ii) where German-speaking peoples live in French territory in Alsace and Lorraine ; (iii) where French is the language of the Walloon people who form the population of the southern part of Belgium, viz. south of a line running approximately from east to west a little south of Brussels.

Rumanian is derived from the Roman language, as is clearly suggested by the native spelling of the name of the country—" Romania." It has been handed down from the provincials of this north-eastern outpost of the Roman Empire, but it has been greatly modified by the Slav-speaking and other peoples who have since then occupied the country. In most other parts of the eastern portion of the Roman Empire in Europe the later invaders have imposed their Slavonic speech, with the exception of Greece and Albania. In the latter mountainous country the Albanian language appears to be a survival of a primitive Aryan tongue.

The Teutonic family of languages probably had its home among the Nordic folk living in the plains around the west of the Baltic Sea and the south-east of the North Sea ; thence settlements and conquests in all directions led to the development of distinct Teutonic languages among peoples of varied origin. In the north there are the Scandinavian languages, of which Danish and Norwegian are almost identical; Swedish is closely related to the other two.

The English language is based in the main upon the speech

of the Teutonic invaders, modified by Romance elements introduced as a result of the Norman conquest. Other westward migrations of Germanic peoples have resulted in the development of the Dutch language in Holland and of Flemish in Belgium. This latter language is very closely akin to Dutch ; it is spoken by the Flemings, who form rather more than half the population of Belgium and occupy the part of the country north of the Walloon area.

Southward the Teutonic languages have had a wide extension over lands in which the people show relatively little influence of Nordic stock, i.e. from the racial point of view. German is spoken not only throughout Germany, but also beyond its borders in the Alsace-Lorraine portion of France, over the greater part of Switzerland, and in the upper Adige basin in Italy (see the end-paper map).

Eastward and south-eastward are " islands " of German speech, some of which are due to past wars between the Teutonic and Slav peoples. The Teutonic Knights won back East Prussia from Slavonic invaders and dominated the country now forming the States of Estonia and Latvia. In Poland, too, there are many German communities bearing witness to a similar ebb and flow of conquest. German settlers also went far into south-eastern Europe—into the Danubian plains and the upland basins and valleys of Transylvania, and even into the steppe-lands of Russia.

The Lithuanian and Latvian (or Lettish) languages, like the peoples of those countries, have a mixed origin. They are alike, and are regarded as a survival of an archaic Aryan type ; in each country the ancient tongue has been modified by the introduction of Slavonic and other elements.

The Slav languages have spread over the greater part of east-central and eastern Europe. There is the western group, including Polish and the closely related Czech and Slovak languages. There is the southern group, which includes Slovene, Croat and Serbian spoken by the three peoples who form the bulk of the population of the Yugoslav State. Bulgarian is another of the South Slav group of languages.

The widest extension of the Slavonic-speaking peoples has been eastward into the previously scantily occupied forests and steppe-lands of Trunk Europe. Of the East Slav languages " Great Russian " is the standard literary form, and is spoken

by the vast majority of the Russian people ; " White Russian " approximates to Polish, as its geographical distribution would suggest; " Little Russian " is the language of the Ukraine. The word " Ukraine " means borderland, and here the Russians had to oppose, and in course of time were to some extent influenced by, the invading horsemen from the Asiatic steppes ; consequently the Ukrainians developed differences from the Great Russians in several respects, and now Little Russian or Ukrainian is claimed to be a distinct literary language.

Lastly, there are non-Aryan languages of relatively recent introduction from Asia. In northern Europe, in addition to the speech of the relatively few Samoyeds, there is the Finnish group ; in the north-east are people speaking East Finnish dialects, while the West Finnish languages are spoken by the Karelians, the Lapps and the Finns themselves. These last people have developed the Finnish language proper and created a Finnish literature. Another west Finnish speech has spread southwards across the Gulf of Finland and has there become the Estonian language.

Magyar belongs to the same Finno-Ugrian family, although it has been carried into distant regions and imposed upon other peoples ; hence the Magyar speech of Hungary and Transylvania contains quite different elements from those of the Finnish group.

Of the other " Asiatic " languages, Turkish is now spoken by few people beyond the borders of the Turkish State, and the allied tongues of the Kirghiz, Kalmucks and other peoples of the south-eastern margins of Europe are giving way before the advance of Russian colonization and government. In the Caucasus and Transcaucasia there are spoken various non-Aryan Caucasian languages.

It will be observed that while Peninsular Europe has been influenced by many language developments and their associated forms of culture, Trunk Europe has seen the extension only of the Eastern Slav and the relatively late Asiatic groups of languages.

Religions.—It would be out of place here to attempt to state the faiths of the various religions or the effects they have upon individual people, but the religions have a geographical significance because the churches into which they are organized have had effects upon political, social and economic affairs, while their distribution is related to geographical conditions.

Christianity was adopted as the creed of the Roman Empire, and its spread was influenced by the extent of that power, but Christian missionaries carried even beyond the Empire both their faith and also such advances as reading and writing, better methods of cultivating the land, and various handicrafts ; hence the spread of religious ideas was often marked by a spread of other forms of culture.

Because the Roman power extended over a great part of western Europe the allied religious and cultural influences had more effect in transforming the lives of the " barbarians " in the west than was the case in the east of the continent, and these influences were one factor in bringing about the greater development in knowledge, in arts and sciences, in forms of government, and in economic matters, which long characterized western as compared with eastern Europe.

In the eleventh century the Christian Church was permanently split into two portions : in the east was the Greek or " Orthodox " Church ruled from Byzantium (now Istanbul), and in the west was the " Catholic " Church ruled from Rome. From the original home of European civilization in the Mediterranean region the line separating the areas influenced respectively by the Roman and Orthodox Churches runs from the head of the Adriatic Sea first north-eastward and the northward to the Arctic Sea, as can be seen from the map in Fig. 25.

In the east of Europe the influence of Christianity was greatly weakened by exposure to the attacks of Asiatic intruders. In the Balkan Peninsula the Turkish occupation resulted in a widespread adoption of the Mohammedan religion, and although the Turkish rule has been withdrawn from nearly all the region, nevertheless the people of parts of Yugoslavia and Bulgaria and of most of Albania remain Mohammedan. Here, in south-eastern Europe, the tall minarets of the mosques give an " oriental " appearance to the villages and towns, and from their summits the muezzins call the people to prayer. The Moslem women are still veiled, and the men still wear the round, tasselled fez, although in Turkey itself these distinctive marks of the Mohammedan religion are banned in order to avoid religious animosities between the different sections of the Turkish population.

Farther to the north-east, over most of Trunk Europe, the spread of religious and cultural influences was hindered by geo-

graphical conditions, for between the Mediterranean region and the homes of the early Russians in the clearings of the "farmed forest" region lay the steppe-lands; along these open lands passed wave after wave of nomadic invasion from Asia, which prevented effective contact between north and south. For the many centuries before the Russians dominated the steppe-lands, the advances made over the rest of Europe could reach the

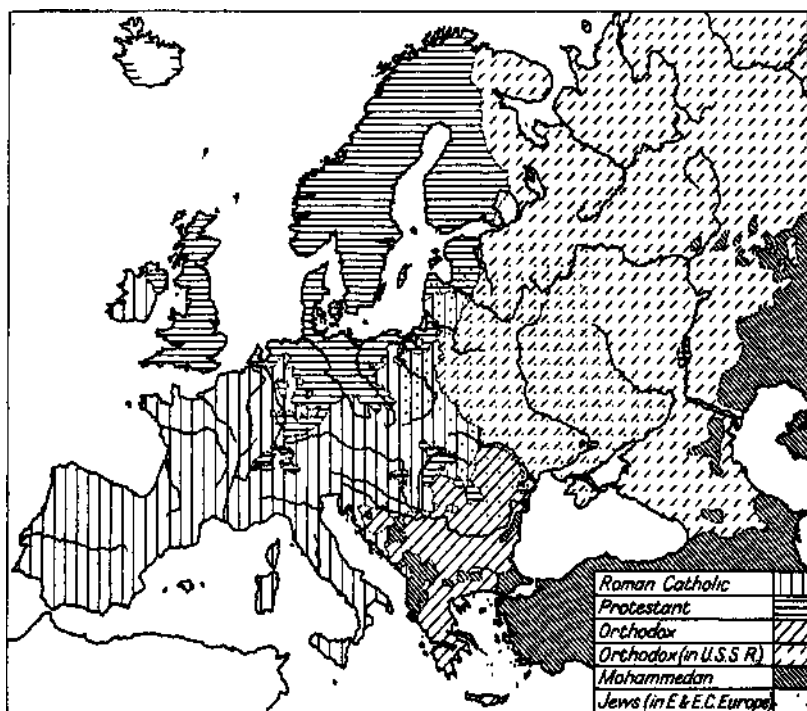


FIG. 25.—DISTRIBUTION OF RELIGIONS.

Russians only by a roundabout route through the Baltic Lands. This retardation is an important factor in explaining the differences between the peoples of Peninsular and Trunk Europe respectively.

The Orthodox faith at last spread over most of Russia and had a great influence for several centuries, but after the revolution of 1917 the new Government was so hostile to the Christian religion that now it is held, as a rule, only by people of the older generation who were brought up in that faith.

Yet one effect of its previous power is shown by the fact that here, as in the other countries in which some form of the Orthodox religion exists, the present alphabet is based upon the ancient Greek alphabet; on the other hand, in the countries to which the Roman Church extended the Latin alphabet is used, even though the language is not of the Romance family. The exception to this rule is Rumania, where the religion is Orthodox, but the Roman characters are used.

Yugoslavia illustrates the influence which religious differences may have on political conditions. The three peoples comprising the majority of the population are the Serbs, Croats and Slovenes, and, as stated in the preceding section, they speak similar languages, but while the Serbs are in the main of the Orthodox faith and have an alphabet derived from Greek, the Croats and Slovenes are Roman Catholic and use the Latin alphabet. These differences add to the difficulty of welding the three groups into one harmonious and firmly knit State.

After the close of the Middle Ages, a number of the States of northern Europe broke away from the Roman Catholic Church, and several Protestant Churches were formed; in determining the distribution of these new Churches the political power of the princes of that time was a greater factor than geographical conditions, and although the religious differences had very important consequences two or three centuries ago, they now count for less when one region is compared with another.

Separate reference must be made to the Jews as a religious community. Although a proportion of the Jews show a facial resemblance by an aquiline nose with a depressed tip and wide nostrils (characteristic of an " Armenoid " ethnic group related to the Alpine race), they have a very mixed racial origin. They have a language of their own—Yiddish—a blend of Hebrew and German elements, but they also speak the languages of the countries in which they have settled. The essential bonds between them are their religion and the traditions associated with it, and their feeling of difference between themselves and other peoples has been greatly intensified in several countries by their being forced into living apart from others. The map shows that they are relatively numerous in the transitional region between eastern and central Europe; here they are largely town-dwellers, engaged in trade, and are not easily

assimilated into States which are mainly composed of peasants. In all Europe, the Jews number nearly 8 millions.

Nationalities.—When a considerable group of people have lived together in one area and feel themselves to be bound by common ties to the extent that they wish to form a Government of their own, they may be said to constitute a "nationality." The ties that unite the members of a nationality are various : belief in a common racial origin (whether this belief is justified by scientific knowledge or not) ; the use of a common language and the enjoyment of a common literature; sharing of a religion ; living in one political state ; association in defence against enemies. Any one or more of these factors may be powerful in creating a feeling of national unity, but any one or more may be lacking among the members of a nationality. Perhaps the most usual indication of a feeling of national unity is the possession of a common language, for this is the result of long association and helps intercourse between those speaking it ; hence the map showing the language of Europe is, as a whole, useful as showing the nationalities of Europe. There are, however, some marked discrepancies ; e.g. the Swiss people certainly form a definite nationality, for they feel among themselves a unity which demands that they form a State independent of any other, yet among them are spoken four official languages—German, French, Italian and Romansch.

If a nationality is able to form a self-governing State, it is fortunate ; if it cannot, it may become a minority within some State in which it is held against its will, and in that case its discontent may be a danger to peace.

Political States.—A State is an association of persons living under one Government and inhabiting a definite territory. The reasons for the existence and extent of a particular State are generally complicated and reach far back into history ; it is clear from what has already been written that the members of a State are not necessarily bound by all the ties which have been discussed, though a feeling of a common nationality usually unites a considerable proportion of the subjects of a State. In the case of Switzerland we have an example of a State coinciding exactly with a nationality, but the Russian Empire as it was in the early part of the present century comprised a number of different nationalities.

It is important to consider the relation of States to geo-



FIG 26 —STATE BOUNDARIES BEFORE AND AFTER THE WAR OF 1914-18.

Note.—The various shadings show the extent of the States before the war of 1914-18; the thick In 1938 Germany incorporated Austria and the north-western margins of Czechoslovakia, and smaller areas of Czechoslovakia were lost to Hungary and Poland.

graphical conditions, and an examination of a map of the political units in Europe shows that they seldom bear any close relationship to natural or geographical regions (see the end-paper map at the front of this book). Indeed, there is a strong tendency to the contrary, for a State may be tempted, if an opportunity arises, to make itself stronger by extending its territory into a region which is of a different type and possesses resources which it has hitherto lacked. A desire to be self-sufficing, or to secure access to trade-routes by which commodities can be secured from abroad, has in many instances been a factor in advancing the frontiers of States across regions of contrasting geographical character.

For this reason, political frontiers seldom coincide with the boundaries of geographical regions, although well-marked natural features, such as rivers or water-sheds, maybe adopted as convenient and definite limits of States ; this is particularly the case when such a frontier offers a useful means of defence.

The difference between geographical and political units is brought out still more clearly when one thinks of the great and sudden changes which the States of Europe have undergone during the last few hundred years : old ones have disappeared, new ones have been formed, and others have expanded or shrunk to various degrees. In the last quarter of the nineteenth century—during the lifetime of many people now living—the Balkan States were carved out of the former Ottoman or Turkish Empire. In the present century, the political map of a broad belt running from north to south of the continent, and overlapping Peninsular Europe on the west and Trunk Europe on the east, has been completely transformed. There is no certainty that political conditions are yet stable in Europe, particularly in this " belt of political change."

The present-day geography has been greatly affected by the alterations brought about by the war of 1914-18; these are shown in Fig. 26. Particular attention must be drawn to the break-up of what were two of the greatest States of Europe before 1914, viz. the " Dual Monarchy " of Austria-Hungary, in which the Austrian Empire and the Kingdom of Hungary were united under one sovereign, and the Russian Empire. Under the strain of war, these great Powers fell to pieces, and several of the nationalities which had been unwillingly included obtained independence.

In the case of Russia, the Finns, Ests, Letts and Lithuanians set up the new States of Finland, and the three "Baltic States" of Estonia, Latvia and Lithuania, and the Poles of Russia united with those of Austria and Germany to re-create an older State of Poland.

Over most of the remaining part of Russia, after a period of revolution, there was formed the "Union of Soviet Socialist Republics" (U.S.S.R.), comprising eleven republics, which may be arranged in four groups on a geographical basis, (i) The "Russian Soviet Federated Socialist Republic" includes the greater part of European Russia, and all the northern and eastern portion of Asiatic Russia; it is the predominant partner in the Union, and at its capital, Moscow, is centred much of the administration of the whole of the Russian territories, (ii) The White Russian Republic (capital Minsk) and the Ukrainian Republic (capital Kiev) make up the remaining portion of Russia in Europe (see the map of eastern Europe in Chapter 17). (iii) The three republics of Georgia, Azerbaijan and Armenia together form the Russian territory of Transcaucasia, (iv) Across the Caspian Sea, in the south of Asiatic Russia, is another group—the Turkmen, Uzbek, Tadzhik and Kirghiz republics.

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When the Austro-Hungarian Monarchy fell to pieces, the hitherto subjected Czechs and Slovaks formed the new State of Czechoslovakia in the north, the Slovenes and Croats united with Serbia and Montenegro to form Yugoslavia in the south, the Rumanians of Transylvania were united to those of independent Rumania across the Carpathians. Thus the previously dominant peoples, the Austrians and the Magyars of Hungary, shorn even of parts of lands they themselves occupied, were left in 1919 to constitute the new small States of Austria and Hungary. Nineteen years later, in 1938, Austria was taken into the German Realm, "Deutsches Reich," and became one of the provinces of Germany.

In thinking of the relation between natural and political units, it must be borne in mind that States may have considerable influence on the geographical conditions of the regions they include, and in particular they may modify economic activities. Thus, in later sections of this book instances will be given of the way in which traffic may be diverted from natural routes because of political frontiers. Here special mention must be

made of the policy of "self-sufficiency" adopted very widely after the war of 1914-18.

With a desire to help their own subjects, and often to assure within their boundaries supplies of food and of materials and armaments which would be required for warfare, many Governments adopted measures such as giving bounties to the producers of particular commodities, and erecting "tariff walls" around their territories; by this latter method duties had to be paid when certain goods passed the Customs barriers at the ports or along the frontiers, and thus such goods were prevented either partially or entirely from entering the country. By such means States have stimulated certain forms of production at the expense of others, and have thus modified the natural economic development of the regions they comprise.

QUESTIONS

1. How can the "race" of peoples, as related to their descent from a common stock, be determined? Illustrate by reference to the Nordic race.

2. What is the "Mediterranean race"? Why is it so called, and in what ways might the term be misleading?

3. What are the Romance languages? Give an account of their spread in southern and western Europe.

4. To what extent does the extension of the German language correspond to the distribution of people of Nordic race?

5. Which peoples may be termed "Slavs"? Give reasons for your decisions, and comment upon any doubtful cases.

6. Magyars and Finns may be grouped together as regards their language. To what extent are they alike (a) in their speech, and (b) in other respects?

7. The Roman Catholic and Orthodox faiths have a markedly contrasted distribution over much of Europe. How is this distribution related, either as cause or effect, to geographical conditions?

8. Show how the entry of Mohammedanism into Europe was connected with the physical geography, and how it has affected the human geography.

9. Distinguish between (1) "language group," (2) "nationality," and (3) "State," quoting examples from Europe.

10. Discuss what truth, if any, there is in the statement that the people of European Russia are more Asiatic than European.

PART II

THE REGIONS

CHAPTER VI

THE NORTH SEA LOWLANDS

THE traveller from England to the Continent, crossing the Strait of Dover towards Calais, sees before him the chalk cliffs of France which are the counterpart of the North Downs. As he nears the coast, however, he observes that his boat passes to the east of the chalk country and approaches a low shore which stretches eastward as far as the eye can see.

Calais marks the beginning of a great lowland region, which forms the north-eastern corner of France and extends behind the North Sea through Belgium, Holland and northern Germany, and along the western side of Denmark (see Fig. 30).

With occasional breaks there is a coastal strip of dunes, and this has behind it a belt of natural marsh-lands, much of which is now transformed into polders, interrupted by shallow inlets of the sea. Behind the marsh-lands is a rather higher area, partly sandy country to which the term "geest" is applied, and partly fertile agricultural plains or low plateaus. Near the uplands of central Europe which form the boundary of the lowlands occur coal deposits, and associated with the mining of the coal are important industrial areas (compare the map in Fig. 80 with the section in Fig. 27). Thus the whole of the North Sea Lowlands region is composed of a series of belts running in a general south-west to north-east direction as far as the south-eastern angle of the North Sea; here, in the peninsula of Jutland, the coastal belts change their direction and run from south to north, while the belt of fertile plains is no longer to be observed, but gives place to another type of country near the Baltic Sea. The North Sea Lowlands region has characteristics marking it off from the neighbouring areas, and it may therefore be regarded as one of the sub-regions of the "Developed Lowlands and Wooded Uplands" of Temperate Europe (marked "2" in Fig. 21).

The surface conditions of the region are in the main due to its position on the south-eastern margin of the shallow depression now invaded by the waters of the North Sea. To this depression rivers drain through the North Sea Lowlands from all the surrounding regions: the Schelde (Scheldt or Escaut) and its tributary the Lys from the scarp-lands of northern France; the Meuse (Maas), the Rhine and the Weser from the Central Uplands of Europe; the Elbe from the South-west Baltic Lowlands and the Central Uplands. Consequently these rivers deposit alluvium in the marsh-lands of this lowland. The sea, too, plays its part in the building up of the coast; strong tidal currents drag sand eastwards along the shores, and the prevailing and occasionally stormy westerly winds heap it up to form the belt of dunes.

In the past, however, conditions have been different, particu-

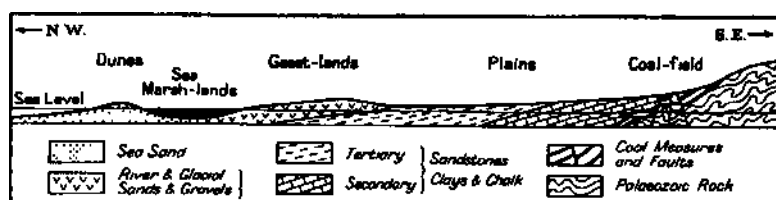


FIG. 27.—DIAGRAMMATIC SECTION THROUGH NORTH SEA LOWLANDS.

larly because of changes in the relative levels of land and sea. During parts of the Secondary and Tertiary Eras, the sea covered much of the region, and beneath its waters were laid down marine clays and sands, and in parts even chalk, which now constitute the fertile interior plains. In the later part of the Tertiary Era, moreover, the rivers accomplished much more work than they do at present: they deeply dissected the uplands to the south, and with the eroded material they built up the huge accumulations of sand and gravel which form much of the geest type of country.

Oscillations of level have characterized also the later geological history of the region. Thus at the close of the Ice Age the land was relatively higher, and the present area of the North Sea was above the sea-level. Since then, however, there has been a general rising of the sea-level, and in early historical times the waters had advanced to the line indicated by the islands and dunes on the outer edge of the present coast. Here

was a continuous line of dunes behind which lay marshes broken only by one great lake in the Zuider Zee hollow. These marshes were gradually drained and occupied by men, but Nature has worked against them: the alluvium tends to consolidate and settle down, and very possibly a relative sinking of the land occurred, and in consequence in the Middle Ages the sea broke in; moreover, wars caused the neglect or destruction of the defences, and altogether some thousands of square miles were lost. In modern times the work of protection has been resumed, and now, in spite of occasional and local floodings, the struggle goes in favour of man.

The position of the region determines its climate, which is broadly similar to that of eastern England, although its continental situation gives it rather colder winters, particularly in its eastern portion (compare the temperature statistics for London and Brussels, given in the table on p. 26). Consequently, the farming possibilities of the North Sea Lowlands are in general like those of eastern England, and differences in production are due largely to soil or economic conditions. We will now consider in turn each type of country constituting this region.

The Dune-lands.—The sand is least in amount in the French and Belgian part of the region, where the available material is mainly that which has been driven through the Strait of Dover, but becomes far more abundant by accumulation towards the east. Moreover, the dunes are highest and broadest where a stretch of north-to-south coast directly faces the westerly winds, as in Holland and in Denmark. The line is, however, broken at areas of relative depression, and channels are kept clear where the currents due to the high tides of the region sweep up and down the entrances to the great rivers.

Where the sand-dunes form a protection against the flooding of the marsh-lands, they have been strengthened by the planting of grass, shrubs or trees and by the construction of groins. Upon the dunes have been built fishing villages and health resorts, e.g. Scheveningen near The Hague in Holland, and Ostend in Belgium; the latter town is also a port with rapid communication across the North Sea to England. Similar ports, but with much more traffic, are Calais, which has the shortest crossing, and Dunkirk (Dunkerque), for these are the French outlets of the industrial area which depends on the coalfield of north-eastern

France. Farther east are " out-ports " at the entrances to the great rivers, e.g. in Holland are Flushing by the *Sehelde*, and the Hook of Holland by the Rhine.

In Germany, the dune-lands are represented only by the Frisian Islands, but in the Danish part of Jutland they again form part of the mainland. Here has been constructed the port of Esbjerg, connected by railway with the east of the country in order to facilitate the rapid transit of its dairy produce, especially to England,

Throughout their extent, the dune-lands are of similar origin and characteristics, and they therefore constitute a distinctive though small region, to which we give the term " tract." It must be observed, however, that this tract is not continuous, as most others are, because it is broken by the waters ; it may therefore be regarded as a " discontinuous tract."

The Marsh-lands.—Behind the line of dunes and islands, the shallows are constantly covered by water only over a relatively small extent. There are other areas, particularly marked behind the various Frisian islands, which are mud-flats at low tide, but water-covered at high tide. These are known as *watten* or *wadden*; they may be regarded as land in the making, and the natural deposition of mud and sand is aided by fences built out from the land, the resultant accumulation being used for summer grazing as soon as it is covered by vegetation.

The Sea-marshes.—Much more work has been required to form the polder-lands. Near the coast are the sea-marshes, which in Holland are even below the mean sea-level, and everywhere are liable to inundation at high tide or in times of storm ; farther inland are the river-marshes, which, though well above sea-level, need protection from flooded streams.

Reclamation of the sea-marshes is still going on. The *Zuider Zee* (the name " South Sea " was given by Frisian fishermen) is now shut off by a dyke across its mouth, and four polders with a total area of about 800 square miles are being formed on its margins, the water area being limited to a central " IJssel Lake " fed by the waters of the IJssel distributary of the Rhine, as shown by the broken lines in Fig. 30.

The utilization of the polder-land varies partly according to the nature of the soils, sometimes clayey and sometimes sandy, and partly according to the traditions of the people or the economic demands of the neighbouring regions. In the small

strip of the French marsh-lands behind Calais and Dunkirk there is intensive cultivation of industrial crops, mainly beet, flax and chicory, which is associated with the manufacture of their products, sugar, linen and chicory ; wheat and barley are also grown. In the Belgian strip similar crops are produced, though cattle-rearing assumes some importance. In the broader polder-land region of Holland, there are again the cereal and industrial crops, but pastoral work predominates, and butter, cheese and milk are the main objects of the farming.



[Netherlands Information Bureau.

FIG. 28.—VIEW NEAR HAARLEM.

Note.—The polder-land has been adapted for the cultivation of bulbs by drainage (note the canal), and by making the clay lighter by mixing sand from the pine-clad dunes shown in the background.

In Holland are two areas of special character. In a narrow strip behind the dunes near Haarlem the sand has been mixed with the muds and clays of the marsh-lands to produce a soil exceptionally well adapted to the cultivation of flowers. The horticultural industry, like several others, began when the Netherlanders were one of the foremost maritime peoples of Europe ; tulips, hyacinths and other plants were brought from the East, and centuries of experience and organization have made the growing and export of many kinds of bulbs, flowers, shrubs and fruit an important occupation. The proximity of the port

of Rotterdam, with its rapid communications, has been a significant factor, and now a neighbouring aerodrome offers still quicker facilities for transport.

Farther south, the shelter of the dunes allowed woods to grow in past centuries, and here the counts of Holland had a hunting-box. This became their residence and was called " s'Graven - hage "—"the Counts' Hedge," in its English form, The Hague ; it has now grown into a city of nearly half a million inhabitants, for it is the capital of Holland, and is also the seat of the International Court of Justice.

In Germany the marsh-land again narrows to a belt bordering the coast and the estuaries of the Ems, the Weser and the Elbe, while in Denmark it is not quite continuous but appears as areas surrounding lagoons. (These lagoons are known as Fjords, but like the neighbouring Lim Fjord, they are shallow depressions quite unlike the Fjords of Norway.) In the eastern part of the North Sea marsh-lands cattle rearing is the main occupation, and supports a less dense population than the more intensive farming common in the central and western polder-lands.

The River Marsh-lands.—Although lying above sea-level, these areas are subject to inundation by the rivers ; in some parts they have needed reclamation, but in other parts they require only protection by dykes from occasional floods. These floods generally occur in winter, for most of the rivers have a " regime " in which the flow of water is greatest in the winter season, after the relatively heavy rainfall of autumn and when the run-off into the streams is least reduced by evaporation and the demands of the plant-covering of the land. The Rhine has a more uniform regime than that of the other rivers, for its headwaters come from the Alps, where the melting of the snow in the upper part of its basin provides additional water in summer; consequently, the main stream brings down a summer supply which balances the winter maximum of the tributaries of the middle and lower parts of the basin, which are dependent upon the rainfall.

Parts of the river flood-plains are used for tillage similar to that of the sea-marshes ; elsewhere are long stretches of grassland, absolutely flat with their uniformity broken only by the dykes ; here villages and even houses are rare.

Waterways and Ports.—Much of the importance of the North Sea Lowlands region is due to the rivers which direct into it-

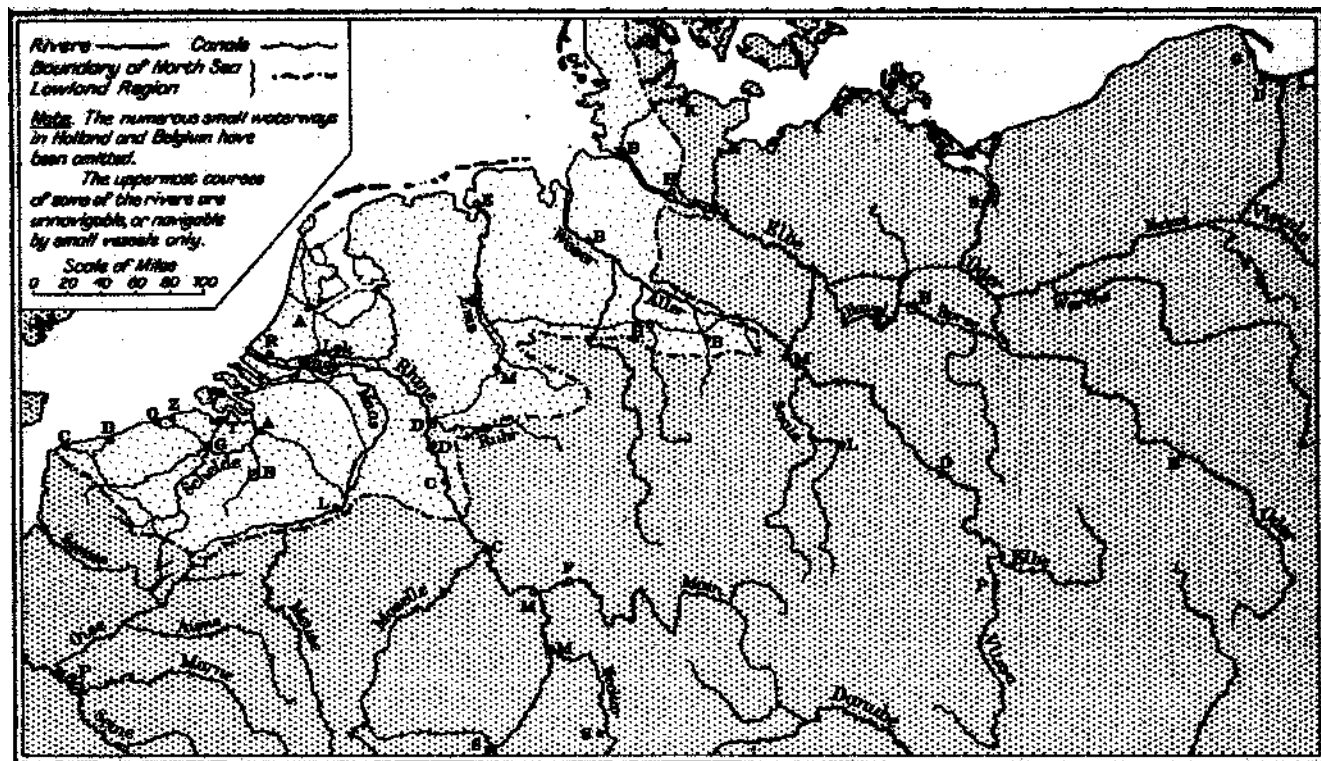


FIG. 29.—WATERWAYS LEADING TO THE NORTH SEA LOWLANDS.

communications from and to a great part of central Europe ; consequently, at or near the mouths of these rivers have grown up several great ports which make the region by far the most important commercial area of the continent of Europe (see Fig. 30). Moreover, most of these ports have been developed at points on the waterways where higher land forming suitable sites for settlement adjoins the marshes ; these sites are mainly at the inner margin of the marshes on the geest lands or the fertile plains, but at the western end of the region they are at the outer margin adjoining the dunes.

The greatest of the ports is Hamburg, on the Elbe estuary, which brings ocean liners 70 miles inland from the North Sea, Fig. 29 shows that while the main stream gives communication with the industrial areas of Saxony and of Bohemia in the Central Uplands region, the Havel tributary leads from the Spree and Berlin ; also a system of canals links the Elbe to the other great rivers of Germany and Poland in the south-west Baltic region. Moreover, a little above Hamburg the Elbe-Trave Canal leads to Liibeck on the Trave, and from Brunsbiittel, near the mouth of the Elbe, the Nord-ostsee (i.e. North-Baltic Sea) Canal leads to Kiel and carries most of the traffic between the various Baltic Sea ports and the outer world.

With such a large hinterland, Hamburg has an amount of trade which makes it rank with London and New York as one of the greatest ports of the world. Its imports consist of all kinds of commodities, while its exports are mainly of manufactured goods ; shipbuilding has developed, and also manufacturing in many forms, particularly the working up of imported materials* Consequently, the conurbation which includes Hamburg and Altona on the north bank of the river, and Harburg on the opposite side, is one of the largest in Germany, and numbers nearly one and a half millions.

Bremen, on the Weser, is nearly as far from the sea as Hamburg ; it is in the river-marsh area, and its trade is chiefly remarkable in that it is the greatest tobacco market in the world ; its population is more than a quarter of a million. At the mouth of the Ems is Emden, but this port is of comparatively little importance, although the river is joined to the Ruhr industrial area by the Dortmund-Ems Canal ; the traffic of the Ruhr region mainly goes by the Rhine to the chief markets and the sources of raw material.

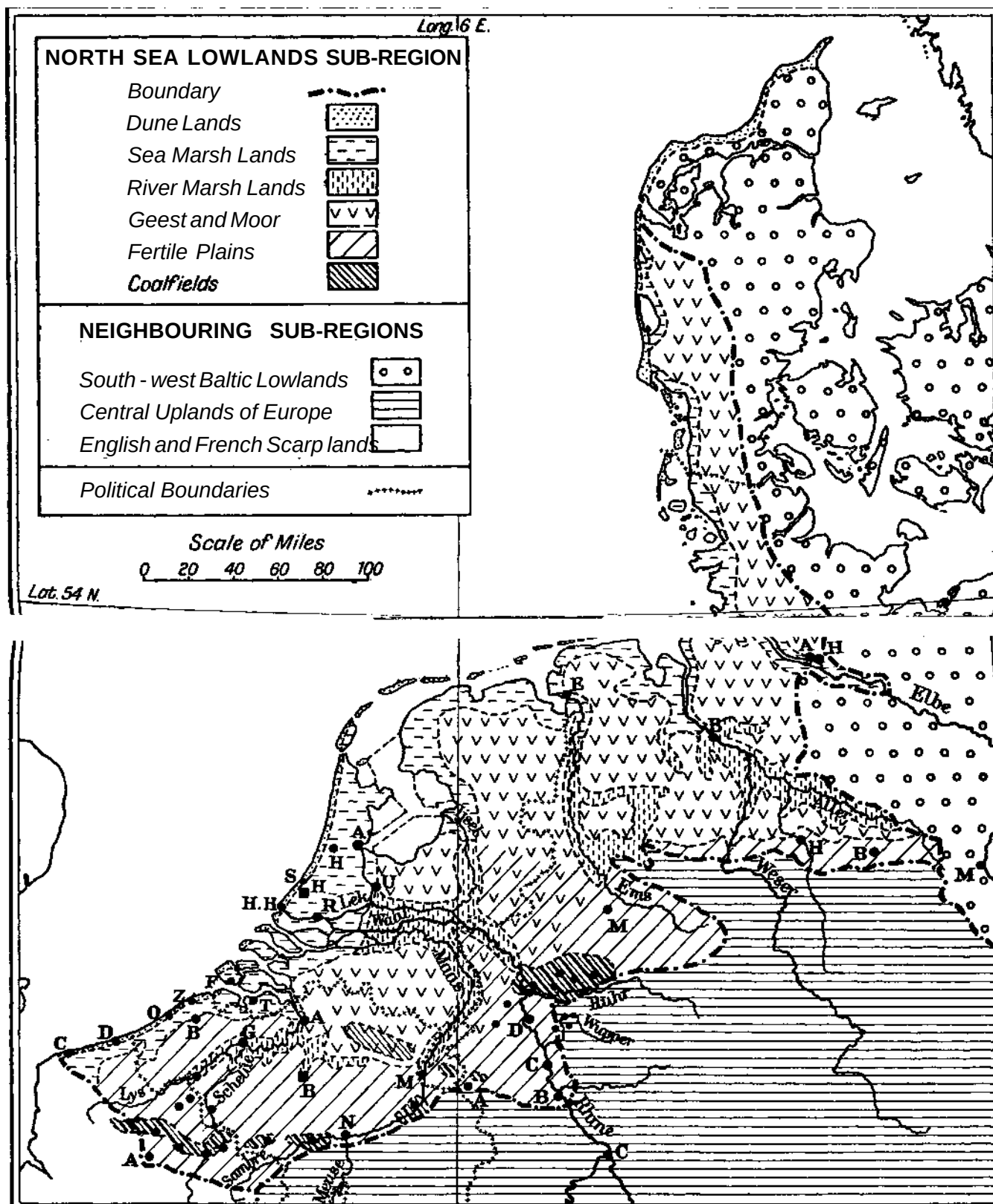


FIG. 30.—REGIONS OF THE NORTH SEA LOWLANDS.

From near the junction of the Dortmund-Ems Canal with the Ems River, another canal leads east near the margin of the North Sea Lowlands (see Fig. 29). This is the Mittelland (Midland) Canal; it crosses the Weser and its navigable sub-tributary, the Leine, on which Hanover stands, and is now continued north of Brunswick to join the Elbe at Magdeburg. By its completion a through route of inland waterways connects eastern Germany and Berlin with the Rhine-lands.

The Rhine is incomparably the most important waterway of Europe. It is navigable for small vessels from Basel downstream, but its great amount of traffic is in the North Sea Lowlands region between the Ruhr and the sea ; while there are river ports of considerable size in German territory, the chief port of transshipment between ocean and inland transport is Rotterdam. This is the one striking exception to the rule that the great ports are on the margins of the marsh-land ; unlike the others it is of recent growth, and became important only when in the latter part of the last century the increase of German trade made it necessary to improve the navigation of the Rhine estuary. Then the " New Waterway " was cut : a deep channel was made from the North Sea at the Hook of Holland, and where the waters of the Waal and Lek were led into this channel at Rotterdam, in the middle of the marsh-lands, great wharfs and basins were constructed, and the port rapidly developed. Of the goods transhipped from sea-going vessels, the greatest amount goes inland up the Rhine, and most of the remainder by the system of canals which forms a network throughout the Netherlands and is without parallel in the world. Railway transport counts for little, one reason being because the traffic consists mainly of heavy and bulky imports, such as iron and other ores and metals for the industrial regions higher up the Rhine and grain for the food-supply of the dense populations of the Netherlands and Germany. With manufactures associated with the imports, particularly for use in Holland, Rotterdam has grown till it has a population of over half a million.

Amsterdam rose to importance centuries ago when the protected waters of the Zuider Zee gave access to the interior of the polder-lands of Holland, but the increasing size of ocean-going vessels made this shallow sea useless ; first the North Holland Canal was constructed through the peninsula to the entrance of the Zuider Zee, and later the North Sea Canal gave a direct

approach available for ships of any size. Thus Amsterdam, although rather off the main lines of communication, has been able to retain a certain amount of ocean traffic, and it affords an example of geographical inertia by the fact that it still remains the chief centre of the organization of the commerce (as distinct from the actual handling of the traffic) and of the financial business of the Netherlands. It also has industries which are traceable to its pre-eminence in trade in the days when Holland was a great colonial power, e.g. cigar making and tobacco preparing, sugar refining and diamond cutting. Moreover, Amsterdam has remained a professional and residential centre, and with more than three-quarters of a million inhabitants it is the largest city in Holland.

The lower Maas is inconvenient for commerce, for being without Alpine tributaries, it is subject to very low water in summer and to floods in winter ; its middle course, however, is connected by a canal in Dutch territory from Maastricht to the Rhine estuary, and in Belgian territory by a canal from Liege to Antwerp on the Schelde (see Fig. 32).

The estuary of this latter river is the entry to a very considerable system of waterways which traverses all parts of Belgium and is joined to the rivers of north-eastern France. Where the Schelde enters the sea-marsh region Antwerp has grown up. This city has a population of more than a quarter of a million ; it is the chief port for Belgian commerce, and its transit trade, mainly for Germany and Switzerland, is of about equal importance. Like Amsterdam, Antwerp has developed industries connected with its import of " colonial " wares. At the junction of the Lys and the Schelde is Ghent, a centre of local trade and small textile manufactures ; from it one canal runs northward to Terneuzen in Dutch territory on the " West Schelde " inlet, and another leads westward to Bruges on the inner edge of the sea-marshes. Bruges was once a port, but its outlet has been silted up, and it is now joined to the sea by canals which cut through the dune belt to Zeebrugge and Ostend.

The canal which runs through French territory roughly parallel with the national boundary shows the influence of political conditions. While the natural waterways would direct traffic from the French coalfield to the Schelde and Antwerp, the desire to keep the trade within France has been an important factor in the construction of the canal which leads to Calais

and Dunkirk; the growth of these ports must therefore be ascribed in part to political causes.

The Geest and Moors.—Behind the tract-group of the Marshlands, extends another and strongly contrasted series of tracts, from near Antwerp north-eastwards to the borders of the Baltic

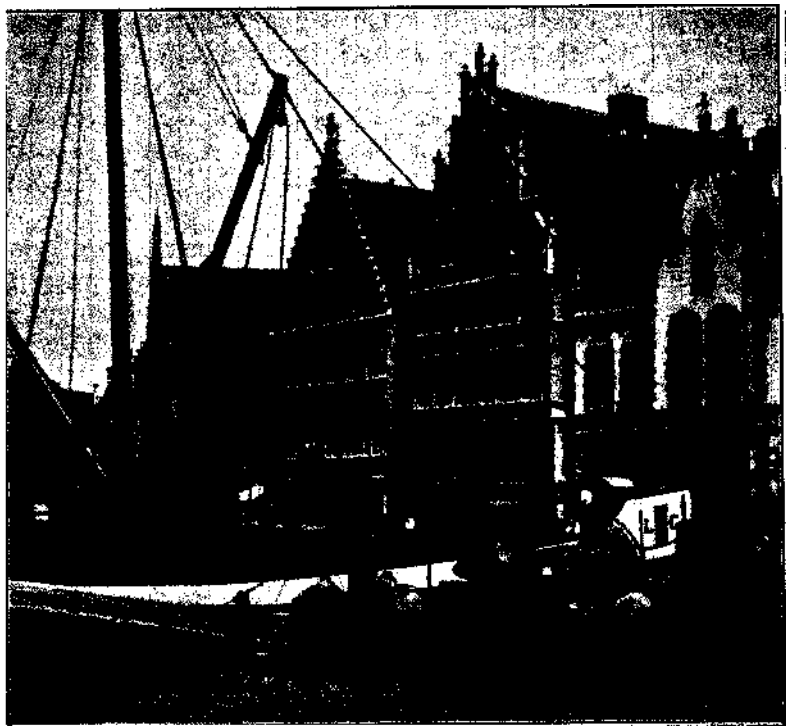


FIG. .31. --VIEW IX GHENT. [Belgian Railways & Marine.]

Note.—The steeply gabled high houses are typical of Flemish-town architecture. The view shows the "Quai aux Herbes," by one of the small waterways, carrying barge traffic, largely used in Belgium and in Holland.

Lands. These areas are in the main wide stretches of heath-land known to the Germans as geest. In the west of the region from near the mouth of the Schelde to about the lower Ems, they have developed upon masses of gravels and sands which were brought down by the Rhine and Maas until the deposits formed a great fan-like plateau. The plateau was highest near the centre of its inner margin, dipping north-westward to the sea (see Fig. 27). Later it was dissected by streams, and great valleys were cut across it. The largest of these valleys are the

two now occupied by the parallel courses of the lower Maas, Waal and Lek and by the Ijssel; consequently, the sandy plateau is divided into three masses : (1) the Campine or Kempenland, which overlaps the boundary of Belgium and Holland within the curve of the Maas ; (2) the Veluwe, between the Lek and the Ijssel; (3) the West Frisian Geest, between the Ijssel and the Ems.

The words " Veluwe " and " Geest " both mean " barren land " and, apart from some woodland on the slopes, the vegetation cover of most of the area consists of coarse grasses and shrubby growths such as heather; the surface is dry and infertile, while in parts the finest sand is blown into small dunes. In other parts iron in the sand has formed a pan of impermeable rock upon which drainage is poor, and moors have developed with marshes, peat bogs and pools of stagnant water.

Reclamation of these lands, for long almost uninhabited, is going on, and " Fen colonies " grow potatoes, beet and some rye and oats. Yet these lands remain scantily populated, and the larger settlements are generally on their margins.

East of the Ems the geest is formed mainly of sands washed away from the morainic material deposited by the ice-sheet which extended from northern Europe, as shown in Fig. 3. The greatest of the moraines are shown on the map, and it is to be observed that they mark out the eastern limit of the North Sea Lowlands region.

Streams brought sandy material from the Baltic morainic areas into the eastern part of the North Sea Lowlands region, where it is widely spread and is the basis of the geest-lands of this part; moreover, among the dry sands occasional sheets of boulder clay play a similar part to that of the iron pans in the western geest-lands and give rise to similar wet moor districts. Reclamation of this type of country has gone on in Germany, but to a less extent than in the Netherlands.

In Jutland, the strong westerly winds have blown the sand from the dune belt inland to combine with that of glacial origin and form a broad belt of dry, infertile country ; the Danes have recently begun to afforest and cultivate the sandy heath-land, but this western part of Denmark remains by far the least valuable part of their country.

In the western part of the geest-land, however, there is another resource which may be developed ; beneath the Campine are

deeply buried coal deposits : a " spur " from the belt of coal-fields of the southern margin of the North Sea Lowlands. The Campine field has a width of about 8 miles and a length of about 40 miles ; working has commenced near the Maas, but whether economic conditions will make a great extension profitable is uncertain.

The Fertile Plains.—To the south of the tract-group of the geest-lands, sedimentary soils of Tertiary and Secondary age emerge from beneath the marshy alluvium and the sandy accumulations (again see Fig. 27), and form plains of relative fertility, while in certain parts this fertility is actually great, due to a superficial deposit of loess.

Owing to the complicated way in which the older rocks of the Central Uplands were faulted, raised and depressed, they project irregularly northward into the lowlands ; consequently, the fertile plains of the latter are in some parts narrow, but in other parts form wide embayments between the upland masses. Thus in the North Sea Lowlands region, four main tracts of generally fertile plains or low plateaus may be observed.

(i) In the easternmost tip of the region is a strip in which the towns of Brunswick and Hanover are situated and which narrows westward where it is crossed by the Weser. This *Loess belt of Hanover and Brunswick* is noted especially for its production of sugar-beet and other industrial crops as well as cereals. Along it run ancient roads and modern railways which skirt the uplands and connect Berlin with the cities of the Netherlands and of northern France.

(ii) *The Westphalian Embayment*, which may be called the Plain of Munster from the town which is its natural centre, is of mixed soils and varied production. On its north-eastern and southern boundaries it is well defined by the edge of the uplands • on its north-western side it passes into an area which gradually becomes more like the geest; in the map of Fig. 30 this area is shown as transitional in its character, by the overlapping markings of both types of country. On the south-west of the Westphalian embayment the agricultural land of the plain is being invaded by the mining of the coalfield of the Ruhr region.

(iii) *The Cologne Embayment* is well defined on its southern and eastern sides, but on the north-west passes into transitional-geest country. The population of the Cologne embayment is great, for its agriculture is intensive, particularly upon a loess

covering in the south, while on the west side of the Rhine near Cologne there are deposits of lignite, or brown coal, a mineral which has been greatly developed in Germany in recent years (see Fig. 32). The Rhine, however, gives the region its greatest significance, for as a waterway it enables sea-going ships to reach Cologne, while its valley provides the most important route between southern and northern Germany and, indeed, between the Mediterranean and northern Europe.

Bonn marks the entry of the Rhine into the lowlands, but Cologne, a Roman "colonia," is a far more important focus of trade, for here the great traffic route which skirts the Central Uplands crosses the river. With industries utilizing both the lignite from the neighbouring deposits and the coal from the Ruhr, Cologne has grown into a city of about three-quarters of a million inhabitants. Farther downstream is Diisseldorf, the river port for the industrial area of Wuppertal immediately to the east in the adjoining upland ; at and about Diisseldorf a population of nearly half a million has congregated. Other centres of industry have developed west of the Rhine, e.g. Munchen-Gladbach and Crefeld, famous for textile production.

(iv) West of the Cologne embayment the fertile belt narrows between the Ardennes area of the uplands and the Campine, and here, near Maastricht, it includes the small southern prolongation of Dutch territory. Beyond the Maas the fertile belt widens to form the *Plains of the Schelde*, a region drained mainly by that river. In central Belgium this forms a low undulating plateau. In this area, again, sedimentary strata have a covering of loess, and there is intensive agriculture yielding wheat and oats, industrial crops, and roots grown as fodder for considerable numbers of cattle. This type of country extends into France.

Farther north, between the Lys and the sea marsh-lands, the plains of Flanders are less productive by nature ; here sandy soils predominate, and arduous toil, involving thorough cultivation and the use of manures, has been necessary to obtain fertility. Cereals are not so widely grown ; moreover, rye is in parts more important than wheat. The predominance of rye over wheat is fairly common on the poorer sandy soils of this section of central Europe, for climatic conditions make both crops possible and the determining factors are the dryness and relative infertility of the soil.

On both the Belgian and the French sides of the political

boundary south of the Lys, a rather scattered form of industrial development has persisted from the days when wool was produced, spun and woven in this region. Other forms of textile manufacture have grown up by "transferred inertia," the traditional skill being adapted first to the working of linen and then to that of cotton. Domestic manufacture still continues, sometimes as a necessary supplement to the scanty earnings of agriculture when winter gives spare time, but most of the work is carried on in a number of towns of moderate size situated to the north of the coalfield: in Belgium are Courtrai and Tournai, and in France are Roubaix and Lille; at these last two towns textile and other machinery is made.

By far the greatest city is Brussels, the capital of Belgium, conveniently situated in the centre of the lowland part of the State. It is at the end of the marsh-land of the Senne, a tributary of the Schelde, and grew up at the head of navigation; now it is connected by canals to the coalfields area to the south, and it has become also a centre of railway communication. As the capital of the country, the seat of much financial business, and the site of manufactures of many kinds, it has grown until its conurbation includes a population of nearly a million persons.

The Coalfields.—Fig. 27 shows in a very simplified manner how Coal Measures, formed in the upper part of the Palaeozoic rocks, have been worn away from the uplands region but outcrop at the surface where this descends to the lowlands, and are buried at increasing depths under the plains. The coal was mined, therefore, first on the inner margin of the lowlands, and the pits were later extended northwards till the deep working became too costly.

The section might suggest that there is a continuous belt of coal-mining all along the edge of the plains, but the geological structure is actually more complicated and the Coal Measures have not been preserved throughout the border of the lowlands; in consequence the coalfields form a series of disconnected patches. The actual mining areas are shown on the maps on Figs. 30 and 32. The most important of the coalfields is in the neighbourhood of the lower Ruhr where the river leaves the uplands to join the Rhine. Here the Ruhr district has become an intensely industrialized region. The industries, like those of the somewhat similar South Pennine coalfields of England, began in the valleys of the adjoining uplands, [where](#) water-power

from the streams was used for an early iron and steel industry which obtained ore and limestone from the uplands and fuel from the forests which clothed their slopes. In some of these valleys geographical inertia has allowed the industries to persist with the aid of the coal from the neighbouring Ruhr field ; thus in the basin of the Wupper, the tributary of the Rhine situated a few miles south of the Ruhr, the towns of Remscheid and Solingen have long been famous for fine steel products, while

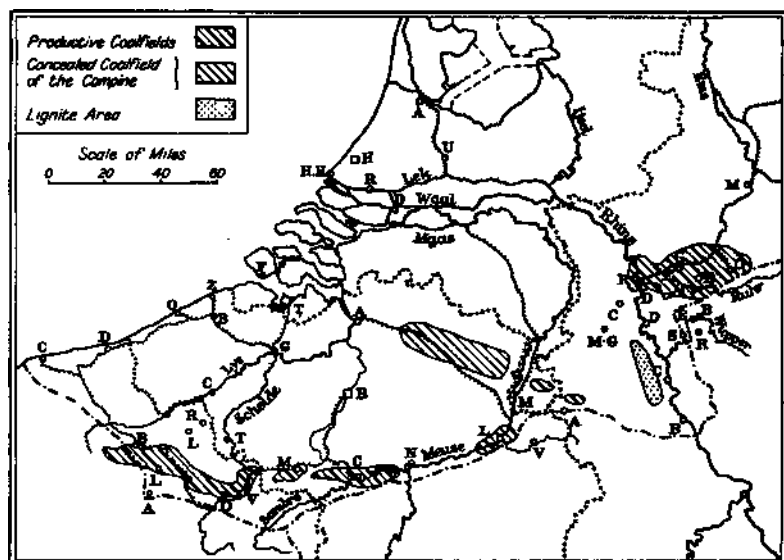


FIG. 32.—COALFIELDS OF THE NORTH SEA LOWLANDS.

a textile industry has persisted, working first wool, and later also cotton and rayon, into many fabrics, notably at Elberfeld and Barmen. These two towns became crowded together into the narrow steep-sided valley of the Wupper above Solingen, and have now been incorporated into one long municipality known as Wuppertal (i.e. Wupperdale) in which nearly half a million people are so packed that the railways have been tunnelled below the houses and elevated above the river and streets.

It is in the plain, however, that the greatest industrial development has occurred. On the Ruhr coalfield a number of towns have grown up, and have so spread that they form an almost unbroken sea of houses north of the river, stretching for about

50 miles eastwards from the Rhine. Where the Ruhr enters the Rhine it is joined by a canal connecting it with the Dortmund-Ems Canal; here a group of river-ports, including Duisburg and Ruhrort, carry on a great traffic in export of coal and import of ore and raw materials, and here are also metallurgical works.

The greatest aggregation of works is at Essen, where, within the municipal boundaries, live two-thirds of a million people, while adjoining it on the east are Gelsenkirchen and Bochum, each of which is about half the size. Several other large towns have sprawled over the coalfield, and the whole region has an unparalleled production of iron and steel goods, among which may be mentioned railway equipment, shipbuilding material, armaments, constructional steelwork, and machinery for manufacturing and agriculture. From the coal are obtained coke and by-products, including tars, dyes and other chemicals. Power stations furnish electricity for the grid system, which, fed also from other centres, distributes power to almost all parts of Germany. Textiles, leather goods and many other commodities are produced, while Dortmund is a centre from which great quantities of coal are sent inland by rail.

West of the Cologne embayment, the coal appears again: a little is mined near the German town Aachen, and also in Dutch territory, where an increasing amount is being obtained east of Maastricht.

The Belgian group of coalfields has a large production. The eastern mining area is in the Meuse valley around Liege, the greatest industrial centre of Belgium; the conurbation has a quarter of a million inhabitants and, owing to an early exploitation of ores of zinc, copper and lead, as well as of iron, metallurgical industries are very varied. In a neighbouring valley of the uplands, at and near Verviers, the manufacture of woollen goods has survived.

West of Namur, the line of the Meuse valley is continued by that of the Sambre, and here around Charleroi is another coal basin and metallurgical industry. Farther west the next outcrop of the Coal Measures occurs north of the river near Mons. Like Charleroi, Mons is itself but a small town, and it is characteristic of these western coal areas of Belgium that much of the mining and the associated work is carried on in groups of numerous small settlements set in rural surroundings.

Just across the French frontier is the last of the series of coal-

fields ; this stretches in a long and narrow belt from near Valenciennes, past Denain, Douai, Lens and Btethune, until its tip ends beneath the chalk sheet of north-eastern France. As in Belgium, there is no large city, but in and around a string of small towns and villages there is a considerable population engaged in the production of coal, coke and chemicals, steel and machinery. A great deal of coal is sent away, much of it northward to the French industrial area or the ports, and the rest southward by water or rail to Paris and elsewhere.

The belt of coalfields of the North Sea Lowlands may be regarded as a discontinuous tract; it supplies by far the greatest part of the coal-supplies of Germany, France and Belgium, and it includes some of the most densely populated areas of these countries.

Thus, with the coalfields of the inner margin and the ports of the outer margin, the North Sea Lowlands is a sub-region with an economic and political importance scarcely equalled in the world.

QUESTIONS

1. Show how the nature of the coastal areas of the North Sea Lowlands has influenced the manner of life of the inhabitants.
2. Show how the rivers of this region have influenced (*a*) the physical conditions, and (*b*) the economic development.
3. Compare and contrast the situation and the functions of three large ports of this region.
4. Write a reasoned geographical account of the Ruhr industrial area.
5. Describe and account for the differences between the farming of various parts of the North Sea Lowlands.
6. State and explain the main facts of the distribution of population in this region.
7. Briefly state how men have transformed three different types of country in the North Sea Lowlands.

SOUTH-WEST BALTIC LOWLANDS

EAST of the North Sea Lowlands is a region which, because of its position, is different as regards its climate, its surface conditions and its relations with other parts of Europe.

Climate and Vegetation.—As was explained in Chapter I I, in summer the temperatures of the lands south of the Baltic Sea are very similar to those south of the North Sea ; but in winter the conditions are more severe. Broadly speaking, the Baltic Lands have a mean January temperature below freezing-point and as one goes eastward still lower temperatures are experienced. As a consequence, the harbours of the Baltic Sea unlike those of the North Sea are normally ice-covered in winter, the period increasing eastwards, e.g. about two months at Stettin and nearly four months at Königsberg; during this period the ports have to be kept open by ice-breakers.

The gradual eastward change to a continental type of climate is also expressed, though less clearly, in the amount and character of the precipitation ; the annual total decreases, mainly due to a lessened amount in the winter half of the year (compare the figures for Brussels, Berlin and Warsaw in the table on p. 26). Moreover, at this season, with the greater cold the precipitation takes the form of snow, and this commonly remains for weeks upon the ground. Yet the sun is often bright, and clear skies are more often enjoyed in the Baltic regions than in the neighbourhood of the North Sea. Because of the above facts the South-West Baltic Lowlands region is included in the " Interior Temperate " climate region.

The natural vegetation shows changes which accord with the shorter period of vegetative growth towards the east. In the region here called the Baltic-Entry Lands the beech is dominant; from the neighbourhood of Lübeck eastward to the lower Vistula the deciduous beech and the evergreen coniferous pines form the " mixed " forest cover; from the lower Vistula to the lower Niemen pines and spruce are the most common trees, but with them are some beech and oak; beyond the

Niemen the length of the winter does not permit the growth of the beech.

The eastern limit of the beech is broadly taken as the boundary of this region, but the precise course of this boundary will be indicated later.

Surface Forms.—The surface conditions of the region are to a large extent determined by the effects of glaciation, e.g. the occurrence of great areas of boulder clay deposited as ground moraine under the ice, broken by great lines of hills formed by the terminal moraines, which have a general east and west direction and are composed of clay, sand and gravel and boulders of all sizes (see Fig. 33).

Beyond the successive margins of the ice-sheet, the water resulting from the melting formed large rivers, which occupied valleys probably existing in some form before the Ice Age ; they are known to German and Polish geologists as "primitive valleys." Along these valleys the great ice-water rivers drained westward, deepening and broadening them, and depositing in them masses of sand and gravel. Now that the ice has gone, the valleys are occupied only by smaller rivers coming from the south, and at a number of places these break through the morainic accumulations northward to reach the Baltic Sea, or in the case of the Elbe to reach the North Sea. Hence the primitive valleys have wide expanses of deposit in which there are either relatively small streams or none at all.

Consequently, in the northern part of the region there are three main types of country : (i) In the *Baltic Entry-lands* behind the line of terminal moraine which almost bisects the Jutish Peninsula is a ground-moraine area in which boulder clay predominates. These lands form the region marked (I) in Fig. 33. (ii) Farther east are the *Baltic Plateaus* (marked II), on which varied morainic material is thickly heaped, (iii) South of this belt is that of the *River Lowlands* (III), where the terminal and ground moraines of the earlier stages of the Ice Age were cut by the waters from the ice in the later stages ; here the primitive valleys are important elements in the geography.

Finally, in the south, beyond the limits of all but the earliest extension of the ice, and therefore where glaciation has had relatively little effect, the underlying rock formations have a greater influence on the geography ; here are the relatively fertile *Interior Plains and Plateaus* (IV). These areas in some

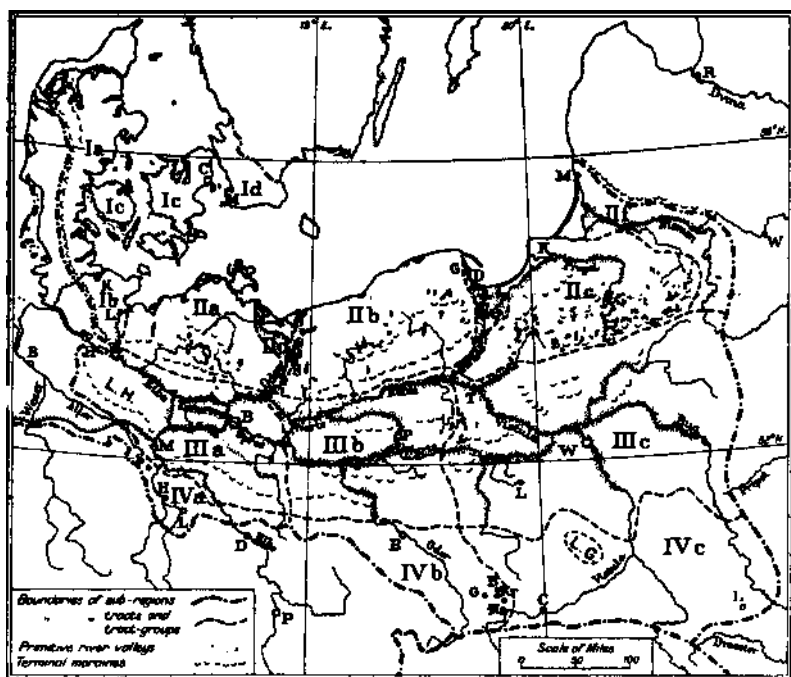


FIG. 33.—REGIONS OF THE SOUTH-WEST BALTIC LOWLANDS.

ways resemble the fertile plains in the south of the North Sea Lowlands. Moreover, adjoining the Central Uplands which form the southern limit of the South-West Baltic Lowlands are some coal deposits, though of less extent than those of the North Sea Lowlands.

The eastern limits of the South-West Baltic Lowlands have been drawn in Fig. 33 as follows : the northern belt of Baltic Plateaus ends where, on the north-eastern side of the lower Niemen valley, a line of terminal moraine (the " Baltic Border-moraine " of Lithuania) marks the beginning of a rather different type of country in the East Baltic area; the River Lowlands belt ends with the basin of the Vistula, beyond which are the great Pripet Marshes of East Poland and Russia ; the Interior Plains and Plateaus end at the water-parting between the Vistula and the Dniester, which drains to the Black Sea. Together these boundaries approximate to the eastern limit of the beech, and so correspond with the change to the Sub-boreal climate region.

The Baltic Entry-lands.—The terminal moraine which almost bisects the Jutish Peninsula forms a narrow belt of hilly country, a few hundred feet above sea-level, mainly covered with beech and oak trees. Behind this, on the eastern side, the boulder-clay country is low, sloping down to inlets of the Baltic Sea, which represent former glacial lakes, now "drowned" by a slight sinking of the whole area, or by an equivalent rising of the sea-level.

This change of level has also changed earlier river valleys into the three Baltic entries which now separate what was previously one area of almost uniform character; hence the present similarity of all these Baltic Entry-lands, marked I in Fig. 33, including Scania, the extreme southern tip of Scandinavia. Throughout the region beech woods alternate with the fields and meadows. The main aim of the farming is the keeping of cattle, pigs and poultry, and the consequent production and export of butter, bacon and eggs. The land is therefore utilized mainly for obtaining grain, roots, clover, grass and hay for the animals and to a much smaller extent for growing crops for human use, especially barley, oats and beet; closely associated with the agricultural production and keeping of animals are small industries of making sugar, brewing beer and dressing leather.

Along the north coast of Jutland the sand-dunes have been drifted as far as the point Skagens Horn, and the northern part of the peninsula is in parts sandy rather than clayey, but apart from this there is much similarity throughout the Baltic Entry-lands. Scania (Id) differs very markedly from the rest of Scandinavia, fundamentally because along its north-eastern boundary are a series of faults which have let down and preserved sedimentary rocks on the south-western side, while crystalline rocks of the Baltic Shield form most of the country on the north-eastern side. How this has influenced the farming is shown by the fact that on the south-western side 80 per cent, of the land is cultivated, while the proportion on the north-eastern side is less than 30 per cent. ; a population map shows a correspondingly sharp contrast. Climatic factors, too, play some part in bringing about the difference, for southern Scandinavia as a whole has the Sub-boreal type of climate, but in Scania the beech can thrive.

In addition to relatively favourable conditions of climate and soil, the Baltic Entry-lands, as the name implies, have a favour-

able commercial situation. This was more important in the past before railways, good roads, and canals diverted traffic from the seas, but there are still several ports at the eastern end of the Baltic. In the German part of the region (marked lb), Ltibeck is an " old-world " town, once the chief seat of the Hanseatic League dominating the trade of the Baltic lands ; it is now eclipsed by Kiel, a naval fortress at the end of the North-Baltic Sea Canal. On the Danish portion of the Jutish



FIG. 34.—VIEW ON THE ISLAND OF FUNEN.

[Danish Tourist Bureau.]

Note.—The ground-moraine landscapes of Eastern Jutland and the Danish Islands have numerous low rises and small hollows, many of the latter being occupied by lakes or ponds ; by the coasts the " drowning " has converted these into small inlets. As in this view, the farms are commonly set among pastures and beech-woods ; in the foreground the foliage of a beech tree can be recognized.

Peninsula (marked la), there are only smaller ports, but on Zealand, the largest of the islands (marked le), is Copenhagen. It is situated on the Sound, the shortest route between the Kattegat and the Baltic, though its growth to a great city of more than three-quarters of a million inhabitants is due largely to the fact that it is the capital of Denmark. In Scania, Malmo is connected by train-ferry with Copenhagen ; it is the chief port of this part of Sweden, and in size is the third town of that State.

The Baltic Plateaus.—East of Lubeck, the Baltic coastlands become on the whole higher and form a series of plateaus

sometimes known by the name of the Baltic Heights, which alternate with low and broad river valleys. The Mecklenburg plateau (IIa) is followed by the Oder Valley, the Pomeranian plateau (IIb) by the Vistula valley, and the East Prussian plateau (IIE) by the Niemen valley. The highest parts of each plateau are covered by terminal moraines, rising to several hundreds of feet. These are to a considerable degree wooded, but as a legacy of the ice the drainage is in general poor, marshy areas abound and there are so many lakes that the regions are often referred to as the "lake plateaus." On the northern slopes, boulder-clay areas provide better soils, and agriculture yields crops of rye and potatoes, but the productivity is never high and decreases towards the east. On the southern slopes, outwash sands from the ice form but poor soils, and woods and pastures give a living to a scanty population. The low river valleys are naturally marshy and liable to flood, but where the alluvial plains are protected by dykes there is fertile ground, on which cereals, sugar-beet and other crops are grown, and animals are pastured.

The coasts vary in conformity with the lands behind them. Projecting from the Mecklenburg plateau are islands with low cliffs, as on Riigen, and parts of the coasts of the other plateaus are also cliff-edged. The valleys end in funnel-shaped estuaries in which the rivers have built deltas; sand drifted from the west has formed spits which almost shut in lagoons and, where the coast faces west, there are high sand-dunes.

These river and sea deposits hamper navigation, which also suffers from the formation of ice in winter, but ports have grown up at the mouths of the largest rivers. By the Oder is Stettin, which has some importance from the trade of Berlin, with which it is connected by canals.

At the end of the Vistula valley are two ports: Danzig is a German settlement which, situated by an old mouth of the river, has for centuries been the outlet for the trade of the Vistula basin; Gdynia, away from the river itself, is a new creation of Poland constructed to give that country an independent port at the end of the "Polish Corridor" which runs between East Prussia and the rest of Germany.

At the mouth of the smaller River Pregel is Konigsberg, a large German city; its development was in part due to trade from Russia, which came here in preference to the more easterly

ports because of the shorter time during which ice prevented navigation.

At the far east of the region is Kaunas (Kovno), the capital of Lithuania, where the Niemen, or Memel, River turns westward, and the port Memel is situated where the river leaves its lagoon.

The River Lowlands.—Not all this region marked **III** is low, for there are lines of terminal moraine forming belts of hilly country ; these are, however, neither so high nor so wooded as those farther north, and frequently form heath-land, e.g. the Liineberg Heath west of the Elbe (marked L.H. in Fig. 33). More extensive are the areas of ground moraine, generally covered by a relatively fertile loamy soil, on which corn, especially rye, sugar-beet and potatoes are grown.

The characteristic areas of the region, however, are the broad, primitive valleys. One series is just within the northern boundary of the region ; with the aid of canals it connects the Vistula above Thorn with the Netze and Warthe tributaries of the Oder, and a short reach of that river with the lower Elbe. The second important line of valleys runs along the middle of the region ; it joins the Bug tributary of the Vistula to the upper Warthe, and this river by the Spree to the Elbe. The Elbe above Magdeburg flows in another glacial valley, but below the town the river breaks off to the north ; its earlier valley is continued westward towards the Aller and is occupied by the new Mittelland Canal.

These and other glacial valleys have facilitated water communication, but they did not easily lend themselves to other use, for they are partly marshy and the natural vegetation-cover is commonly heath on the drier sands and dense thicket in the damper parts. But now considerable areas have been drained and dyked and transformed into fields and meadows.

Of the three areas comprising this River Lowlands region, that drained by the Elbe (marked **IIa**) is particularly important because Berlin has grown up within it. The rulers of the district around Berlin, the " Mark," during several centuries increased their power until they became Kings of Prussia and, at last, Emperors of Germany ; Berlin was the seat of their Government and is now the capital of the German State. Its position in the centre of the waterways is shown on the map, and when railways were constructed they were made to centre upon the city. Its development as an administrative and com-

mercial metropolis aided the establishment of many forms of industry, until it is now the largest manufacturing city of Germany. It is also the chief German centre of education and of many professions. As a consequence it has spread until it occupies an area of over 300 square miles and the city itself has a population of about 4½ million persons; it is thus the greatest city on the continent of Europe. Magdeburg is a large town which owes its growth mainly to its position on the Elbe.

The Oder Lowland (IIlb), has been less developed than the Elbe Lowland; it is a rather sparsely populated rural region, and has smaller towns. The most considerable of these is Poznan, formerly known by its German name, Posen.

In the Vistula Lowland (IIlc), with which part of the upper basin of the Warte is here included, the terminal moraines are less developed, and in addition to the wet river valleys, even the areas of ground moraine have large marshy spaces. There are other districts of woods and heaths, and in general the amount of cultivated land is less than in the more westerly lowlands. In the centre and on the Vistula is Warsaw, the capital of Poland, with about 1½ million inhabitants. The Polish Government, and before that the Russians, aided manufacturing in this region by customs barriers. Consequently, industries which here lack any special natural advantages are carried on in several towns, including Warsaw and the large manufacturing city of Lodz, which has more than half a million inhabitants; metal goods and machinery are made, but the greatest development has been in connexion with textiles, and especially cotton goods.

The Interior Plains and Plateaus.—It has already been suggested that this most southerly belt of the South-West Baltic Lowlands, with its less-marked glaciation and its greater fertility, may be compared with the "Fertile Plains" belt of the North Sea Lowlands.

This is certainly true of the area which is drained to the Elbe, and may be called the *Leipzig or Saxon embayment* (IVa), for it resembles the Cologne embayment in several respects. The sedimentary rocks are covered with loess in the southern part, and the region as a whole has intensive agriculture, in which the growing of industrial crops is important. Moreover, there are great deposits of lignite, extending from near Magdeburg southwards past Stassfurt, Halle and Leipzig, which supply power for local industries. These industries are aided, too, by

the occurrence of common and potassium salts in the districts adjoining Stassfurt and Halle, where there are great chemical works. At Leipzig there are varied manufactures which have grouped themselves around an older commercial settlement; this grew up because here an ancient east-west route avoiding the Saxon Uplands found a convenient crossing-place in the otherwise marshy valley of the River Elster, by which Leipzig stands. The city is also noted as a centre of printing and publishing. It has become one of the most important railway junctions of central Europe, and its population is now about three-quarters of a million people.

Farther east, the broad upper valley of the Oder forms the *Silesian Embayment* (IVb). While the south-eastern part of this hollow is covered with sandy and rather infertile glacial deposits, the lower north-western part has more clay and loess or loamy soils on which industrial and other crops are grown. On the Oder is the large city of Breslau, with over half a million inhabitants—another of the commercial centres which have arisen where land routes which skirt the uplands cross riverways leading to the lowlands and the seas.

At the south-eastern end is the Upper Silesian coal basin, of which part is in the Oder valley, and part drains to the Vistula. Coal is not actually mined in all parts of the basin, but iron, zinc and lead deposits are worked in the area ; as a consequence there are considerable metallurgical industries. The Upper Silesian coalfields are shared by three States, as shown in Figs. 78 and 80. In Germany there is a large industrial population in and around the towns of Beuthen, Hindenburg and Gleiwitz ; in Poland there are three smaller manufacturing areas, one at Krolewska Huta and Katowice, a second at Rybnik, and a third between Teschen (Cieszyn) and Moravska Ostrava ; in Czechoslovakia there is a much smaller district in and adjoining Moravska Ostrava.

The South Polish Plateaus.—This region (IVc), mainly drained by the Vistula, rises from the River Lowlands southward to the Carpathian Mountains. As a whole, it consists of a number of plateau-like areas, but the upper courses of the Vistula and its tributary, the San, flow through lower country, while north of this upper Vistula valley the land rises in the Lysa Gora (marked L.G.) to a height of almost 2,000 feet. This variety in the relief corresponds to a variety in structure, for the greater part of

the region is formed of limestones and other sedimentary strata of Secondary or Tertiary Age, much dissected by the rivers, but faulting of the earth's crust has resulted in the emergence of blocks of more ancient and more resistant rock in the Lysa Gora area. Surface conditions, too, vary considerably, for in parts glacial deposits cover the sedimentary strata, while in some areas, especially in the southern part, there is a thick mantle of loess in which streams have cut canon-like valleys.

With the variation in relief and soils, the fertility and the utilization of the land vary, but in general it is an agricultural region suited to the growth of grains and industrial crops, and noteworthy, as compared with the more northerly Baltic lands, for a relative importance of wheat production. The southern portion of this region forms part of Galicia, which extends also into the Carpathian Mountain region, and the famous salt-mines of Galicia are at Wieliczka, near Cracow (Krakow).

Cracow is situated where the Vistula was crossed by an old route following the northern side of the Carpathians, and another old commercial centre with a somewhat similar position is Lwow, or Lemberg. This latter city, however, is unusual in being situated on no large river; it is on the water-parting between the streams draining to the Baltic on the one hand and to the Black Sea on the other. Its significance is due to the fact that it is near the meeting-point of several natural regions, and therefore at the focus of routes by which products of different character are interchanged.

In this neighbourhood, we reach the limit of Temperate Europe, and therefore return to deal with the lands situated on the Atlantic side of the North Sea Lowlands.

QUESTIONS

1. Compare and contrast the south-west coasts of the Baltic Sea with the south-east coasts of the North Sea.
2. Show how the glaciation of the South-West Baltic Lowlands has influenced land-utilization in that region.
3. Give an account of the inland navigation system of North Germany, with reference to physical conditions and economic developments.
4. Write a systematic account of the geography of Denmark, relating the facts as closely as possible.
5. Make a comparative study of the situation and development of the three capitals : Berlin, Copenhagen, Warsaw.

NORTHERN FRANCE

The North French Lowland.—West of the North Sea Lowlands rises a belt of chalk country which reaches the Strait of Dover in Cap Blanc Nez, the counterpart of the cliffs of Dover. From this cape southward to the Central Plateau of France, and extending from the Central Uplands of Europe in the east to the Breton Peninsula in the west, is the North French Lowland (see Fig. 35). In its build this sub-region resembles the English Lowland: it is formed in the main of low plateaus, which are cut by river valleys, are sometimes edged by escarpments and sink in parts to low basins or marshy plains.

From the geological point of view, the North French Lowland occupies a great hollow known to geologists as the Paris Basin. Within the hollow the land is composed of strata lying one above another upon a platform of ancient rock which rises in the east to form the Ardenne and other parts of the Central Uplands of Europe, and in the west to form the Breton Peninsula, while on the southern side it is upthrust in the Central Plateau (see the section in Fig. 08, and note that the succession of the strata is set out in Appendix I). Broadly speaking, the lower sedimentary layers outcrop near the margins of the basin, while the uppermost ones appear in the central part.

The strata of the North French Lowland, like those of the English Lowland, differ markedly from one another in their composition, and thus give rise to differences in the relief, in the soils and in the utilization of the land; hence the structure largely determines the varying conditions within the region.

The North French Lowland has a more southerly and a more continental position than the English Lowland, and consequently its summers are warmer and its-winters rather colder, as may be seen by comparing the temperature figures for Paris and London in the table on p. 26. There is not much difference in this respect between the districts near the two sides of the Channel, but in the more southerly part of the French region the greater heat in summer becomes more marked and makes pos-

sible the growth of plants, particularly the vine, which cannot ripen their fruit under normal conditions in England. Such differences, allied to traditional differences between the English and French people in the modes of cultivation, lead to considerable contrasts in the appearance of the landscapes and the mode of life of the population in the two countries.

The Ile de France.—The central part of the North French Lowland (marked I in Fig. 35) lies around the capital, Paris, towards which the streams draining the area converge. Here, in past centuries, was the heart of what was then the Kingdom of France, its eastern side being protected by a cliff-like line of escarpments¹ which raised it, island-like, above the surrounding lowland ; hence this central region became known as the " Ile de France."

It is a group of tracts consisting of gently inclined table-lands, rising in the eastern escarpments to about 800 feet above sea-level, and in parts deeply cut by the valleys of the Seine and its tributaries.

The strata of which the lie de France is formed differ in composition, and as they are slightly tilted, they outcrop in various parts of the region and hence lead to differences which mark out the respective tracts. For example, south-west of the Seine is Beauce, which has characteristic features due to the subsoil being a layer of permeable limestone ; the country is a flat, monotonous and rather dry plateau, though a thin, loamy soil allows cultivation of great quantities of wheat. Usually water can be obtained only by boring deep wells ; these are therefore costly and not numerous, and around them the farm-houses are grouped in large villages, whence the treeless fields of the whole community spread out to considerable distances.

Between the Seine and the Marne is situated another wide and generally level tract, Brie, where the subsoil consists of a lower sheet of limestone of a siliceous, " millstone " type and includes clay, which prevents downward drainage. Consequently the surface is often wet, there are groups of trees, and the characteristic occupation is the keeping: of cattle and the production of milk and cheese ; with no difficulty in obtaining water, the farms are conveniently situated within their fields and the population is of the dispersed type.

¹ These escarpments, and also geological faults in other parts of France, are shown in Fig. 86 by symbols which are explained on the map in Fig. 44.

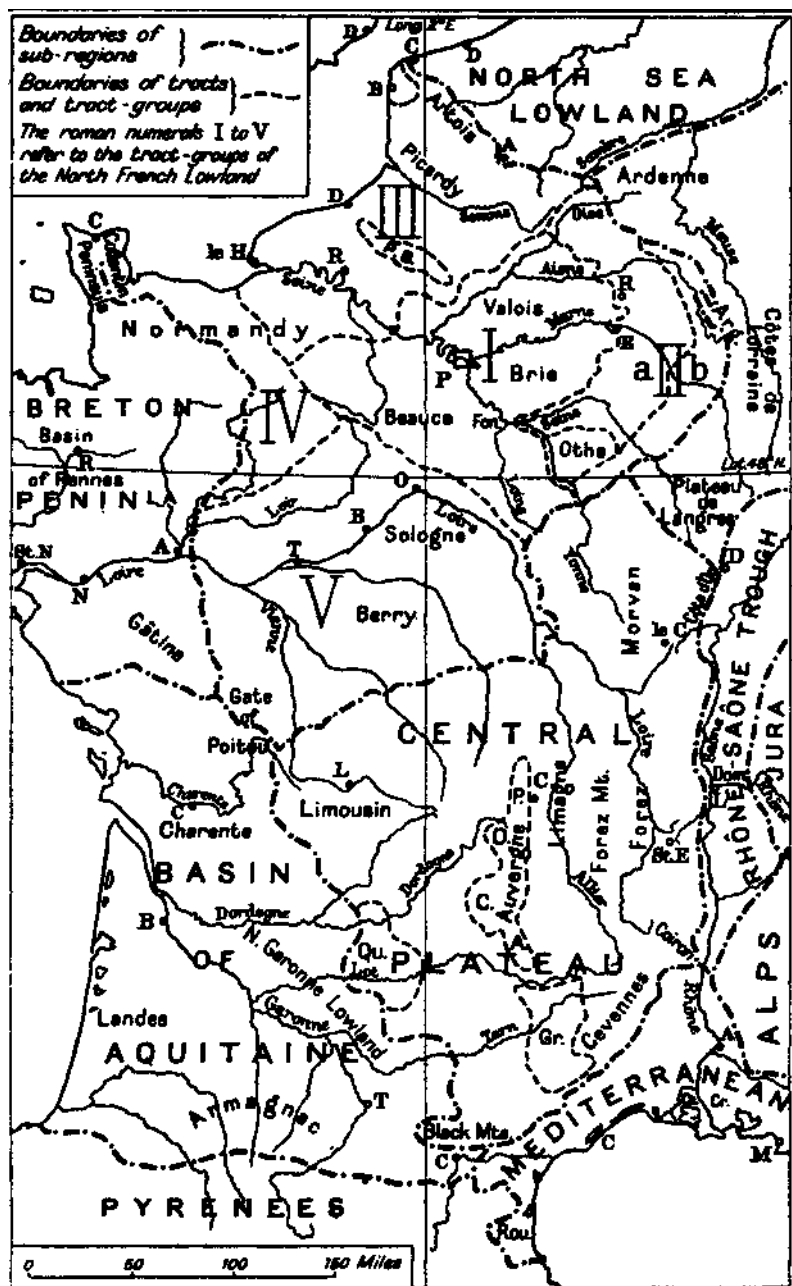


FIG. 35.—REGIONS OF CENTRAL FRANCE.

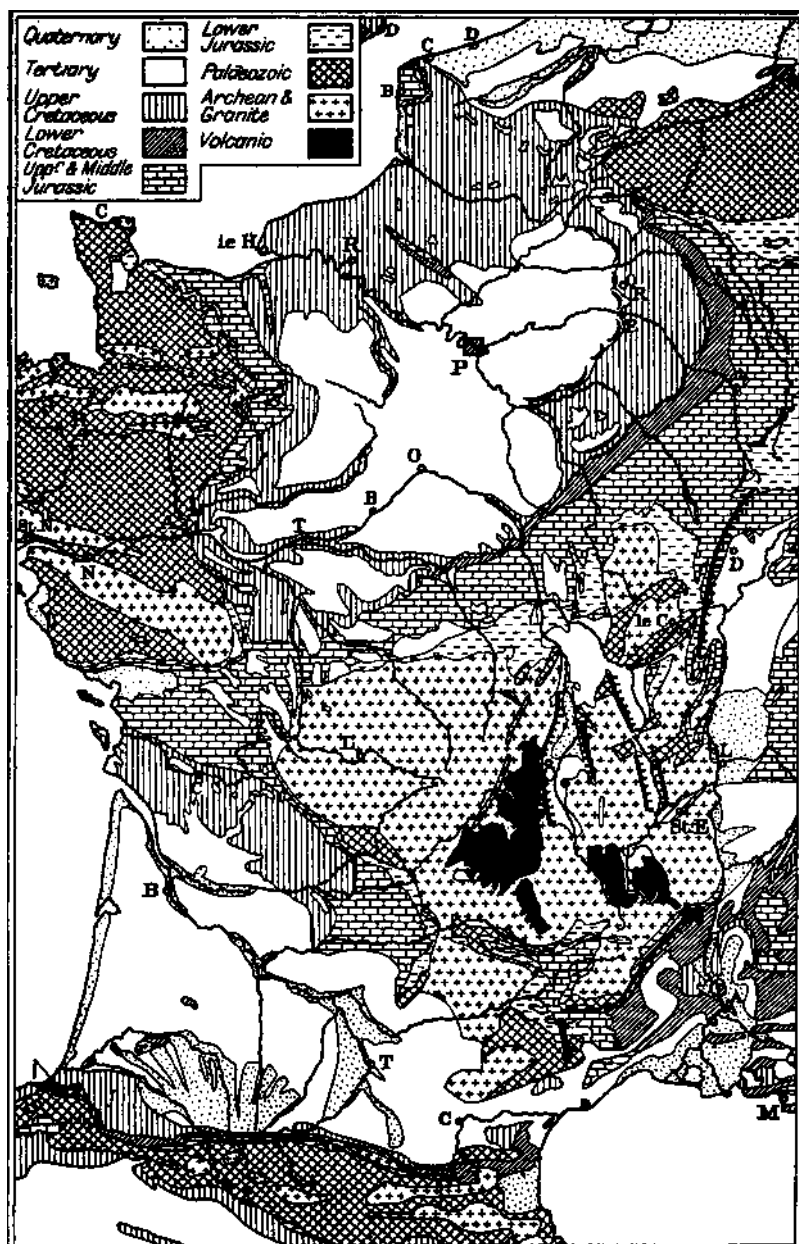


FIG. 36.—STRUCTURE OF CENTRAL FRANCE.

Between the Marne and the Oise is another tract, Valois, distinguished by the occurrence of a still lower stratum of limestone, generally covered with a fertile loam, but there are also patches of sand on which are woods. Elsewhere, too, in the lie de France wooded, sandy or clayey layers outcrop ; e.g. the forest of Fontainebleau (Fon.) is on a sandy stratum situated between the limestones of Beauce and Brie.

The plateaus are separated by broad and often marshy

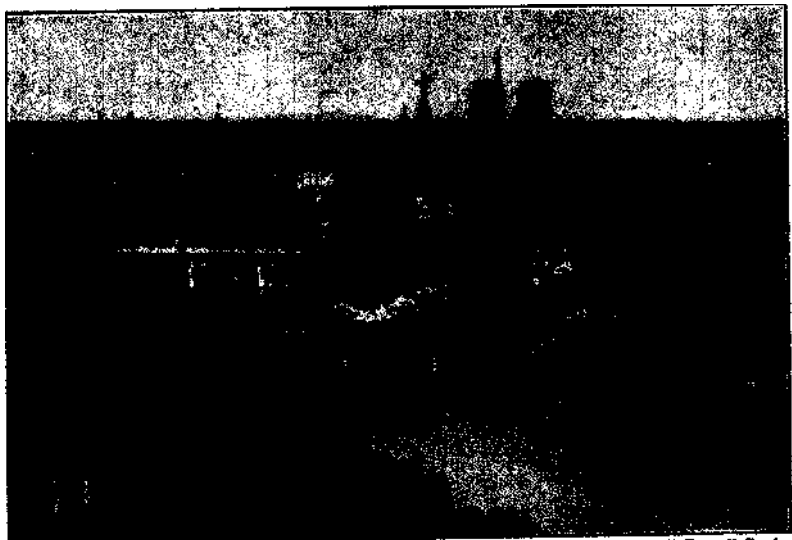


FIG. 37.—VIEW IN PARIS.

"Yoon," Paris.

Note.—The photograph was taken looking up-stream to the island in the Seine, the "He de la Cite," the nucleus of Paris; on the island are to be seen the towers of Notre-Dame. The view shows the shorter bridges spanning the Seine on either side of the island as compared with that across the undivided river; below this bridge are a few of the many barges which load and onload on the quays of Paris.

valleys, and in that of the Seine Paris grew up at a site where an island facilitated the bridging of the river. The position of Paris ensured its future importance : a north—south route here crossed another leading from east to west down the Marne and the lower Seine ; further, its central situation in the He de France early made it the natural seat of the kings of France, and with the development of the French territory it became the capital of the modern State.

As the seat of the Government and at a meeting-place of routes, it became a trading and residential centre, to which new roads were made and railways were built from all parts of France,

and indeed from all western Europe. Also, the River Seine is now navigable between the sea and the capital, and from the neighbourhood of Paris canals complete the natural communications of its tributaries : the Oise is joined to the North Sea Lowlands, the Marne to the Rhine valley, the Yonne to the Saône valley, and the Loing to the Loire valley. With this increase in its commercial significance and with the accompanying growth of its population, Paris was in a most favourable position for manufacturing and for the production of goods of almost all kinds; it is famous for articles of clothing or adornment for which skill and artistic taste are required. Paris is the artistic and intellectual, as well as the political, capital of France, and its great treasury of art, the Louvre, draws visitors from all parts of the world.

Paris now has a population of nearly three million persons, while the whole conurbation of which it is the centre has spread along the neighbouring valleys and on the adjoining plateau areas, absorbing many outlying towns, until the total population exceeds four millions.

The east-facing escarpment of the *He de France* has a peculiar importance, for on its lower slopes limestones with a covering of vegetable humus provide a suitable soil for the vine, and where there is a favourable exposure are the famous vineyards from which champagne wine is obtained. Also the Marne has here cut through the escarpment and formed a wide valley, into the opening of which the champagne vineyards extend. At this opening is the town of Epernay, and some miles to the north, at the foot of the escarpment, is Reims (Rheims); these two towns are the great wine centres of the district. At the base of the escarpment of Tertiary rocks, the chalk of the Upper Cretaceous comes to the surface, and at and near Epernay and Reims it has been hollowed out into great labyrinths of caverns ; here, where the underground temperatures remain even, the wine is matured.

The " Dry " and " Wet " Champagne Regions.—The term champagne as applied to wine comes from the name of the old French province, which included this vine-growing area. The province, however, extended far to the east, where it comprised the greater part of two markedly contrasted geographical regions; these have long borne the names *Champagne pouilleuse* and *Champagne humide*, indicating the beggarly and dry nature of the one **and** the wet condition of the other.

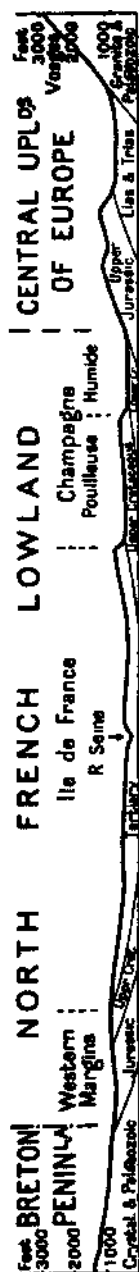


FIG. 38.—SECTION THROUGH NORTHERN FRANCE.

The contrast is due directly to the Secondary strata which rise from below the Tertiary escarpment of the He de France (see the section in Fig. 88). Immediately to the east the Upper Cretaceous chalk comes to the surface, forming at first a low belt of country, but then rising to the bare plateau of the "Dry" Champagne (IIa in Fig. 85); here there is little cultivation, and poor pasture lands on which sheep feed are the chief resource of a small and scattered population. At the northern and southern ends of this chalk plateau, coverings of Tertiary deposits give rise to more wooded landscapes; the southern area, that within the great westerly bend of the Seine, is the Forest of Othe.

Eastwards the chalk forms an escarpment, beneath which outcrop the Lower Cretaceous clays to which the character of the "Wet" Champagne (lib) is due. Although naturally forested and marshy, when drained its soils are capable of producing crops and rich pastures, and now it is a tract of agriculture and cattle rearing. This low Champagne region is bounded eastward by the wooded heights of the Argonne (Arg.) and by the more gradually rising uplands of the C6tes de Lorraine; these may be regarded as the beginning of the Central Uplands of Europe.

The Channel Plateaus.—From beneath the Tertiary layers of the He de France, the chalk emerges northward to form a series of plateaus (III in Fig. 85); these extend to the coast of the Channel, largely in the form of low cliffs, though where the coast faces westward between Dieppe and Boulogne the westerly winds have built up sand-dunes.

At the north-eastern end the chalk is bent up into the "swell" of Artois, which is a lower continuation of the Wealden Uplift of south-eastern England. Adjoining the channel the anticline is sufficiently great for the chalk top to be worn off,

as it has been in the Weald; the underlying strata, among which is a good deal of clay, have been exposed and worn down into a lower area around Boulogne known as the Bas Boulonnais. This low country is a relatively wet, cattle-rearing district, while the surrounding chalk regions of the Haut Boulonnais and the hilly Artois are drier.

This Artois plateau is not, however, poor country like the Champagne pouilleuse, for the chalk is largely covered by deposits of loam or loess with a fertile soil producing much wheat, fodder crops such as clover, colza, from which oil is obtained, and beetroot; after the harvests sheep are turned out to graze on the fields. Continuing the Artois tract to the south-west is Picardy, essentially similar in character; here the folds of the chalk, almost parallel to that of the Wealden-Artois anticline, give rise to an undulating country with the trends running south-east to north-west, and in the same direction the rivers drain to the Channel, the largest being the Somme. On the south-western border of Picardy, one of the anticlines is so marked that the chalk top has been worn away, and the resultant long and narrow Pays de Bray ("P.B." on the map) is a relatively low tract much like the Bas Boulonnais.

South-west of the Pays de Bray the chalk appears again in the low plateaus of Normandy; much of it is covered with "clay with flints," or, south of the lower Seine, with Tertiary deposits, often loamy in composition. While the plateau areas show much open cultivated country, the valleys have more trees and pasture; as a whole, Normandy is a province of varied productions and varied relief. The most marked features of the relief are seen in the valley of the Seine; here the river has been incised deeply into the plateau.

Near the head of the tide on the Seine is Rouen, and here is much interchange of goods from sea-going vessels to inland barges; here, too, was the lowest bridge-place on the river. Now Rouen has a greater amount of traffic than any other port of France. In and around the city are many factories in which cotton and other textiles are manufactured, while there are also other industries in the neighbourhood; Rouen is consequently one of the larger cities of France.

The coasts of the North French Lowland are on the whole not such as to facilitate maritime activities, but the easy crossing to England has given rise to the ferry ports of Boulogne, which

is also an important landing-place for fish, Dieppe and le Havre. The foreign trade of le Havre is very considerable ; it is the outport of Paris and Rouen, specially constructed to accommodate the large vessels which cannot proceed up the Seine ; it imports the cotton for Rouen and the other manufacturing towns of North France, and through it passes much of the foreign produce needed for Paris and for the North French Lowland in general.

In the *Western Margins* of the North French Lowland (marked IV), there is a gradual change to a more diversified region. Here the Cretaceous and Jurassic strata which rise to the surface are not so thick nor have they the same clearly contrasting characteristics as in the east, though limestones, sandstones and clay still bring variety to the country; the strata, however, rise in parts to greater elevations than are found elsewhere in the North French Lowland. Near the coast is the dry limestone plateau of Caen ; elsewhere fields alternate with heaths and woods, and the general appearance of the landscape suggests a transition to the adjoining Breton Peninsula.

The Middle Loire Basin.—The River Loire, between its exit from the Central Plateau and its lower course across the region of the Breton Peninsula, traverses and drains a broad and generally low area which continues the structure of the North French Lowland. This Middle Loire Basin is marked V on the regional map.

Here are all the strata found elsewhere in the North French Lowland region, but they are generally thinner and have narrower outcrops, and also they have been less upraised than in the more northern parts of France ; consequently they do not form wide plateaus, nor have they been etched out into such marked escarpments. Moreover, the Middle Loire Basin includes in the south a part of the belt of Jurassic limestones which, farther east, have been raised to form part of the north-eastern projection of the Central Plateau and also the C&tes de Lorraine (compare the regional and geological maps). Here in the Middle Loire Basin, on the western side of the Loire, the belt is lower and the limestones form the dry plains of Berry.

Although there are not marked differences in the relief of the Middle Loire Basin, its varied structure expresses itself in a diversity of scenery and productions, so that it is difficult to give a short summary of the characteristics of the region from

these points of view. But the generally low altitude and the more southerly situation of this part of the North French Lowland result in relatively high summer temperatures, and of these the people have taken advantage to grow great quantities of vines in the valley of the Loire and its southern tributaries.

Agriculture is the predominant occupation of the region, which as a whole is of moderate fertility. Cereals, especially wheat, are the main product; in addition, fodder for animals is grown, for on the better watered areas cattle are largely kept and sheep in drier parts, such as the open lands of Berry and also in the Soioigne, once marshy but now drained.

In past centuries the basin of the Loire was relatively a more important part of France than it is at present; Orleans at the nearest point to Paris served as a link between the metropolitan region and the centre of France, and from Orleans down the valley there is still to be seen a succession of finely built castles, e.g. at Blois, Tours, Saumur and Angers.

At its south-western end the basin of the Middle Loire narrows to the Gate of Poitou, which leads to south-western France.

The Breton Peninsula.—By comparison with the broad open fields of the North French Lowland, the Breton Peninsula is shady country, with small fields enclosed by hedges and with a good deal of tree growth. The distinction is largely due to the irregular relief of the land and to the abundant surface water, and these characters are themselves the result of the occurrence of older and impermeable rock and the heavier rainfall of the region. Hence the boundary between the North French Lowland and the Breton Peninsula is drawn where the impermeable rocks of Palaeozoic and Archaean age emerge from beneath the sedimentary strata already described, and project westward between the Channel to the north and the Bay of Biscay to the south. Since the greater part of this area formed the old province of Brittany, the name Breton Peninsula is here used, although the region includes the western part of others of the old provinces, notably Normandy and Maine. The peninsular position of the region gives it the equable and rainy climate which marks it out as part of the Atlantic Margins minor region of Temperate Europe. The contrast between the conditions at Brest and at Paris are shown by the figures on p. 26.

Moreover, the structure of the Breton Peninsula, one of the " Hercynian " uplands, distinguishes it from the neighbouring

regions of France and, together with the climate, makes it resemble the Devonian Peninsula of England in many respects.

The plateau was raised a relatively little distance above sea-level, and rivers have etched out the less resistant rocks, leaving the more resistant ones as ridges or bosses of moderate height. The direction of these elevations corresponds with that of the old mountain systems : in the north from west to east, and in the south a tendency to the south-east; consequently the present triangular-shaped region shows, at the Atlantic corner, parallel ranges near the north and south coasts with a narrow low belt between them, while on the continental side of the triangle there is a broader northern upland area forming the heights of Normandy and Maine, then a wide lowland through which the Loire enters the sea, and in the south the Gatine upland trending south-eastward before it disappears under the Gate of Poitou.

Uplands versus Lowlands.—The structure is the main cause of the differences between the uplands and the lowlands of the Breton Peninsula—one of the three great contrasts which the region offers to the observer.

The uplands, both those near the western extremity and those near the eastern margin, reach 1,000 feet and more above sea-level ; frequently they are in the form of long ridges composed of Archaean crystalline rocks, such as gneiss or quartzites, or of resistant sandstones ; in other cases they are broader and more rounded in form and composed of granite. On these rocks poor stony soils have developed, and the wind-swept, rainy uplands generally bear a heath-land type of vegetation ; in parts water collects in the hollows of the impermeable rocks and forms pools, while marsh plants grow in a peaty soil.

Between the uplands the lowlands have been worn down in the less-resistant slates or shales ; here clayey soils have been formed, and though naturally ill-drained and wet and once densely forested with oaks, they have proved capable of utilization. There are meadows on which many cattle are reared, largely for the production of milk and butter ; there are fields in which cereals and vegetables, especially potatoes, are grown ; there are orchards from which large amounts of apples are obtained, and in this part of France cider made from the apples takes the place of wine. The most extensive lowland area is the "Basin of Rennes," in the centre of the region, situated between

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EUROPE

BY

J. F. UNSTEAD, M.A., D.Sc.

**FORMERLY PROFESSOR OF GEOGRAPHY IN THE
(UNIVERSITY OF LONDON)**

**WITH NUMEROUS MAPS AND
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PREFACE

THIS study of the lands and peoples of Europe is written primarily for the use of students taking " Intermediate " or " General " courses towards a University degree, " Higher School " examinations, or courses in Training Colleges.

It aims at providing a twofold training : in the first place it not only presents facts but points out their significance and how they may be correlated ; in the second place, it shows the interaction between the facts of geography and those human affairs, economic and political, which are the concern of all.

From both points of view a study of Europe is important. To the geographer, this continent offers a great variety of conditions within an area small enough to be studied in some detail and with some approach to actuality. To every man, the economic and political affairs of Europe influence his own life whether he lives within the borders of the continent or beyond the seas.

Yet a study of Europe involves considerable difficulties, for it is scarcely too much to say that it confronts one with a mosaic of geographical units, a jig-saw puzzle of nationalities and a kaleidoscopic picture of States ; one has to work out a method of recognizing order and causation in this complexity, for the three factors cited above overlap and conflict in a most confusing manner. In many cases, the natural unit of the geographer, e.g. the Rhine Rift Valley, the Alpine Highland or the Lower Hungarian Plain, is inhabited by people of more than one nationality and divided among two or more States ; again, the fact that the limits of the nationalities by no means correspond with those of the political divisions is the origin of some of the most serious problems of Europe.

Because the various States bear so little relationship to geographical regions, and also are liable to sudden and catastrophic changes, it seems to the writer impracticable to arrange a study of Europe according to the political divisions ; hence this book has three parts.

Part I makes a general survey of the continent as a whole—its relief and structure, its climates, soils and vegetation, the

types of land-utilization and production and, by combining these factors, the major geographical regions; at this stage, also, a general survey of the peoples and States of Europe is given. The broad pattern of the distribution of the physical and human elements is thus brought out.

Part II presents a more detailed study on the basis of the natural or geographical regions which comprise the continent : the major and minor regions and, except in eastern Europe, the sub-regions. These are treated as units, and in each the interrelations of the physical and human factors are considered. This is the longest section of the book, and in it the economic conditions are given special attention.

In Part III each of the States is dealt with in turn. Their physical and economic foundations are reviewed, the peoples who form their populations are considered, and an examination is made of the boundary changes of recent years and of those international problems which are either influenced by geographical factors or have geographical effects. In this section, facts are stated without prejudice, causes and consequences are pointed out, but judgments are deliberately withheld as unsuitable to a geographical text-book.

The relative space allotted to the various parts of the continent has been determined partly according to their importance as the homes and work-places of large populations or of characteristic groups of people, and partly according to the nearness to Britain.

A large number of maps have been specially drawn to illustrate the text. These deal with all aspects of the geography, but the available space has been used to supplement, not to duplicate, the maps to be found in atlases; it is assumed that an atlas will be constantly used with this book.

Questions have been added, in many cases designed to require a reconsideration of the facts and ideas already given and to promote individual thought.

The writer cordially thanks Mr. L. Brooks, M.A., Mr. G. J. Cons, M.A., Professor C. B. Fawcett, Dr. H. A. Matthews and Dr. S. W. Wooldridge, who have each read the draft of parts of the book and have given advice which has been gratefully accepted.

J. F. U.

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NOTE

IN March, 1939, while this book was being printed, the State of Czecho-Slovakia was dismembered ; Germany established one Protectorate over Bohemia and Moravia and another over Slovakia, while Hungary annexed Ruthenia (Carpatho-Ukraine). The political boundaries on the end-paper maps have been altered to conform with these changes, and on pages 344 and 345 the geographical consequences are described in such a way as to bring Part III of the book up to date. The statements made in Chapter XIX regarding the States of Germany and Hungary must therefore be modified by the facts given on pages 344 and 345.

The account in Chapter XIX of the conditions of Czecho-slovakia, as it was just before March, 1939, explains the fundamental political and economic factors in the problems and relationships of the three States ; many of these factors, though modified in certain respects, still remain and are still important in the human geography of Central Europe. Similarly, the map of the earlier boundary changes in Czecho-Slovakia (Fig. 80) is still useful in showing important features of the areas which have now passed into the possession of Germany and Hungary.

In April, 1939, following disagreement between the governments of Italy and Albania, Italian troops overran Albania. The King fled, a group of Albanians offered the Crown to the King of Italy, and the two States were thus united.

April, 1939.

PART I

EUROPE AS A WHOLE

CHAPTER I

RELIEF AND STRUCTURE

Introduction.—If we want to understand the nature of any region and the manner of life of its people, and we trace back to the reasons for the facts, we find that the most fundamental consideration is the position of the region in the world—its situation on the globe.

That position has, in the past, determined the way in which the region has shared in the great earth movements which have, for example, raised some areas to broad highlands, subjected some to foldings producing mountain systems, or lowered others, in some cases even below sea-level; in other words, the position has determined the broad features of the relief and structure of the region.

The main characteristics of the climate are similarly due to its position on the globe, which exposes the area to the influence of the sun and to that of one or more great wind-systems, while the relief also influences the climatic conditions.

Climate and relief together are directly or indirectly the chief factors conditioning the type of vegetation which can live in the region, and this in turn has a great influence on the agricultural and pastoral work by which many of the people get their living.

Of course, the environment of a people does not *determine* their work, nor their particular manner of life, for different peoples are at different stages of development and have different traditions and habits. Yet the position of a region in relation to other regions, either near at hand or far away, has been one of the main factors in aiding the immigration of peoples and ideas, and so affecting the character of the population and their mode of life. Moreover, the incentives and opportunities which their environment may offer influence their further development.

The position of regions may therefore be regarded from several points of view, and in each of the earlier chapters of this book, which deal with the general characteristics of Europe and its peoples, we shall examine the position of the continent from the particular aspect with which we are concerned. Accordingly, we will now consider how the varied relief and structure of the continent are related to the situation of its constituent regions.

A relief map of Europe shows at once a marked contrast between the relatively level and unbroken east, and the remaining part of the continent which is diversified by many uplands and lowlands and, moreover, is divided by invasions of the Atlantic waters and by inland seas. This fundamental distinction as to relief and outline affects practically all aspects of the physical and human geography of the two contrasted regions, known sometimes as "Trunk Europe" (because it forms part of the great trunk of the Euro-Asiatic land-mass) and "Peninsular Europe" respectively. The cause of the contrast lies in the fact that whereas eastern Europe is situated in a part of the globe which has been relatively stable through much of its geological history, the rest of the continent has been involved in repeated disturbances and dislocations of the crust of the earth.

In Peninsular Europe, on the north-west margin of the continent, one group of highlands stands out clearly and will be first considered.

The North-western Highlands.—The Highlands of Scotland-and-the north of Ireland resemble in many ways, though on a smaller scale, the Highlands of Scandinavia because they have shared the same geological history."

Some of the rocks comprising these regions were formed before the Palaeozoic Era, i.e. before any life appeared upon the earth ; even at that time the surface was contorted, and these earliest rocks were folded into great mountain ranges, but of these denudation has by now removed all but the deepest roots.¹

During the Palaeozoic Era other rocks were formed, and in the Devonian Period there occurred a series of dislocations of the earth's crust which were called the " Caledonian " earth-movements because their effects were studied in the structure of Scotland. At this period the rocks were subjected to great

¹ A time-sequence of the geological periods and the great earth-movements is given in Appendix I.

foldings in a general south-west to north-east direction. As a result the Caledonian mountain system arose, which extended over all the region now forming the north-western margins of Europe (see Fig. 1), including Spitsbergen far to the north of Scandinavia. In the course of these disturbances much of the rock was metamorphosed into crystalline forms, including schists and gneisses, while there are also large areas of granite, gabbro and other resistant igneous rocks.

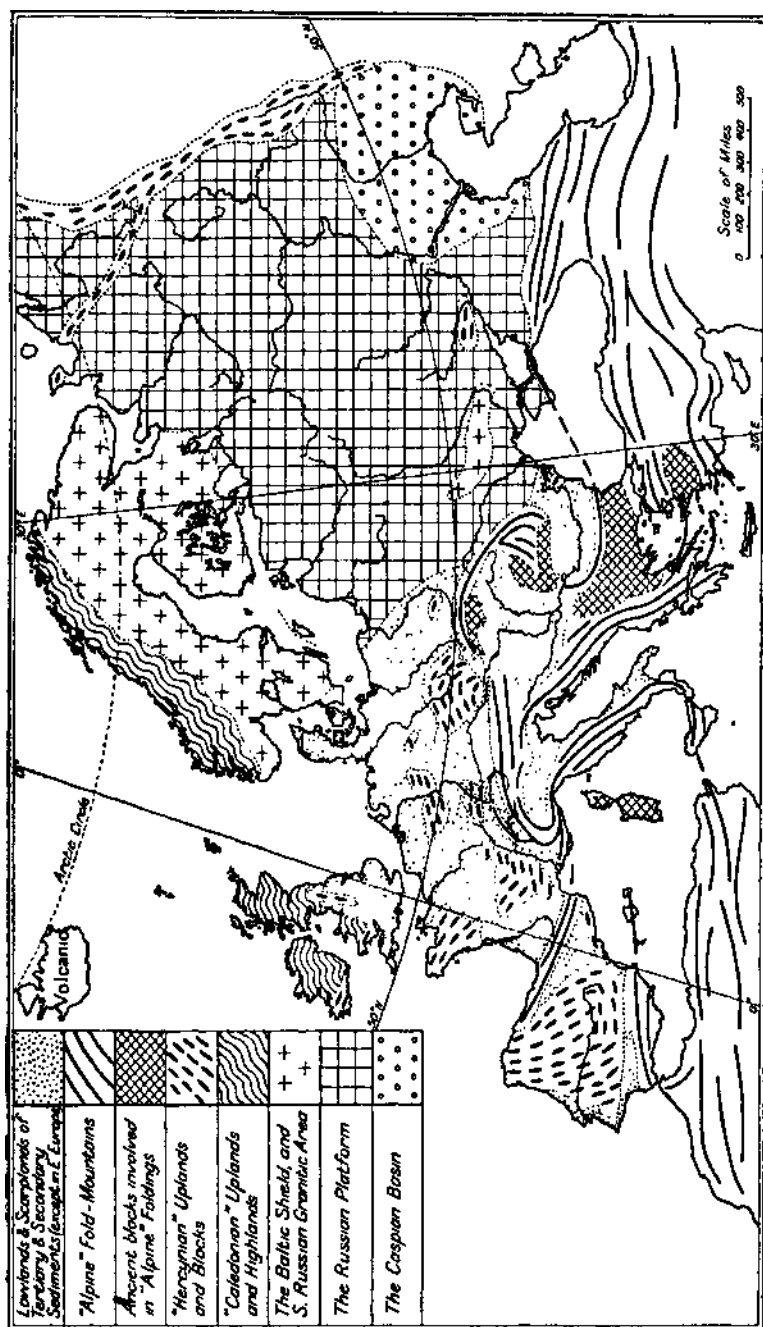
From this period onward through the Secondary Era the great mountain system was worn down to the condition of a peneplain, and only its stumps remained. Then, in the "Alpine" earth-movements of the Tertiary Era, the region again suffered disturbance, this time by faulting and the uplift of some of the resultant dislocated blocks and the subsidence of others. At this time, too, that part of the earth's surface now under the Atlantic waters was detached from the continental platform from which the lands of Europe rise, and the present shape of this margin of Europe was determined.

On the continental side, the blocks were raised probably in more than one stage, so that a low terrace-like step was formed between the sea and the great plateaus which in the Dovre Fjeld now reach over 7,500 feet and in the Jotun Fjeld over 8,000 feet (see Fig. 2). Moreover, the area was dislocated by faults running in several directions, and along these cracks there occurred both subsidences and also lines of weakness along which rivers eroded deep valleys in the plateaus.

Through such cracks and vents in the earth's crust, the pressures associated with the Alpine disturbances forced volcanic material in a number of places, and the Faroe Islands and Iceland in the far north-west are almost entirely formed of these volcanic accumulations.

In the Ice Age, snow accumulated on the high plateaus and ice was formed which worked its way down the valleys, deepening them and changing their section from V-shape to U-shape. In many other ways, too, glaciation played a part in producing the present relief; and its general importance is so great that we may at this point consider it further, although its influence extended far beyond the limits of the North-west Highlands.

At one stage the climate was so cold and precipitation was so great that the great ice-sheet from the Scandinavian Highlands and the smaller ones from the British Highlands extended south-



ward as far as the broken line marked as the maximum extension of the ice on the map showing the distribution of glaciation (Fig. 3). After this period, the climate became warmer, the southern part of the ice-sheet gradually melted and its edge lay progressively farther north ; this continued until the climatic improvement ceased and the margin of the sheet remained in the same position. Here lines of terminal moraine, composed of boulders, gravels, sands and clays, marked the end of this stage in the retreat of the ice. In the area between the outer margin of the earlier ice-sheet and the terminal moraines, there was now visible a layer of boulder-clay, the ground moraine formed below the ice in its wider extension. Also, melted ice-water washed away clayey and sandy material from the later terminal moraines, and much of this was deposited upon parts of the ground moraine ; occasionally such sheets of gravel and sand covered considerable areas. At later periods, with other climatic changes, the ice-edge withdrew farther, and the various stages in the retreat of the ice are therefore marked by alternations of lines of very irregular and often hilly terminal moraines, and flatter stretches of clayey or sandy character. Since the farthest southward advance of ice occurred, there has elapsed sufficient time for streams and weathering to reduce considerably, and to smooth out to some extent, the glacial deposits, but some of the later series remain so little affected that they dominate the landscape and largely control the way in which man uses the land.

An important effect of the ice was to obstruct or alter the courses of the streams, and in many parts this is now shown by rapids in the rivers and by the presence of lakes or swamps. Immature river-development and poor drainage are frequent characteristics of glaciated regions.

In general, the areas from which the ice worked its way outward are those in which its scouring action predominated, while the marginal areas of glaciation are those of deposition. Hence, over parts of the North-western Highlands region the soil was completely worn away and bare rock is the witness of the action of the ice, while in other parts are the coarse gravels and sands of the later terminal moraines. Taken as a whole, in the northern regions glaciation has made surface conditions more difficult for man's occupation and use ; on the other hand, some of the glaciated regions of central and western Europe have

benefited by the finely ground and fertile material brought from the north.

Another very important element in the evolution of the North-western Highlands was a succession of changes in the relative level of land and sea which have occurred several times since the Alpine dislocations, and are still in progress. These changes

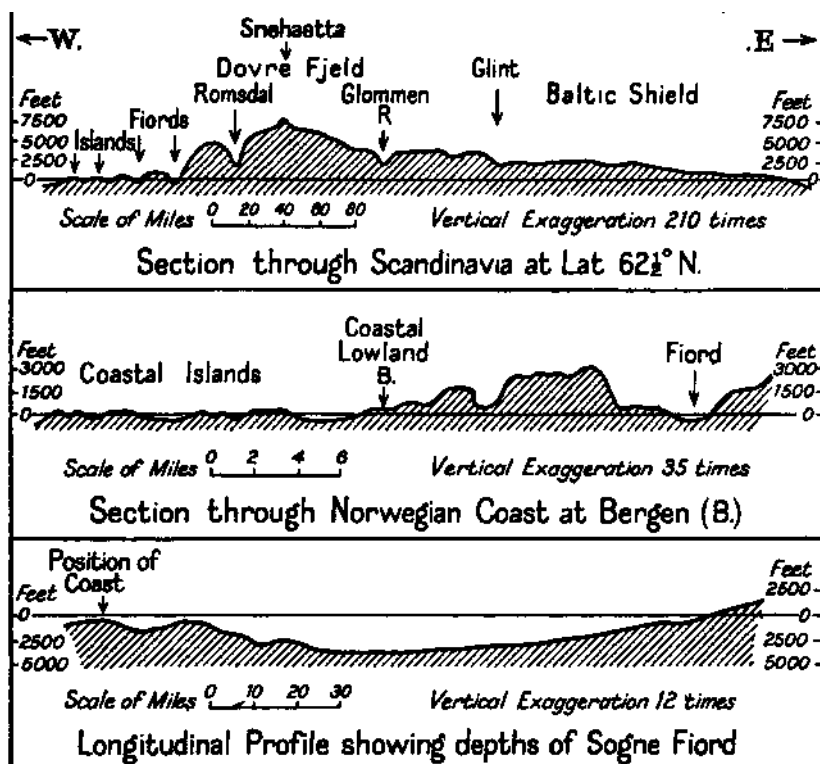


FIG. 2.—SECTIONS SHOWING RELIEF OF SCANDINAVIA.

may be due either to alterations in the level of the sea or to the slow risings, sinkings or tiltings of the land masses; in this part of the world the broad result has been a general sinking of the continental margin as compared with the Atlantic waters, and consequently the shores have been partially "drowned." The low terrace off the Norwegian coast has been reduced either to several small archipelagoes or to narrow patches of lowland extending beyond the highlands (see middle section in Fig. 2).

Also, the lower parts of the valleys, whether due to faulting, to stream erosion, to scraping and deepening by ice, or to a combination of these processes, have been invaded by sea-water and have become the wonderful fiords, with great side-branches leading inland, in some cases for scores of miles. Usually the fiords have steep or even vertical sides, rising to many hundreds of feet, while below the quiet waters are corresponding depths (see bottom section in Fig. 2). Apart from the narrow patches of coastal lowland the only habitable areas are either at the heads of the fiords or at the sides where old terraces interrupt the mountain slopes ; they give landing-places when they are at the water-level, and fields and pastures when they are a little above it.

The influence of this history and its resultant land-forms on human occupation will be considered in detail later. Yet it may be at once observed that it is in the main unfavourable, although the indented coast affords harbours for seafaring. Less obvious is the fact that the enormous amount of denudation has brought the surface of the earth down to the level of the minerals, originally formed in the depths, and now able to be reached by man ; iron and copper ores are therefore among the rather scanty resources of the Scandinavian Peninsula (see Fig. 6).

Another very important result of the geological history is the modification of climatic conditions by the upraised continental margin bordering the ocean. The precipitation of rain or snow is concentrated, as it were, along the coast and on the neighbouring mountains, while in the lee of the great barrier the Baltic lands are relatively dry. Similarly, the moderating influence of the oceanic winds is mainly limited to the Atlantic margins ; behind the highlands continental conditions at once begin, and from Sweden right across north-eastern Europe and far into northern Asia extend regions where the long, severe winters allow the growth only of the tundra or coniferous forest vegetation.

. **The Baltic Shield.**—The Scandinavian Highlands descend, often by a marked drop, known as the Glipt (see Fig. 2), to a great region which dips gently eastward under the Gulf of Bothnia and rises again in Finland, thence sinking in northern Russia till its border is largely covered by the waters of the Arctic Sea, the White Sea and Lakes Onega and Ladoga. Because this

region is slightly concave towards its centre under the northern arm of the Baltic Sea, and thereby resembles an inverted shield, it has been termed the Baltic Shield. It is one of the most ancient land surfaces on the globe, for it is composed of highly resistant granites, gneiss and crystalline schists which, although folded in the dim geological past, before life appeared upon the earth, have remained almost undisturbed during and since the Palaeozoic Era. Faultings have let down parts where relatively small areas of Palaeozoic sedimentary rocks have been preserved,

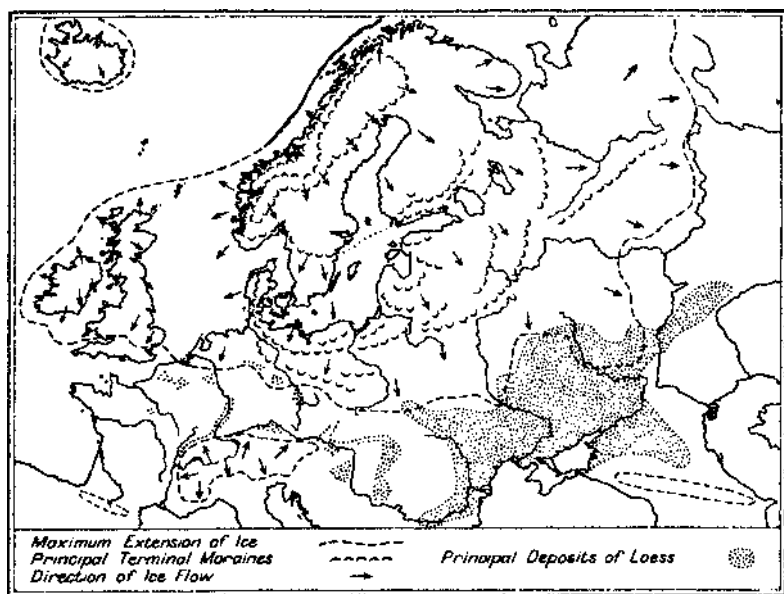


FIG. 3.—DISTRIBUTION OF GLACIATION AND LOESS.

and where the surface is rather lower than the rest, as, for example, in the "Lake Belt" of southern Sweden, in which are situated Lakes Vaner, Vatter and Malar.

For the most part the bed-rock forms undulating country in which the characteristic land-forms are due to glaciation. Near the southern margin there are long lines of hilly terminal moraines, behind which the glacial deposits are still so abundant and so recent that rivers have not been able to develop mature drainage systems. Their courses are irregular, and lakes are numerous. In central Finland, indeed, lakes and marshes cover much of the country and the roads make use of long,

narrow, winding ridges which stand above the waters; these are asar, or eskers, trains of gravel and sand deposited beneath or on the margins of the ice-sheet.

Yet over large areas the naked rock is exposed, for much of the soil was scraped away by the ice and transported to the surrounding regions ; nor was this loss remedied in the lower areas near the Baltic Sea and the Gulf of Bothnia by the deposit of sandy or clayey material when, for a time, the waters spread farther over the land.

Although the ancient rocks contain certain minerals, the Baltic Shield has proved a generally inhospitable region to man, even apart from its climatic conditions.

3. The Hercynian Uplands.—As the mountains of the north of the British Isles are akin to the Scandinavian Highlands, so the uplands of the south of Ireland and of the south-west of England and Wales are akin to a number of others scattered widely over the continent. They are known as the Hercynian Uplands because they represent fragments of mountain systems folded in the Hercynian earth-movements which occurred at the close of the Carboniferous Period. These mountains were continuous over great areas, though their traces are now found only in scattered fragments, and their folds ran in various directions. In the south-west of Britain and the adjoining region of Brittany, the general direction was about west to east with a trend to the south-east towards the centre of France, as is shown by the direction of the lines in these areas in Fig. 1 ; folds running in this direction are referred to as Armorican, from the ancient name of part of Brittany. In central Europe, however, the common direction is from south-west to north-east, termed Variscan, from the name of a tribe long ago living in the neighbourhood of the Fichtel Gebirge.¹ The Variscan direction is seen in the structure of the Rhine Plateau, which is cut across by the Rhine in its course between Bingen and Bonn, and also in the Harz Mountains, the Vosges and the Black Forest Mountains. In the Central Plateau of France both directions are seen, and still others appear in other regions, notably in the central tableland, or " Meseta " of Spain, in the " Diamond " formed

¹ Both the term " Armorican " and that of " Variscan " are sometimes used to denote all these foldings and all the regions of this type, but it seems best to restrict them as is here done, and to employ the term " Hercynian " in the general sense. " Hercynian " is derived from the old name of the Harz Mountains, one of the regions of this type.

by Bohemia and its margins, and in the Lysa Gora -Uplands of Poland. Even in eastern Europe are two similar Hercynian areas, viz. the Donetz Plateau in the south, and the Ural Mountains, with their offshoot, the Timan Uplands, on the borders of Asia.

The various mountains formed by the Hercynian movements have had a history somewhat like that of the older Caledonian mountains ; they were worn down to peneplains, so that the directions of the folds showed only in the strips of the various strata outcropping along the surface, like the graining of the wood in a sawn tree trunk. The Hercynian peneplains later suffered changes : over some areas they were depressed and upon them were laid down sedimentary rocks during the Secondary and early Tertiary Eras, and in the succeeding Alpine earth-movements they were considerably fractured, tilted, upraised or depressed.

Consequently much of what continuity they had previously shown has disappeared, only those parts which stand up above the surrounding lowlands being clearly recognizable as Hercynian Uplands of the usual type. These, which are shown as such on the map of structural regions in Fig. 1, were uplifted to plateau-like form, with more or less level surfaces, but denudation has since removed most of the overlying sedimentary rocks of Secondary and Tertiary date, and has exposed the older rocks of the peneplains with their graining ; even in this older rock the less resistant strips have been etched out so that the more resistant stand up above the general level as ridges running in the direction of the original mountain-folds.

Where an uplifted mass is bounded by clearly marked, and more or less parallel, faulted edges, it is known as a " horst," and such structures are common in the Hercynian Uplands. The converse of a raised horst is a rift-valley, which has subsided between two parallel series of faults. One very important rift-valley is that in which the Rhine flows between Basel and Mainz ; the parallel faults which bound it are shown in the map in Fig 46, and the section in Fig. 47.

In many cases, uplands due to dislocation rise steeply on one side where they are bounded by marked faults, and descend more gently in other directions ; structures of this kind are commonly known as " massifs " and are exemplified by the " Massif Central " or " Central Plateau " of France, which is fault-edged where it overlooks the Rh6ne Valley.

The dislocations which broke up the Hercynian areas allowed igneous material to be forced up along faults and through volcanic vents, and in several parts, notably in the Central Plateau of France, great sheets of lava and the remains of volcanic cones bear striking witness to this part of the history.

In the rocks of the Carboniferous Period which enter into the structure of the Hercynian regions, there were formed widely extending coal-measures containing seams of valuable coal, and these coal-measures were involved in the Hercynian foldings. Where they formed parts of the upfolds which were first denuded, the coal-measures have been worn away, but where they formed parts of downfolds or basins they have, to a certain

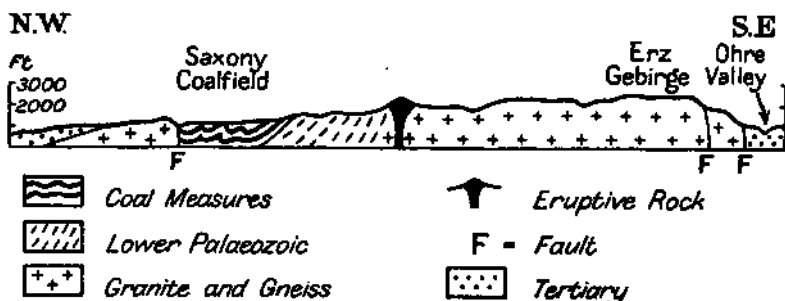


FIG. 4.—SECTION THROUGH THE SAXON UPLANDS, ERZ GEBIRGE AND EGER (OHRE) VALLEY.

extent at least, been preserved. Consequently there are important coal-fields associated with some of the Hercynian Uplands, and these, together with other mineral resources found in their exposed rocks, are the basis of mining and manufacturing industries which have attracted people to the mineral-bearing areas.

The structure of the Hercynian Uplands is illustrated in Fig. 4 by the section through the Erz Gebirge and Saxon Uplands; this area exhibits most of the elements described above.

Yet in general the Hercynian Uplands are not well populated, for they are not productive agricultural regions, since, as they stand above the surrounding lowlands, they have a relatively cool and moist climate, and also they do not usually bear fertile soils. Hence they naturally tend to be heath or moor lands or to be clothed with forests.

4. Central and Western Lowlands and Scarp-lands.—After the Hercynian earth-movements and the later wearing down of the resultant mountain systems, most of Europe, except the north, was submerged under the waters of seas or lakes. This submergence was, however, not uniform over the whole of the southern part of the present continent; some parts were beneath relatively deep seas in which was deposited the ooze from which limestones were formed, while other parts were covered by shallow seas or lakes in which clay-forming muds were laid down, while elsewhere sand was dropped which was changed to more resistant sandstones or remained in an unconsolidated form. Moreover, alterations in the depths of the various parts brought differing conditions first to one region and then to another, and thus at a given place there might occur first the formation of sandstones, then of limestones, and later perhaps of sands or clays.

Thus over wide areas of central and southern Europe there was a succession of deposits of varying composition during considerable parts of the Secondary and Tertiary Eras, and consequently thick strata of sedimentary rock covered platforms of more ancient formation.

Where, in the Alpine earth-movements, the platforms and their coverings of Secondary and Tertiary sediments were broken and upraised, the Hercynian Upland regions were formed as has been described above, but in the less-disturbed areas the strata remained at a lower elevation and the sedimentary cover was less exposed to denudation. In central and western Europe this was the case between and around the blocks of the Hercynian Uplands, where basins were formed such as those of south-eastern England and northern and south-western France, or where there were broader depressions, such as that on the southern shores of the North Sea and the Baltic Sea; in these regions the older rocks are still covered by a succession of sedimentary strata lying above one another in more or less saucer-like form or in an almost horizontal position, as is shown in the section through northern France in Fig. 38. v*

In other parts the rocks have a pronounced tilt, as in England west of the London Basin, in France west of the Vosges Mountains and in Germany east of the Black Forest Mountains; in such cases the less-resistant strata have been worn away, leaving the more resistant as long, tilted slabs, and giving to the

whole region a scarp-land character. This structure is shown in the section in Fig. 48.

Moreover, in the Ice Age, parts of these lowlands were invaded by ice, especially from the North-western Highlands, as was described above, and in such parts various deposits of clays, sands and gravels were laid down.

Frequently, fertile soils have developed upon the rocks of the lowlands and scarp-lands, and agriculture and pastoral work are carried on in such forms as the generally favourable climatic conditions have allowed.

Exceptional fertility marks the soils which have been derived from a mantle of loess covering the earlier deposits in certain parts of the central and western lowlands, and over a great area in south-eastern Europe (see Fig. 3). This loess resembles that of China in its composition ; it is fine-grained, loose and sufficiently porous to allow a free downward drainage of water after rain, and a slow upward movement by capillary-action in dry weather. Its existence in Europe is due to dry climatic conditions which occurred during and after the Ice Age, when southward-blowing winds raised clouds of dust from the finely ground particles of the moraine areas, and deposited them over the surrounding lowlands until a layer was accumulated, in the west often to a depth of scores of feet, and in the east to much greater depths. In central and western Europe the existence of the loess was specially important during the period of man's early settlement and cultivation of these regions, for loess areas were usually free from forest, easily worked and gave abundant return to the simple forms of agriculture then practised.

Minerals are not characteristic of the later sedimentary rocks, though iron ores were formed in some of the Secondary strata (again see Fig. 6), and lignite deposits are found in some of the Tertiary. Yet where the older rocks of the Hercynian Uplands dip down beneath the edges of the basins, the coalfields may extend beneath the younger strata, and therefore in several cases coal-mining has spread from the Hercynian margins some distance into the neighbouring lowlands.

Because of the subsidence of the basins and hollows, the waters of the Atlantic have invaded the lowest parts, and oceanic inlets or inland seas adjoin these lands and bring opportunities for fishing and trading. Hence the lowlands and scarp-lands of central and western Europe have varied resources, and as a

whole have become the most densely populated parts of the continent.

3. The Regions of " Alpine " Folding.—Great as were the changes brought about by the Alpine earth-movements in northern and central Europe, they were but small compared with those which entirely transformed the southern part of the present continent.

It appears that during a very long period about the middle of the Tertiary Era, the block of the earth's crust which forms northern Africa moved northwards towards the similar block forming the platform of ancient and resistant rock which in central Europe underlay the sedimentary strata of Secondary and early Tertiary date. The northward movement was irresistible: the older rock structures of central Europe were broken and displaced, while the younger, sedimentary strata of the south were contorted in a most complicated fashion.

In a general way it may be said that massive sheets of limestones and other sedimentary rocks were ridged up into folds along lines which formed great curves, as indicated in Fig. 1. These curves appear to sweep round from the south of Spain across the Strait of Gibraltar into the Atlas Mountains of northern Africa, whence they are continued across the central narrows of the Mediterranean Sea into Sicily and through the Apennine backbone of Italy into the Alps; even the Pyrenees and the Cantabrian mountains of northern Spain are linked with this system, which therefore almost completely encircles the area of the western Mediterranean. A small spur from the Alpine system is seen in the Jura Mountains.

On their eastern side the Alpine folds appear to spread out, both to the north-east in the Carpathian system and to the south-east in the Dinaric Alps, thus enclosing the lowlands of the middle Danube. The southern part of the Carpathian system swings round into the Balkan Mountains, so that between these and the southward continuation of the Dinaric Alps is another enclosed area in the neighbourhood of the northern part of the *Mæan* Sea. An eastward continuation of the Balkan Mountains is probably to be seen in the Yaila Mountains of the Crimea and in the Caucasus, while those of the southern part of the Balkan Peninsula are continued in the islands of the southern *Mæan* and curve again into the mountains of Asia Minor. Indeed, the whole system extends east-

ward across Asia on a still greater scale and culminates in the highest ranges of the world.

The term "folded" is, however, inadequate to describe the^T contortions which the strata have suffered (see Fig. 5). They have been squeezed together in most complicated ways, and on the outer side of many of the curves, sheets of rock (called "nappes") measuring hundreds or thousands of square miles in area, have been thrust bodily forward over other strata till

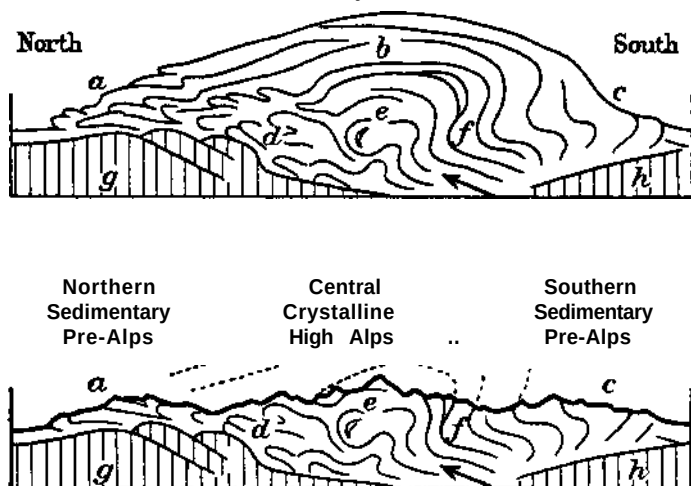


FIG. 5.—DIAGRAMMATIC SECTION THROUGH THE EASTERN ALPS.

(Vertical Scale greatly exaggerated.)

Note.—The upper diagram shows in a simplified form the contortions due to a thrust from the south. The underlying platform, *g* and *A*, is dislocated; the lower sedimentary rocks, *d*, *e* and *f*, are metamorphosed into crystalline nappes; the sedimentary nappes of the upper strata, *a*, *b* and *c*, are thrust northward (except in the extreme south), far from their roots.

The lower diagram shows the present constitution of the Eastern Alps after great denudation. In the central zone the crystalline nappes are exposed, and in the northern zone the sedimentary strata are left widely separated from their counterparts in the south.

they have been parted from their "roots" and now lie in regions far distant from those in which they were formed.

Under the pressures which have brought about such movements, some of the rock was metamorphosed into crystalline form; for example, a large part of the central Alps is composed of crystalline rocks which were thus formed. In some parts, too, molten material was forced up from the depths, and igneous rocks thus add to the complexity. Moreover, volcanoes were formed and are still to be observed, and even now earthquakes show that stability has not yet been attained in this part of the earth's surface.

The Alpine foldings have not only affected sedimentary rocks ; within them have been enclosed masses of older date and more resistant composition. For example, in the central Alps themselves are large areas, including the Mont Blanc massif, consisting of splinters of an Hercynian floor driven up into the folded pile above ; again, in the system of the Carpathians (in the wider sense of the name) is the great and ancient massif of the Transylvanian Alps as well as ancient fragments on the west of Transylvania and in parts of the Tatra Mountains.

Other blocks or massifs occur within the folded mountains of southern Europe, notably that between the Balkan Mountains proper and the western heights of the Balkan Peninsula ; here is the massif of which the Rodopi Mountains form the highest part. Again, within the curved folds of the western Mediterranean, there stand up ancient massifs forming the greater part of the islands of Corsica and Sardinia.

Another very marked, and very important, feature of the region affected by the Alpine foldings is the formation of great basins within the mountain system. These are of varying depth : in the western Mediterranean subsidences have let down the earth's surface over 10,000 feet below sea-level; the Adriatic Sea, however, is relatively shallow, especially in its northern part, and the North Italian Plain is essentially a continuation of this depression now just above the level of the sea. The iEgean Sea occupies another area of subsidence ; it is " half-drowned," and the higher parts of the previously continuous mountain chains form the islands which appear as stepping-stones between the Balkan Peninsula and Asia Minor. The southern part of the Black Sea is another well-marked basin; the north-western edge of the deeper area is the line of shallows showing the earlier connection between the Balkan Mountains and those of the Crimea.

A less-marked basin is that between the Balkan Mountains and the Transylvanian Alps where the relatively recent deposits forming the Walachian Plain stand above sea-level, and thus resemble those of the North Italian Plain.

Broadly similar in origin are the lowlands between the Alps and the great curves of the Carpathian system.

The Alps themselves, and to a less extent other parts of the great fold-mountains, reach such heights that, during the Ice Age, they bore ice-sheets which overrode the highest parts, and

in the case of the western Alps extended into neighbouring regions. The complex results of glaciation in the Alpine Lands and the Alpine Forelands will be described in later chapters.

The effects of the geological history on other conditions than structure and relief are very great; we can here only hint at a few of the results. There is the existence of the Mediterranean and Black Seas which separate Europe from Africa and southern Asia; these seas have physical influences, such as their warming influence upon the winter climate of the neighbouring lands, and influences upon human life, such as the way in which they have enabled civilization to spread all around their habitable coasts.

Corresponding to the variety in the rock structure and the relief of southern Europe is the variety of resources which include mineral deposits, Alpine pastures, mountain forests, broad inland lowlands and hill-sides facing the seas, all capable of human utilization; thus the extraordinary complexity of the geological history has been followed by an extraordinary complexity in the conditions of human life.

6. The Russian Platform.—In eastern Europe the physical development and the human history have been quite different. The ancient rocks of the Baltic Shield dip gently south-eastward, and form the substratum of the great structural region known as the Russian Platform. Apart from its margins, where there are the Hercynian areas of the Ural and Timan Mountains and the Donetz Block, the whole area between the Caledonian Highland system and the fold-mountains of the Crimea and Caucasus has remained almost unaffected by the later disturbances, and the most important movements have been relatively slight alterations in its general elevation as compared with sea-level. Because of these alterations, the area has been covered by the waters of seas of varying extent, and hence the ancient rocks which continue those of the Baltic Shield are covered in the north-west of Russia by deposits of Palaeozoic age, while farther to the south-east these are followed first by Secondary, and then by Tertiary, strata.

But because these deposits have lain almost undisturbed, they have not been subjected to pressures which would have changed their character, and in general even the oldest remain in much the same condition as those of recent formation; stone

which could be used for building or road material is a rarity over large areas of Russia.

The region is not of uniform elevation ; the Valdai Hills are over 1,100 feet above sea-level and form part of the water-parting between the rivers flowing north-west to the Arctic and Baltic Seas and those flowing south-east to the Black and Caspian Seas. The greater part of eastern Europe is less than 600 feet in height, while the land immediately north of the Caspian and the surface of that great inland lake are below the general sea-level of the globe.

Moreover, there have occurred warpings of the underlying platform which, although very slight if measured in degrees of slope, when continued over the great distances of eastern Europe have important consequences. The most marked of these warpings occurs in the south-west, where it brings up to the surface a belt of granite (Fig. 1); through this resistant mass the Dnieper River has been able to cut its southward reach only incompletely, and there are rapids which prevented navigation, but gave water-power now used for industrial purposes.

It must also be observed that all the northern part of the region has been glaciated, with results similar to those found in the plains of the central and western parts of the continent.

Because of its uneventful history, the Russian Platform has in general lacked the formation of mineral ores. Apart from some coal in the Palaeozoic strata near Moscow and iron in the granitic belt, the chief minerals are in the Hercynian areas of the Donetz and the Urals, where industrial development can utilize resources lacking over most of European Russia.

One consequence of the geological history is of the first importance. Undisturbed by the great forces which have led to such a complicated relief in the rest of Europe, the east has remained open, level country in close physical association with the similar lands of western Asia, for the Ural Mountains do not form an effective barrier of any kind. Hence the climates of western Asia are continued across " Trunk Europe " about as far as " Peninsular Europe." Similarly, the belts of natural vegetation, i.e. the tundras, the forests, the steppe-lands and the semi-deserts, extend unbroken from Asia across eastern Europe. Consequently peoples who have adapted their ways of life to each of these types of vegetation have worked their way, either westward or eastward, along almost the whole extent of the

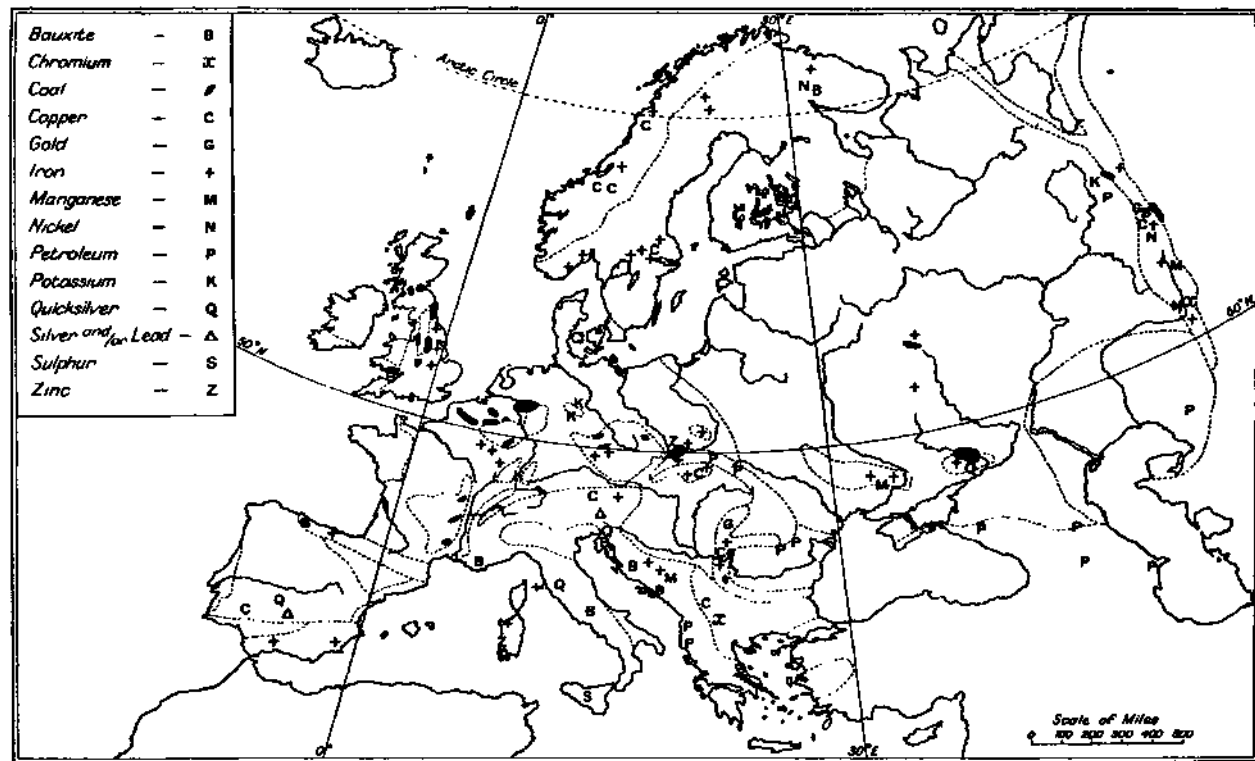


FIG. 6.—PRINCIPAL MINERAL WORKINGS.

Note.—There are also numerous lignite workings, especially in central Europe.

belts, and so kept western Asia and Trunk Europe in very close association from the human point of view.

7. The Caspian Basin.—Here is a region which is certainly more " Asiatic " than " European." It is a part of a great depression which includes the three inland seas : Caspian, Aral and Balkash. To this hollow flow the waters of the surrounding higher lands, and to the Caspian Sea the Volga brings the drainage from a large part of eastern Europe. With the water is brought down the material worn away by the rivers, and the Caspian Basin is covered partly by such recent alluvium and partly by deposits formed when a greater sea than the present one occupied the area.

Moreover, the formation of the Caspian depression, in causing the greatest river of Europe to flow, not towards the Mediterranean, but to the south-east, and to end in a lake without access to the oceans, has tended to hinder close association between eastern Europe and the remaining part of the continent.

QUESTIONS

1. How much knowledge of the Ice Age do you consider necessary in order to understand the present-day geography of the northern half of Europe ? Illustrate by reference to particular areas and their characteristics.

2. Certain parts of Europe may be referred to as being regions of " Alpine folding." Make a sketch-map showing these regions, and consider to what extent they have geographical, and not merely geological similarity.

3. What are the common structural characteristics of the " Hercynian Uplands," and how do these characteristics affect their utilization by man ?

4. Distinguish between four types of coast on account of their structure, and state their location in Europe. Give a description of any two of these types.

5. Define " Trunk " and " Peninsular " Europe respectively, and explain the fundamental causes of the contrasts between these areas.

CHAPTER II

CLIMATE

Wind Systems.—Over much of Europe, oceanic influences play a very great part in determining the climatic conditions, and the belts of wind systems which are developed over the oceans are therefore important. Since these belts lie in certain latitudes, the position of Europe as regards latitude must be first noted. On its southern margin, Europe forms the northern part of the Mediterranean area; Gibraltar is about lat. 36° N. In the north of Europe the Scandinavian peninsula extends well beyond the Arctic Circle; North Cape is about lat. 71° N.

As a consequence of this position, all the continent except the east, i.e. Peninsular Europe as distinct from Trunk Europe, comes under the influence of the great system of winds known as the "westerlies," which appear on wind maps as blowing from a more or less westerly direction, that is, from the neighbouring Atlantic Ocean, whose waters are exceptionally warm for their latitude because they have been brought from tropical regions by the Gulf Stream Drift.

It may therefore be deduced that the climate of Europe, in so far as it is determined by these westerly winds, is not only made equable, but on the average is exceptionally warm for its latitude; further, it may be deduced that these winds bring water-vapour which is precipitated as rain or snow over the land, especially on the windward side of the highlands.

But though there is truth in these ideas, there is the complication that the westerlies are not by any means constant, even in those parts where the maps show that the prevailing winds blow from the west in all seasons. In England, for example, the "prevailing" winds may be shown on a climate map as coming from the south-west, but this is the actual direction of the winds only for about 20 per cent. of the observations. Indeed, the most characteristic fact about the winds experienced in England is that they frequently change, depending upon the passage of low-pressure systems called "lows," "depressions" or, less

frequently, " cyclones," or upon the development of high-pressure systems or anticyclones.

Hence the belt of the westerlies may be usefully considered as a belt in which depressions are common and travel in a generally west-to-east direction. In these depressions are two main streams of air, one coming from a south-westerly or

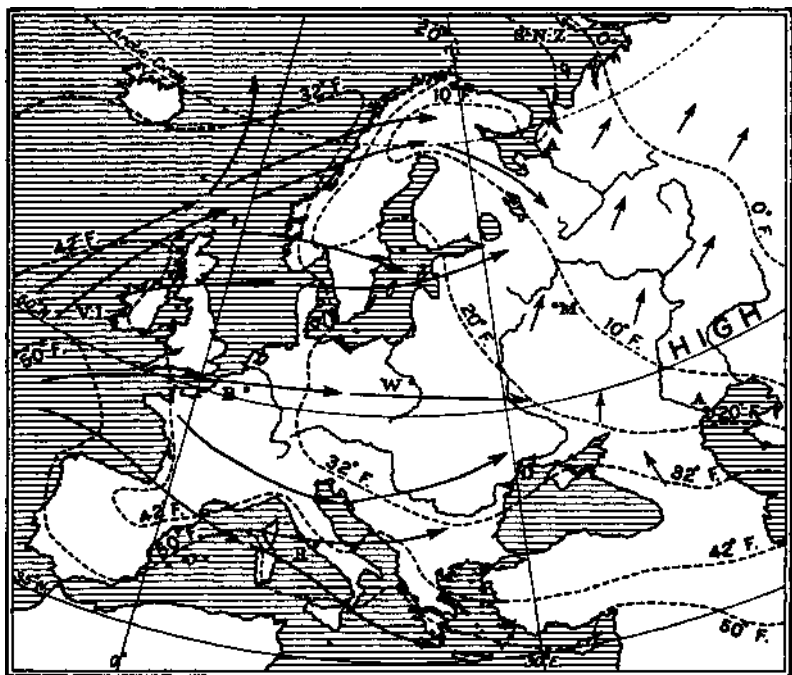


FIG. 7_JANUARY " LOW " TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean January temperatures reduced to sea-level.

southerly direction and bringing warmth and usually rain, the other coming from a north-westerly, northerly or easterly direction and bringing cool and dry weather. As the depressions pass over a given place, there are accordingly changes in the weather as the warmer and the cooler air-streams cover the area in turn ; on the whole, however, the " lows " bring rain, and on their southern side warmth, although cold weather may be found on their northern side. Since the centres pass most frequently over the northern part of Europe, it is their southern sections, with warmth and rain, which most affect the continent.

As the central parts of depressions are areas of low air-pressure, the regions over which they are most commonly found necessarily appear on maps showing the average barometric pressures as areas of lowest pressure, e.g. that between Iceland and north-western Europe.

On the contrary, anticyclonic conditions are marked by high

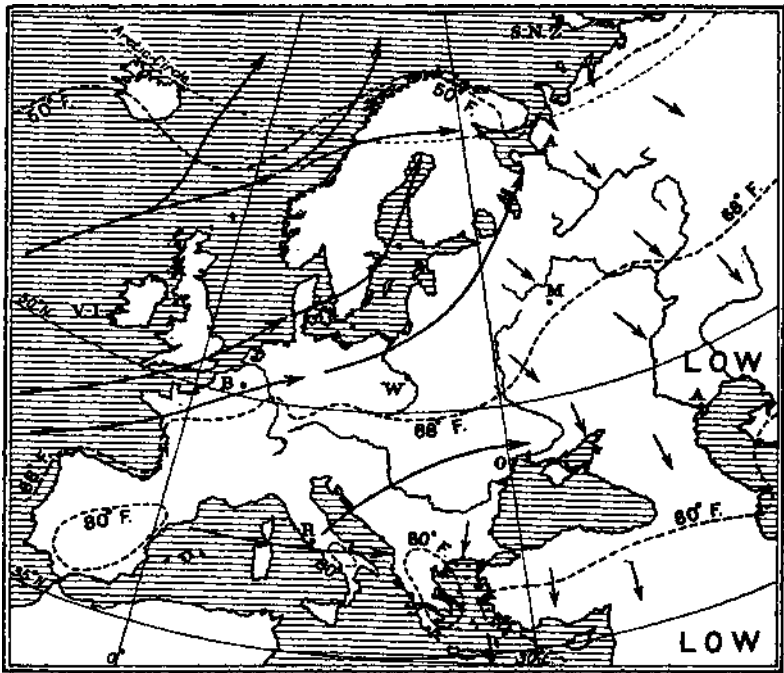


FIG. 8.—JULY "LOW" TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean July temperatures reduced to sea-level.

pressures, gentle winds or calms, and dry weather. Such conditions only occasionally develop within the belt of the westerlies, but they are more common on the southern side of this belt, that is, in the sub-tropical latitudes to the south of Europe, where the climate maps show relatively high average pressure.

Hence, one may shortly say that western Europe is in general under the influence of the belt of the cyclonic, rainy westerlies, while to the south of Europe lies the belt of sub-tropical calms and droughts.

The two belts, however, are themselves not always in the same latitudes, but shift with the sun, southward in winter and northward in summer. Consequently in winter the westerlies cover the whole of western Europe, and their depressions may fairly often pass over the Mediterranean area. In summer, on the other hand, the depressions leave the Mediterranean relatively free, especially in the east, and the south of Europe frequently experiences the calms and drought of the sub-tropical belt of high pressure.

In Figs. 7 and 8 the long arrows show the tracks commonly followed by the centres of "lows," but it must be understood that the area covered by a depression is normally very considerable ; if the centre passes over Berlin, for instance, its influence would probably extend from central Scandinavia in the north to the northern Adriatic in the south. Bearing this in mind, it will be seen from the maps that in winter cyclonic conditions characterize the whole of Peninsular Europe, while in the summer they are generally less frequent, particularly in the Mediterranean region.

In eastern or Trunk Europe the depressions have less influence, for they tend to pass over seas rather than lands, and when they do penetrate the great land-mass, they diminish in intensity. The climate of eastern Europe is therefore more closely related to that of Asia ; it is marked by a reversal of the conditions as between summer and winter which is associated with the monsoonal changes of the greater continent.

In summer the heat sets up a system of continuous low pressure over Asia towards which the winds blow inwards, though deflected, by the earth's rotation, to the right of the most direct path ; consequently in the east of Europe they commonly blow from a more or less north-westerly direction, as is shown by the short arrows in Fig. 8. Even in the eastern Mediterranean this influence is felt, and the prevailing northerly winds of this season were there known to the ancient Greeks as the " Etesian " or " annual " winds, whose onset marked the beginning of uninterrupted easy navigation for their small ships.

In winter the continental land-mass is cooled, high pressure is more continuously developed and the air tends to move outward. The winds, deflected to the right of their direct outward path, usually blow from a more or less southerly direction over most of eastern Europe (see Fig. 7), though in the Mediter-

ranean region they are more frequently interrupted by the passage of cyclones.

Temperatures.—The wind systems combine with the direct heating effect of the sun to determine the temperature conditions,

In the summer the sun's direct influence is the greater, as may be seen from Fig. 8, in which are shown the isotherms drawn from the records of the mean monthly observations of air temperatures in July. (To simplify the maps, the temperatures have been reduced to sea-level; consequently the uplands and highlands have cooler conditions than are indicated.) Where the sun is relatively high in the sky, that is, in southern Europe, the heat is greatest, and over the southern parts of the three peninsulas the lowlands have mean temperatures at, or even over, 80° F. during July. In the far north the temperatures are at about 50°. The course of the isotherm of 68° is worth noting: in the Atlantic area it is well to the south of latitude 50°, for the ocean is relatively cool; in eastern Europe it passes considerably to the north of this latitude because the continental mass is greatly heated by solar radiation; in central Europe the isotherm runs almost along the line of latitude, and places east and west of one another have about the same summer temperatures.

It is convenient to say that when the mean temperature is above 68° F. (20° C.) the climate is "hot"; when between 68° and 50° F. (20° and 10° C.) it is "warm"; when between 50° and 32° F. (10° and 0° C.) it is "cool"; and when below 32° F. (0° C.), it is "cold." Adopting these terms, we may point out that the temperature map shows that in July the climate of most of Europe south of latitude 50°, together with all south-eastern Russia, is hot, that of most of Europe north of latitude 50° is warm, but the lands adjoining the Arctic Sea are cool.

The January map indicates marked contrasts, for in the latitudes of Europe the winter sun is visible for a shorter time in the day and is lower in the sky than in the summer; consequently the sun has much less effect and the winds have relatively more influence, as they bring warm air from the Atlantic Ocean.

The isotherm of 50° is now the highest and, away from the Atlantic, only the southern Mediterranean lands have this temperature. This is due partly to the latitude and partly to the influence of the Mediterranean Sea itself, for this sea remains remarkably warm in the winter because it is shut off

TABLE OF CLIMATIC CONDITIONS

Climate stations		Lat. N.	Height above Sea-level (Feet)	Temperatures (Deg. F.)				Precipitation (Inches)				
				Mean Monthly		Mean Annual		Annual Total	Seasonal Totals			
									Win. D.J.F.	Spr. M.A.M.	Sum. J.J.A.	Aut. S.O.N.
				Jan.	July	Min.	Max.					
Arctic	South of N. Zemlya	72	50	2	44	—	—	6	0.9	0.8	2.2	1.7
Boreal	Haparanda	66	10	11	59	—27	81	19	4.0	3.2	5.4	6.6
	Archangel	65	50	8	60	—32	84	17	2.5	2.7	6.6	5.0
Sub-boreal	Stockholm	59	150	27	62	—2	83	21	4.6	4.2	7.0	5.5
	Moscow	56	500	12	66	—17	88	21	3.5	4.6	7.7	5.2
Oceanic Temperate	Bodo	67	10	30	55	7	75	36	9.1	6.3	7.7	12.5
	Bergen	60	70	34	59	12	79	84	24.5	15.2	17.6	27.0
	Valentia Is.	52	30	45	59	28	72	56	17.3	11.4	11.8	15.2
	Brest	48	180	43	64	23	90	32	9.5	6.2	6.2	10.6
	Santiago	43	890	45	66	28	95	65	21.7	17.1	6.9	19.1
Mid-Temperate	London	51	20	39	63	18	88	25	5.6	5.2	7.3	7.0
	Brussels	51	200	34	63	14	88	30	6.6	6.0	8.7	8.3
	Paris	49	180	37	65	12	93	21	4.1	4.8	6.0	5.9
	Karlsruhe	49	390	33	66	8	91	38	7.3	8.7	12.1	9.7
	Lyons	46	570	36	70	10	95	40	7.0	8.7	10.1	11.1
	Milan	46	480	34	75	14	93	40	7.7	10.2	9.3	12.5
	Bordeaux	45	250	41	68	18	95	33	8.0	8.0	7.4	10.0
Interior Temperate	Konigsberg	55	20	27	63	—2	90	25	4.1	4.6	8.8	7.8
	Berlin	52	160	31	64	7	91	23	5.0	5.0	7.6	5.1
	Warsaw	52	440	26	66	6	90	22	3.8	4.7	8.5	5.0
	Munich	48	1,700	27	63	0	86	35	4.8	8.6	14.2	7.6
	Budapest	47	500	28	70	10	91	25	4.6	7.0	7.0	6.7
	Sona	43	1,800	27	69	2	95	26	4.3	7.1	8.0	6.2
Mediterranean	Genoa	44	180	45	75	28	90	52	13.2	11.7	6.9	20.3
	Marseilles	43	250	43	72	21	91	22	5.2	5.2	2.8	8.3
	Borne	42	160	44	77	27	95	32	9.8	7.7	3.2	11.9
	Oporto	41	270	48	67	32	93	48	15.8	13.4	3.4	15.4
	Madrid	40	2,100	40	76	18	104	16	4.0	5.4	2.1	4.9
	Valencia	39	70	49	75	32	99	19	4.5	4.8	1.6	8.2
	Palermo	38	230	50	76	39	99	29	11.7	6.7	1.5	9.3
	Athens	38	350	49	81	28	100	15	5.9	2.9	1.4	5.2
Steppe	Orenburg	52	360	4	72	—23	97	15	3.1	3.3	5.0	3.7
	Odessa	46	210	26	73	0	91	16	2.9	3.5	5.6	4.1
	Bucharest	44	280	25	73	—4	95	23	4.0	6.2	8.0	4.9
Arid	Astrakhan	46	—50	19	77	—15	97	6	1.3	1.5	1.7	1.3

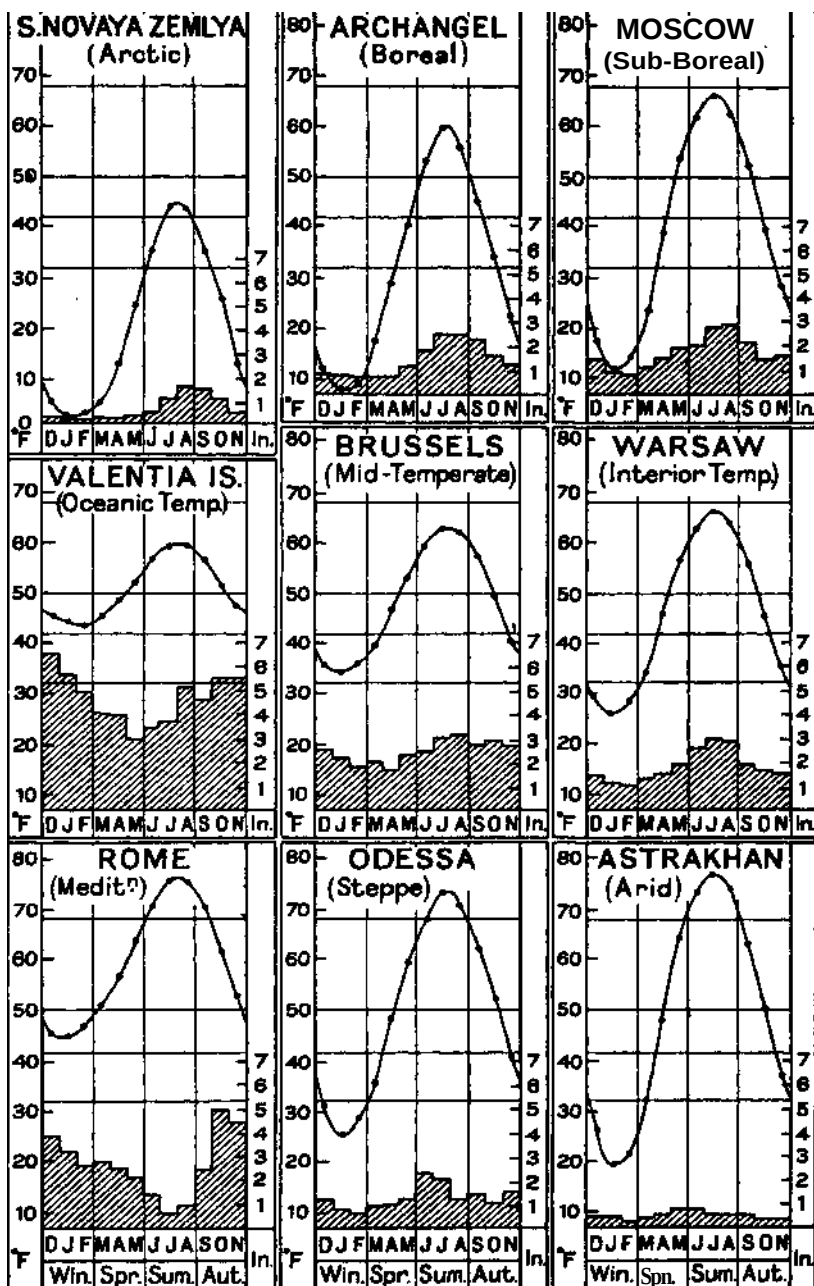


FIG. 9.—TEMPERATURE AND RAINFALL GRAPHS OF CLIMATIC TYPES.

from the cold waters in the depths of the Atlantic by the narrow and shallow entrance at the Strait of Gibraltar.

Most of the other isotherms of the January map have a course broadly similar to that of 50° : in the Atlantic area they run from north to south, showing that the oceanic west is warmer than the continental east, while towards the interior of Europe they run more from west to east because it is colder in the north, where the sun has very little effect.

The isotherm of 32° F. is of special interest, for it marks out an area to the east and north of it where, during a normal January, the average temperature is below freezing-point. As a consequence, within this area, precipitation in January normally takes the form of snow instead of rain, and if the snowfall is heavy there is a snow-cover to the land lasting for at least a month. Moreover, except in a narrow belt adjoining the course of the isotherm, inland waters are normally frozen over and harbours are closed by ice for a month or more ; the chief exception to this latter rule is that the warm Atlantic waters drifting along the coast of Norway keep the harbours of all the west coast of Scandinavia open throughout the year. The extremely cold winters in north-eastern Europe should be observed ; in the neighbourhood of the northern Ural Mountains the mean temperature in January is 0° F., i.e. 32° below freezing-point.

Employing the terms " cool," " cold," etc., as stated above, we may summarize the conditions in January by saying that in eastern Europe as a whole, together with most of Scandinavia and the eastern part of central Europe, the climate is cold ; in most of western Europe it is merely cool, while the south of the Mediterranean area has even warm conditions in this month.

By comparing the mean temperatures in January with those in July, as shown either on the maps or in the table on p. 26, it may be seen to what extent the climate of any place may be regarded as extreme or equable. Subtracting the figure for January from that for July, the annual range is obtained : e.g. for Valentia Island it is only 14° , for Warsaw it is 40° and for Moscow it is 54° . A climate with an annual range of about 30° or less may be regarded as equable, and western Europe as a whole and most of the coast-lands around the Mediterranean Sea have an equable climate. One with an annual range of over 40° is extreme, and all eastern Europe has an extreme climate.

Between these well-marked types comes central Europe, transitional in this respect.

The map of mean temperatures for January shows the average reading of the thermometer in that month, but the actual conditions are at some times above, and at other times below, this average ; hence the winter temperatures are at times more severe than the mean temperature suggests. The lowest temperature which is normally experienced in winter (i.e. the average of the lowest taken over a number of years) is called the mean annual minimum, and for certain stations is given in the table on p. 26. In this table it will be seen that, for example, while the mean January temperature at Moscow is 12° F. (20° below freezing-point), the mean annual minimum is -17° F., i.e. 29° lower (49° below freezing-point). Again, at Archangel the normally lowest reading in January is -32° F. (64° of frost).

Similarly the July map shows the mean temperatures for that month, but the summer temperatures actually rise much higher than these ; the table shows that while at Moscow, for example, the mean July temperature is 66° F., the mean annual maximum, which is the mean of the highest July readings, is 88° F. In the south of Europe the mean annual maximum at Athens is 100° , and at Madrid it reaches even 104° F.

All the conditions hitherto considered relate to those of the coldest or hottest months, but it is also important to know what is happening during other times of the year. This is to some extent shown by the graphs in Fig. 9, which indicate by dots the mean temperatures of each month and join these by curves depicting the normal " march of temperature " throughout the year. From such curves useful deductions may be made ; for instance, at Moscow the mean temperature falls below freezing-point (shown by the line at the level of 32° F.) about the beginning of November and does not rise above it until about the end of March ; we may therefore conclude that normally there is a period of frost lasting about five months. Similarly it may be deduced from the graphs that the period of frost at Archangel is about six months, while at Warsaw it is rather more than three months ; a map showing by lines the lengths of the normal period of frost in all parts of Europe is given in Fig. 10.

Another example of the deductions that can be made from graphs of the normal march of temperature is the duration of the " warm " period, i.e. the time during which the mean

temperature is above 50° F. (10° C). At Valentia Island, off south-west Ireland, the curve rises above the 50° F. line at the beginning of May, and falls below the 50° F. line again near the end of October; the warm period therefore lasts about six months; compare the curve for Archangel, where the warm period lasts only about three months. A map showing the

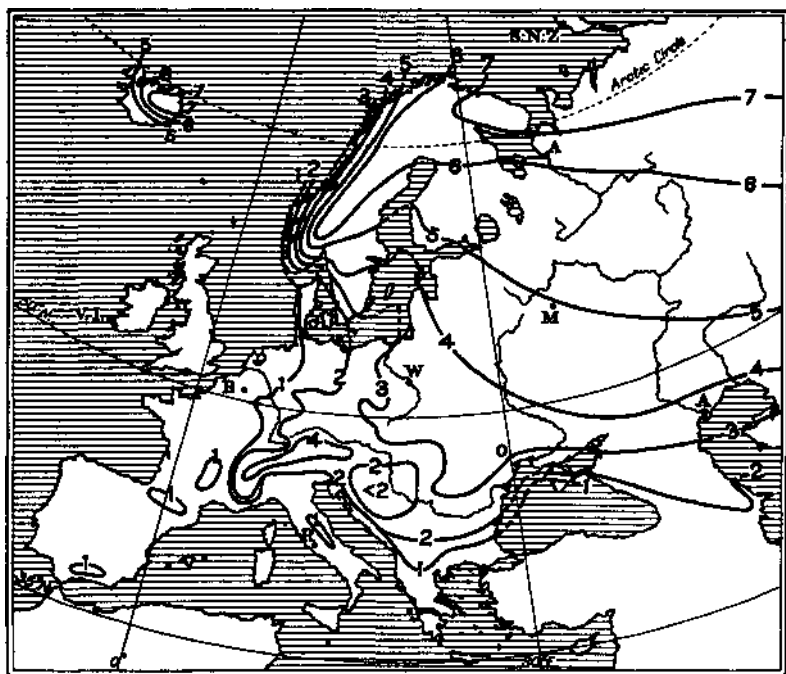


FIG. 10.—DURATION OF FROST PERIOD.

Note.—The lines show the number of months during which the mean temperature is below freezing-point (32° F., 0° C), the calculations being based on actual temperatures (not reduced to sea-level). On the Alpine margins the lines of 3 and 4 months are so close that the former has been omitted, and for a similar reason the 1-month and 2-month lines have not been separately indicated on the margins of the SE. Alps and Dinaric Alps. Note that the area of the Central Danubian Lowlands, marked < 2, has a period of less than two months of frost.

duration of the warm period in all parts of Europe is given in Fig. 11.

From the point of view of the relation of climate to plants the mean temperatures for the hottest month give a very inadequate idea of the temperature conditions which affect growth. For example, the figures for July show that the mean midsummer temperature is about the same at Valentia Island as at Archangel, and yet the graph shows that the warm period is twice as long at the former place as at the latter.

An important fact regarding the relation of climate to plant-life is that for a number of plants growth can begin only when the mean temperature rises above about 42° F. (6° C.). This level is shown by another horizontal line on the temperature graphs, and it may be deduced from the curves that, for example, wheat can begin to grow earlier at Brussels than at Moscow, although the latter place has a higher midsummer temperature.

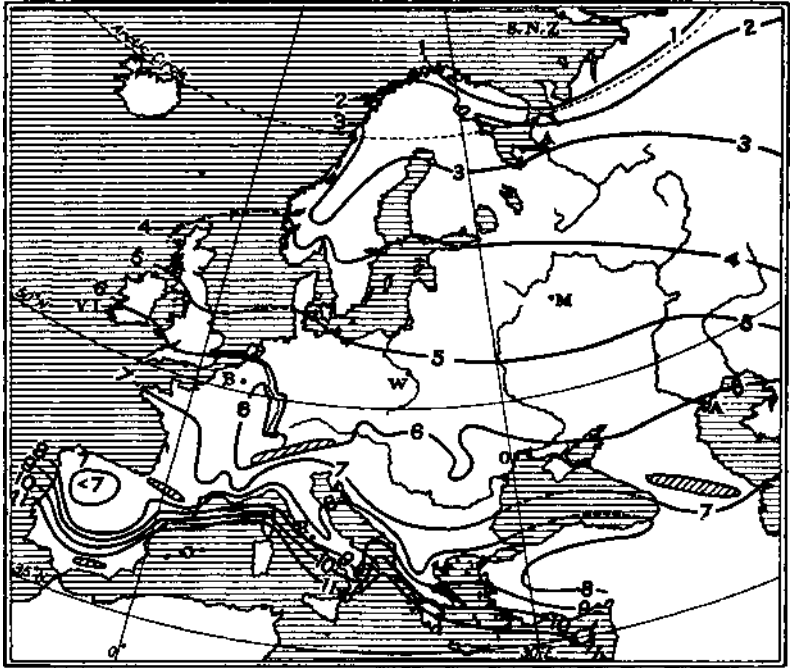


FIG. 11.—DURATION OF WARM PERIOD.

Note.—The lines show the number of months during which the mean temperature is above 50° F. (10° C.), the calculations being based on actual temperatures (not reduced to sea-level).

Conditions in the Alps and other high mountain regions vary so greatly that these areas have been excluded from the map. Note that in the interior of Spain an area marked < 7 has a period of less than seven months of warmth.

Precipitation.—The next element of climate to be considered is precipitation in the form of rain or snow, and this study may well be begun in connexion with the wind systems for July and January respectively.

In July, depressions advance from the Atlantic over northern and central Europe, and since in them the warmer air from the Atlantic rises, it is cooled and water-vapour is precipitated in the form of "cyclonic rains." In eastern Europe the prevail-

ing winds come from the north-west, and have sufficient water-vapour for rain to occur, although in less amount than in the west (see Fig. 13). The greatest precipitation is on the highlands which compel the air currents to rise and to produce "relief rains." In the Mediterranean region and in southern Russia depressions seldom occur, and cyclonic rains are therefore slight, though relief rains give a rather better water-supply

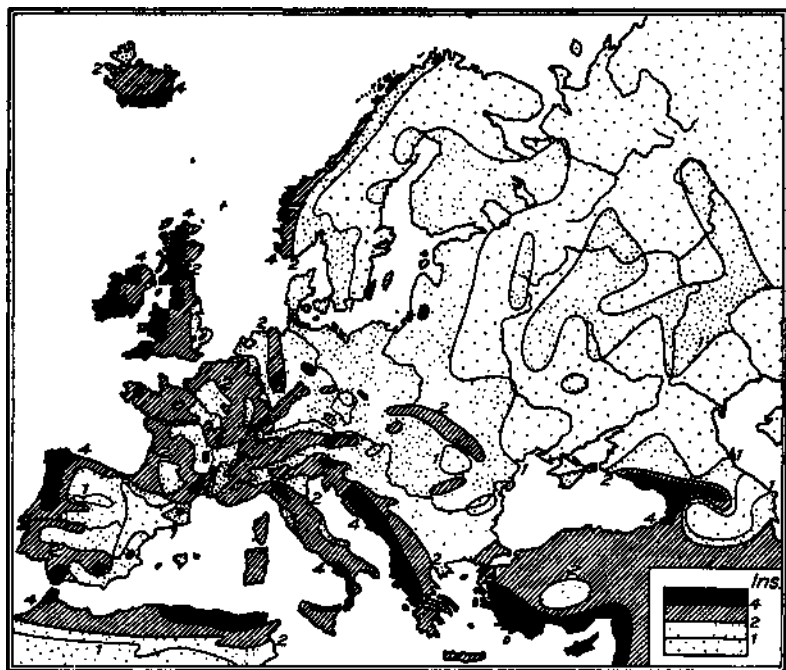


FIG. 12.—MEAN JANUARY PRECIPITATION.

to the mountains, especially to the Caucasus. In the far north there is little rainfall, even in connexion with the depressions, for the cool air can hold but little water-vapour and though the air is further cooled by ascent only a small precipitation can result.

Where cyclonic influence is weak, settled weather is the general rule, but during a period of such weather in summer there may occur thunderstorms and heavy rains, due to the relatively great heating and the consequent rising of the air in particular localities ; such " convectonal rains " account for a considerable proportion of the precipitation in central and eastern Europe.

In January, depressions normally affect the whole of the continent except the extreme east, and where the air is warm enough to contain much water-vapour, precipitation may be considerable. This is the case particularly along the Atlantic margins, where there are the heaviest rains, and in the Mediterranean region ; moreover, on the highlands relief rains add to the total (see Fig. 12). But away from the relatively warm areas adjoining the Atlantic and the Mediterranean the air is so

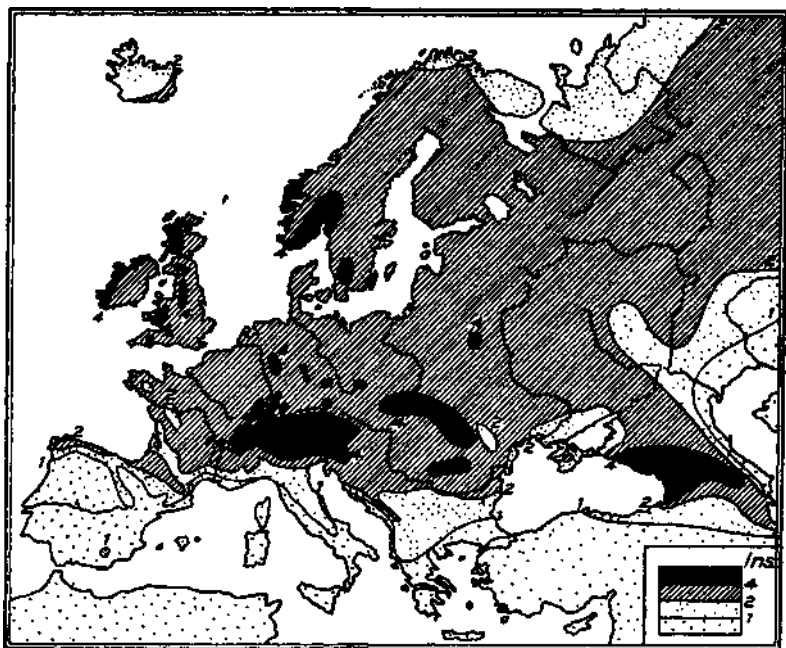


FIG. 13.—MEAN JULY PRECIPITATION.

cold that it can contain little water-vapour and precipitation is generally slight, though relief rains, or falls of snow, occur on the highlands. (In reading maps or statistics of precipitation, it must be remembered that in their compilation one foot of snow is taken as the equivalent of one inch of rain.) In eastern Russia the cold, out-blowing air from the Asiatic high-pressure area is necessarily dry, and this part of Europe would be rainless in winter but for occasional depressions.

The maps for January and July are in general indicative of the whole of the winter and summer seasons respectively ; this

can be seen by the rainfall graphs in Fig. 9, in which the three winter months of December, January and February and the three summer months of June, July and August are marked off by vertical lines.

The rains of spring and autumn are equally important, but as they are to a considerable extent transitional between the more extreme conditions of winter and summer, they are more evenly distributed over the continent. Near the Atlantic and in the Mediterranean region, however, the autumn rains are frequently heavier than those of any other season. These statements about the rainfalls of spring and autumn should be verified by examining the graphs for the stations given in Fig. 9 and the accompanying page of statistics.

A useful summary of the distribution of precipitation during the year at any particular place can be made by adding together the amounts in each group of three months to get the totals for the four seasons respectively, and this has been done for certain places in the table on p. 26. Further, the total for the whole year for the selected stations is given in the same table, and the distribution of the total annual precipitation over the continent is shown by the map in Fig. 14.

By putting together the facts given in the maps, the graphs and the table, a fairly complete idea of the precipitation can be obtained, and some of the main conclusions may be summarized as follows : (i) The regions adjoining the Atlantic have a heavy rainfall fairly well distributed through the year, although greatest in autumn and winter, (ii) Central Europe has an annual total varying according to elevation, considerable on the highlands and moderate on the lower lands ; on the whole, the rainfall is fairly evenly distributed through the year, although the greater amounts occur in summer and autumn and the tendency to a summer maximum increases towards the interior, (iii) Eastern Europe, including most of Scandinavia, has a rather small total precipitation with a summer maximum, and in the extreme north-east and south-east the amounts at all seasons are very small indeed, (iv) In the Mediterranean region the total annual rainfall varies from being very considerable on the highlands behind the Adriatic to being very slight over most of eastern Spain, but the common characteristic is that of summer drought; in the northern part of the Mediterranean region the period of drought is short, but towards

the south the period becomes longer and the intensity of the drought may be severe.

Indeed, throughout all southern Europe, including the south of Russia, the summer is normally a time of drought, for the high temperatures cause rapid evaporation, and the efficiency of what precipitation may occur is thereby greatly reduced. Conversely, in northern Europe evaporation is much less and the rainfall is correspondingly more effective.

Another important consideration is the variability of the rainfall from year to year. This variability is, in the main, greatest where the total amounts are least, and it is consequently quite considerable in the east and in some parts of the Mediterranean region. Moreover, while in a well-watered region a decrease from the average is not a serious matter, in the areas of scanty rainfall it may have calamitous results; thus, in particular years the normal summer drought of the Mediterranean may be unusually prolonged and may even become disastrous, while in southern Russia in years of sub-normal rainfall harvests fail and famines result.

One more point must be noted: when there is little rainfall either during the whole year or during one season of the year, that rainfall tends to occur in short, sharp downfalls; this is frequently the case in the Mediterranean region and with the summer thunderstorms of eastern Europe. A rapid fall means that the immediate run-off of water to the streams is great, and the plants cannot use so much of it; also, after the rain bright weather quickly follows, and evaporation may dispose of much of the water and thus further reduce the value of the already small precipitation. The rapid run-off, moreover, tends to wash away the soil, and therefore soil erosion is a serious factor in the utilization of the Mediterranean and other areas of short and sharp rainfall.

Other Climatic Elements.—The frequent passage of depressions over the Atlantic margin has effects upon the climate of that region besides the equability of the temperature and the heavy precipitation; there are, for instance, the facts that the winds are often violent and the sky covered with cloud. On the contrary, the relative absence of depressions in the Mediterranean region, even in winter, allows a clearness of the sky and an abundance of sunshine which are important factors in attracting visitors from north-western Europe. Similarly eastern Europe has in general clearer skies than the west.

The importance of the element of light in climate is, of course, great, and in this connexion latitude is the main factor. In northern Europe, which lies near and even beyond the Arctic Circle, there is a very marked contrast between winter and summer. In summer the days are very long, and within, the Arctic Circle the sun is above the horizon for the whole of the twenty-four hours during a period which at the Arctic Circle is

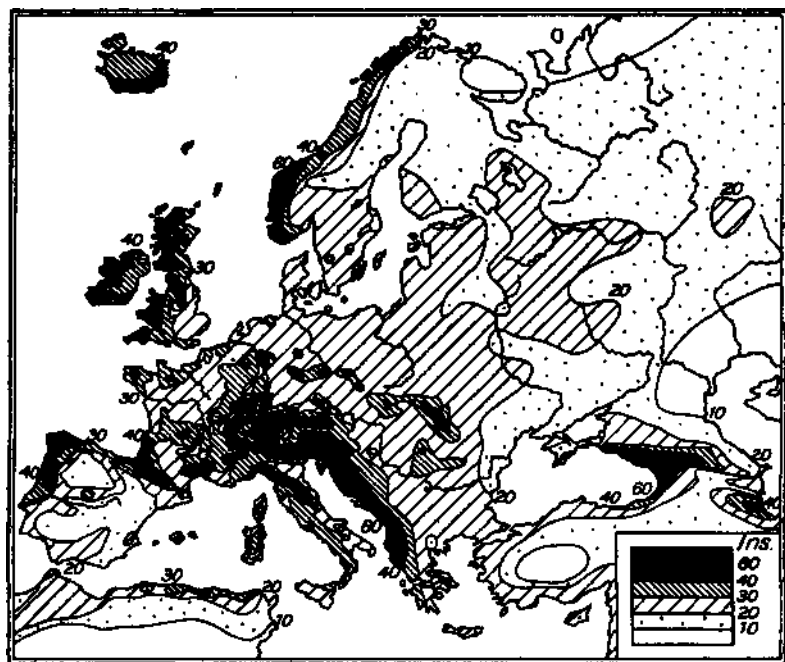


FIG. 14.—MEAN ANNUAL PRECIPITATION.

limited to one day, but at North Cape in Norway extends to over two months.

Conversely, at midwinter the sun is invisible at the Arctic Circle for twenty-four hours, and at North Cape for more than two months. Moreover, even during the short periods in winter when the sun is visible, it rises but little above the horizon.

Climate Regions.—The various elements of climate, e.g. winds, temperature, precipitation and light, of course all exist in the closest association ; they influence one another and have a combined effect upon other geographical phenomena and upon mankind. Regarded in this way, climate is seen to differ very

markedly in different parts of Europe, and it is useful to divide the continent into several regions, in each of which the climate has distinct characteristics. Yet climatic regions seldom have definite boundaries, and it must therefore be emphasized that, when maps are made like those in Fig. 15, the various regions usually "shade off" into one another and the descriptions are only generalizations which apply best to the central parts of the respective regions.

It is convenient, however, to draw lines to serve as approximate boundaries of climatic regions, and for this purpose two devices are commonly employed. In the first place, there are lines based upon meteorological records, like those drawn on the maps showing the conditions of temperature and precipitation. Such lines may be without much significance if they are based merely upon some arbitrarily selected numbers, such as 68° F. (rather than 70° F.), or a duration of frost for one month (rather than three weeks), or a rainfall of 10 inches (rather than 12 inches). It is often better, therefore, to employ the second device, i.e. the adoption of some more natural indication of the climates, and for this purpose vegetation, either natural or cultivated, is a useful guide. In the following chapter the main types of vegetation will be described, and it will there be pointed out how these types are related to climatic conditions ; in some cases it appears that the limits of the growth of particular plants correspond with a line indicating certain climatic conditions ; e.g. the northern limit of trees is found where the period of warmth (over 50° F.) decreases to one month. Hence the line indicating this condition on the map in Fig. 11 has been adopted on the map showing climatic regions (Fig. 15) as separating the "Arctic" from the "Boreal" type of climate. Similarly the other lines showing boundaries to climatic regions have been adopted because of some special significance which will be stated when the climates are described.

The conditions of the climates of Europe may now be summarized in the following paragraphs :

The Arctic climate is experienced around the Arctic Sea, and in the main within the Arctic Circle. Its "winter" is very long, with about seven months of frost, very cold, and for a considerable period almost sunless ; for most of the year the ground is covered with snow, and the subsoil is always frozen. The "summer" is correspondingly short, and although at mid-

summer the daylight is practically continuous, the sun is low in the sky; consequently the mean temperatures rise little above the limit of plant growth, and that only for a short period. Most of the scanty precipitation comes during the time of relative warmth, and is therefore available for plant-life; moreover, evaporation is little and the "effectiveness" of the precipitation is considerable.

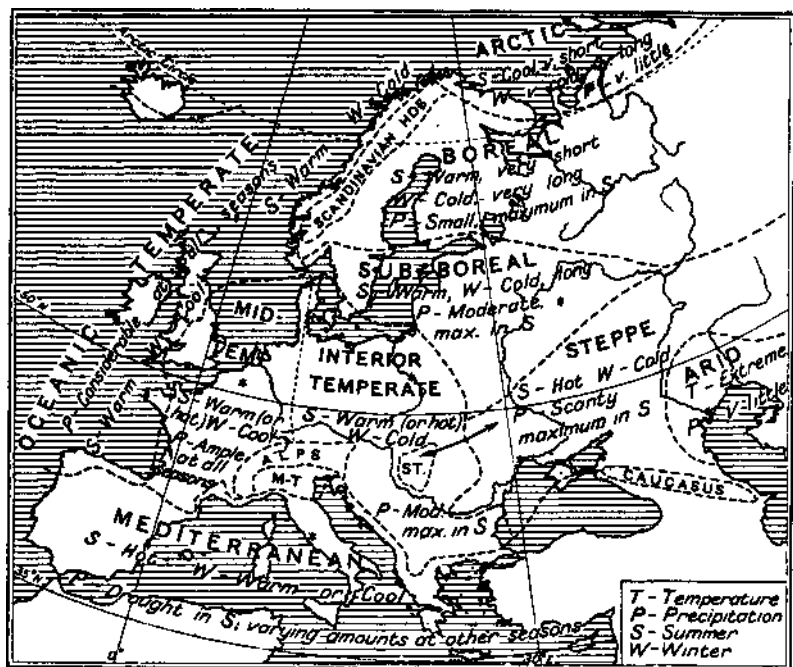


FIG. 15.—CLIMATE REGIONS OF EUROPE.

Note.—In all regions, the uplands or highlands show modifications of the general conditions, but the Alps, Caucasus and Scandinavian Highlands are shown as independent regions.

Except in areas of very marked relief, the boundary lines represent transitional belts rather than definite divisions between the regions. The asterisks indicate the situation of the stations for which graphs are given in Fig. 9.

The *Boreal climate*, or northern climate, is so called because it extends over much of the northern lands of the world which border upon the Arctic Circle; in Europe the belt begins immediately behind the Scandinavian Highlands, which largely exclude it from Atlantic influences. The cold is about as severe as in the Arctic climatic region at midwinter, but it has a shorter duration, and the thick cover of snow due to the winter precipitation lasts for less than half the year. In spring there is a

rapid rise of temperature above the limit of plant-growth, and the summer has from one to four months of warmth, with a small but effective rainfall. The contrast between the light conditions in summer and winter is very marked, though not so extreme as in the Arctic region.

The Sub-boreal climate is transitional between those of markedly continental character and those largely influenced by the Atlantic Ocean; it is experienced in a region in which Atlantic influence can just penetrate into eastern Europe, between the barriers of the Scandinavian Highlands on the north and the Alps and Carpathians on the south. The annual range of temperature is not much less than that of the European part of the boreal climatic region, but both in summer and in winter the temperatures are higher. The period of warmth lasts four months along the northern limit of this region, and increases southward. Also, during this period as well as during the rest of the year there is greater precipitation than in the boreal region. Hence conditions are more favourable for plant-growth, and for the utilization of the resources by man, than under the boreal type of climate.

The Steppe climate is a convenient label to apply to those conditions under which have developed the various forms of steppe vegetation which will be described in the next chapter. This type of climate, like all the others of eastern Europe except the transitional sub-boreal type, is definitely continental and extends far into Asia. It is exceptionally complex, especially as regards the interaction of the temperature and the precipitation, and demands a separate consideration of each of the four seasons.

For about three months or more there is a winter during which the mean temperature is below freezing-point, and for a considerable period the ground is covered by snow. In spring there is a rapid rise of temperature above the limit of plant-growth, and this growth is aided by the melting of the snow-cover and by a moderate amount of rain. In summer the precipitation as recorded by a rain-gauge is greater, but it tends to occur in heavy and short showers, while the weather becomes "hot" (over 68° F.) for about three months; consequently evaporation is great, the effectiveness of the rainfall is small, and the summer is a season of drought during which plant-growth ceases. In autumn, as in spring, the temperatures are moderate,

and the rainfall is consequently more effective ; yet it falls upon parched ground, and a reawakening of vegetable life is soon followed by the cold of winter.

As the complex climatic conditions are closely reflected in the periods of growth and rest which are characteristic of steppe vegetation, the approximate limits of this vegetation are here taken as the boundaries of the region.

In addition to southern Russia, there is an area in the central Danubian Lowlands which has a climate of this type, and may therefore be regarded as an " exclave " of the main steppe region.

The Arid climate is characteristic of the Caspian-Aral depression in the heart of the Eurasian continent, and is therefore only experienced on the south-eastern margin of Europe.

While in the north of the continent it is low temperatures which cause limitation of certain forms of life and activities, and while in the steppe region both the cold in winter and also the drought in summer are the critical phenomena, here in the Caspian-Aral region the precipitation is so scanty, irregular and ineffective, that aridity is the characteristic of the region during the whole year.

That is not to say that the temperature conditions are negligible. In the first place, the ineffectiveness of the precipitation is due to the high summer temperature, for a rainfall of less than 10 inches per annum, which here marks out the arid region, is accompanied by wet surface conditions in summer in north-eastern Europe. In the second place, the extreme character of the climate is in itself of geographical importance ; during the year a " cold " winter, which lasts about three months, is followed by a spring in which the climate rapidly passes through the " cool " and " warm " stages to a summer during which the weather is " hot " for three months, while the mean and maximum temperatures are among the highest in Europe.

The Temperate climate.—None of the regions of eastern Europe has climatic conditions which can be considered " temperate,"¹ for they all experience either considerable heat or considerable cold at some season of the year. In the south-east, moreover, there is a period of deficient moisture, and this characteristic of seasonal drought exists also in the Mediterranean lands.

¹ In accordance with the dictionary definition: " temperate = moderate in degree of any quality . . . cool, mild, moderate in temperature...."

Only in north-western and central Europe is there a comparative moderation of climatic conditions throughout the year ; hence the term " temperate " is restricted to the climate of this region. Within this region, however, conditions are by no means uniform, and three varieties of the temperate climate may be distinguished in Europe.

The Oceanic Temperate climate of the Atlantic margins of north-western Europe is markedly affected by depressions, accompanied by strong or even violent winds and by precipitation which, though heaviest in winter and autumn, is abundant at all seasons. The frequency of winds from the warm waters of the Gulf Stream Drift results in the warmth of the winters and the marked equability of the climate.

The extent of the region thus affected by the westerlies at all seasons is great from south to north ; hence there are considerable differences, especially as regards temperature, between the areas bordering on the Mediterranean climatic region at the one end, and those beyond the Arctic Circle at the other. Contrast the figures given in the table on p. 26, for Santiago in Spain, for Valentia Island, and for Bodo just within the Arctic Circle on the Norwegian coast.

The region which may be termed oceanic is clearly limited inland by the Scandinavian Highlands in the north, and almost as clearly by the uplands of the Iberian Peninsula ; but between these extremes there is a more gradual transition towards central Europe. In the British Isles the English lowland is less equable and less rainy than the uplands of the west and north, and may be better classed with the region next treated.

The Mid-Temperate climate has rather warmer summers, and the winters are so much less influenced by the maritime influences that there is a period during which plant-growth is checked ; also the precipitation is not so heavy. Except in the winter the conditions of heat and water-supply are sufficiently favourable to allow a considerable variety in the forms of plant-life which can here develop.

The North Italian Plain may be grouped with the warmest part of the Mid-Temperate climatic region, for its temperature and rainfall conditions closely resemble those of the nearest part of this region, viz. the Rhone Valley just below Lyons. (Compare the figures for Milan and Lyons in the table on p. 26.)

The Interior Temperate climate shows a further reduction in

the effects of proximity to the ocean. Apart from the higher areas, on which the temperatures are necessarily lower, a line drawn southward from the peninsula of Jutland separates the regions south of the North Sea, where in the coldest month the mean temperature is above freezing-point, from those south of the Baltic Sea, where the winters have a cold period lasting one, two or three months. Also, the precipitation is lower, and has a maximum in summer.

Eastward, conditions gradually approach those of the sub-boreal and steppe climatic regions, and it is convenient to take as the eastward boundary the approximate limit of the beech, which, because of its need for a fairly long vegetative period, is often regarded as a criterion of temperate as distinct from continental conditions.

The region extends far to the south-east, the main modification being a lengthening of the warm period and an increase in the midsummer heat, as may be seen by comparing the July temperatures at Berlin and Budapest.

The Mediterranean climate requires separate consideration for each season. In winter the temperature is almost everywhere above the limit of growth, and in the southern part it is definitely warm, while the rainfall is considerable ; hence neither plant-growth nor the outdoor activities of man need cease. In spring there is everywhere warmth, and in most parts there is sufficient rainfall for the processes of plant-life, enabling flowering, fruiting and ripening to continue. In summer there is a period of three months or more of heat (above 68° F.), and the maximum may be very high ; the rainfall becomes scanty or even fails, and with the high temperature this season is one of drought in which plant-growth ceases, except for deep-rooted types. In the autumn there is still warmth, and usually sufficient rainfall for a resumption of the growth of vegetation ; indeed, in much of the European part of the region the autumn is the season of maximum precipitation.

It is convenient to summarize the more striking features of the Mediterranean type of climate as "winter warmth and summer drought," but, as in the case of the steppe type, no simple meteorological formula can adequately express its character. For this reason the limit of the growth of the olive,, the most typical plant, is adopted as the northern boundary of the Mediterranean region save where, as in the interior of the

Iberian Peninsula, altitude modifies the climatic conditions and prevents the growth of this plant. (Compare the map showing the distribution of the olive in Fig. 18 with that of the climate regions.) It should be noted that, apart from the special case of the interior of the Iberian Peninsula (which will be discussed in a later chapter), the Mediterranean climate in Europe is rather closely restricted to the coast-lands of the Mediterranean Sea, together with the southern shores of the Crimean Peninsula.

Uplands and Highlands.—To simplify matters, it is lowland conditions which have been indicated in the text and in the map of climatic regions. In some parts, however, there are considerable complications, due to the lower temperatures and the greater precipitation which occur with higher altitudes. Such modifications will be taken into account in the more detailed regional studies which will follow, but here, and on the map in Fig. 15, attention can only be briefly drawn to the outstanding highland regions of the Alps and in Scandinavia. In several respects the latter highlands continue southward the characters of the Arctic climate, while conditions in the Alpine region are so complex that they must be specially described in a later chapter.

QUESTIONS

1. State the characteristics of the wind-belts which affect Europe. Explain how they influence different parts of the continent.
2. Draw a graph showing the annual " march of temperature " at any one place you name. Show (*a*) what deductions you can make from the graph, and (*b*) its incompleteness as a record of the temperatures.
3. For any one selected part of Europe, state and account for the essential characteristics of its rainfall.
4. Discuss whether it is possible to find and express definite limits to climatic regions.
5. Examine the truth of the statement that the critical element of climate in Europe is temperature in the north, and rainfall in the south.
6. " The Mediterranean climate has a mild winter and dry summer." Show in what ways this dictum is too simple.
7. Trace the normal succession of climatic conditions through the seasons in the steppe-lands of Europe.
8. Show by reference to one or more particular regions how the various elements of climate interact with one another.
9. To what extent can the climate of " Peninsular Europe " be regarded as a contrast to that of " Trunk Europe " ?

CHAPTER I I I

VEGETATION, SOILS AND LAND- UTILIZATION

NATURAL VEGETATION

IN England and in other parts of Europe which have long been settled, the natural vegetation has been either greatly modified or entirely superseded by cultivated plants, but over other parts of the continent the natural vegetation still dominates the landscape and greatly influences mankind.

It assumes many forms, according to the climate, soil and other factors which determine its growth, but certain main types may be perceived ; we will consider each of these in turn, beginning with those of eastern Europe, where the contrasts are clearly displayed.

Tundra and Alpine Vegetation.—In the preceding chapter it was pointed out that trees cannot grow where the period of warmth is less than one month. The Arctic climate, therefore, with its cool and very short vegetative season, can support low woody shrubs only on the margin of the forest, and the characteristic vegetation of the tundra region consists of mosses and lichens, in addition to many kinds of small flowering and berry-bearing plants. On the drier parts of the tundra lichens grow together so as to form close mats ; in wetter situations mosses grow in abundance, and peat accumulates from dead vegetation and may form hillocks covered with living moss. Wet meadows occur, and swamps with cotton-grass and sedges occupy hollow places.

The region formed by the Scandinavian Highlands, known as the Fjeld, continues Arctic-like conditions southward, the change of latitude being largely offset by increasing altitude ; consequently, below the ice-fields of the highest parts, the mountain flora closely resembles that of the tundra, and may be considered as of the same type.

There are, however, considerable areas on the Scandinavian Highlands, where in the summer there is a thick growth of grasses and herbaceous plants, which afford a fairly rich pasture of the Alpine type. This pasture is so named from the

zone of the Alps situated above the tree-line but below that of perpetual snow ; it is found also on other mountain regions—for example, on the Urals, Carpathians and Pyrenees.

It is impossible to show such a zonal arrangement of vegetation, varying according to altitude, on a small-scale map, and consequently only the type which occupies the greatest area has been indicated in Fig. 16. Thus, while the northern Urals and the Fjeld have been marked as belonging to the tundra and Alpine type, the other mountain regions have been shown as being mainly forested, but with Alpine pasture.

The Coniferous Forest.—Between the tundra and lowland forest is no sharp line of demarcation. Outposts of forest extend northwards into the tundra region, and patches of tundra vegetation are found within the limits of the forest. The dwarf birch which grows on the borders of the Arctic region is replaced by a larger kind farther south, while the spruce and pine increase southwards in number and size till they form the dominant trees in the great unbroken region of the coniferous forests.

In the eastern part of this region, extending into Siberia, the forest is known as the taiga ; here Siberian species of spruce and pine are found, and fir and larch are subordinate members of the plant associations. In the west, the forest is composed of European species ; the pine is that often known as Norway pine or Scots pine, and a zone of birch frequently forms the boundary towards the tundra or the fjeld. Throughout the coniferous forest, on the drier soils the pine predominates, and on the damper soils the spruce, while in the areas of poorest drainage moors with sphagnum moss are common.

Adaptation to the climate, with its short period of warmth, is shown by the needle-like form and leathery surface of the leaves. They are thus protected against the cold winds, and against the loss of moisture by transpiration at seasons when the water in the soil is frozen and there is therefore a time of " physiological drought." Yet the leaves do not fall in winter and are ready to take advantage of every spell of growing-weather ; the forest, therefore, is evergreen. A store of food in the form of starch in the tissues of the wood is another adaptation to the climatic conditions, and the coniferous forests supply timber which is " soft," as compared with the " hard " woods of the deciduous forests.

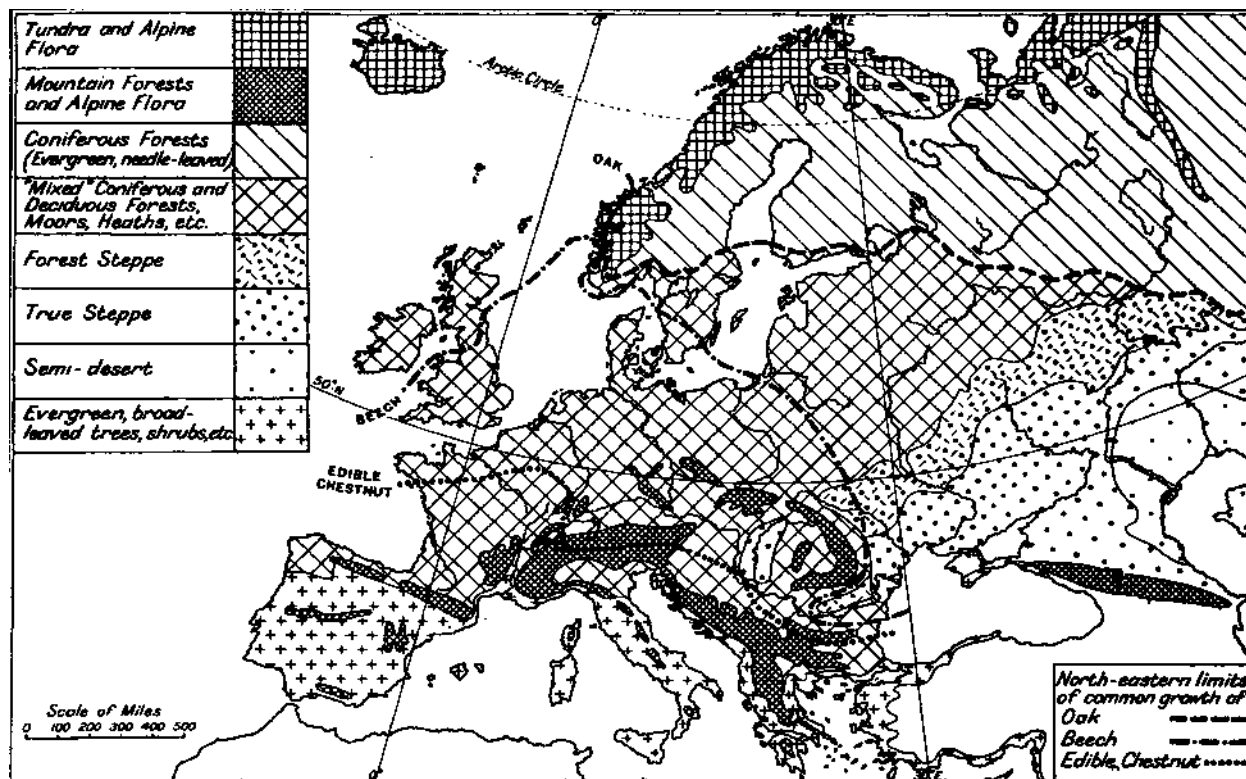


FIG. 16.—NATURAL VEGETATION REGIONS OF EUROPE.

The trees rise tall and straight, almost like poles, from a carpet of fallen needles, for there is little undergrowth in the coniferous forest. Factors which hinder the development of undergrowth are the lack of light beneath the high canopy of leafy branches, and the frequent freezing and thawing of the soil in spring and autumn, with the consequent injury to rootlets.

The "Mixed" Forest.—Even in the coniferous forests, there are representatives of the deciduous broad-leaved trees—for example, the birch, alder and poplar—and in more southerly regions these become more abundant, while others, such as the oak, appear and at last become common. Indeed, the occurrence of the oak is commonly taken as indicating the limit of the forests known as "mixed," and this criterion is here adopted on the map of natural vegetation. Yet the limits of even one species of tree cannot be accurately shown by a definite line, and those of the oak, beech, etc., shown on the map are necessary simplifications.

The annual leaf-fall of the deciduous trees is a protection against the cold and the consequent physiological drought of the winter, but this adaptation can occur only where the summer vegetative period is long enough, first for the growth of the new leaves, and then for their functioning. It appears that for this purpose it is necessary that the mean temperature should be above 42° F. for over five months.

The increasing length and warmth of the summers towards the south-west allow the growth of other species of trees which add to the variety, and in some cases to the value, of the deciduous forests. On the map in Fig. 16 this is illustrated by lines showing the approximate limits of the areas within which the beech and the edible chestnut are widely grown.

The varying nature of the mixed forests of coniferous and deciduous trees depends partly on the climate of the particular localities. In this respect, altitude, with the accompanying modifications of temperature and precipitation, is the main factor in causing the uplands and highlands to have forests of distinctive character; in central Europe the lower slopes are largely covered with deciduous trees and the upper with conifers, until the limit of forest growth is reached. Soil conditions as well as relief affect the character of the natural vegetation, and upland heaths and moors and lowland fens occupy considerable areas.

Over the greater part of the mixed forest region man has modified or transformed the original tree-cover. This has been done either intentionally, by cutting down the trees for timber or to clear the ground for agriculture, or unintentionally by fire or by allowing the young shoots to be eaten by goats[#] and other animals. Once destroyed, forests may be gradually replaced by a natural extension from neighbouring regions ; more commonly, however, new species are deliberately planted, in some parts forming woods of particular broad-leaved trees, and in other parts woods of conifers. In the main, however, cleared forest land has been utilized for agriculture or pasture.

On its southern margin, a climatic limit is set to the deciduous forest by an interruption of the period of summer growth. In the south-west and south this interruption is caused by the summer drought of the Mediterranean region, though the greater precipitation on the higher lands of that region allows trees to extend along the mountains far into the southern peninsulas of Europe.

In the south-east of the continent the hot and dry summer prevents tree growth in general, though there are tongues of forest stretching down the river valleys and " islands " of woodland or scattered trees in the damper places beyond the general limit. Indeed, the transition is so gradual that the northern belt of the steppe region is often known as the forest-steppe.

The Steppe Vegetation.—South-east of this transitional belt is the extensive region of the true steppes in which grasses and herbaceous plants, either annual or biennial, form the characteristic vegetation. As stated in the preceding chapter, the spring is the main season of plant activity ; the grasses and herbs appear above ground, grow rapidly, flower and produce their seeds in the short period between the winter cold and the drought of midsummer. Then they die down, and life is hidden beneath the surface, where, in tubers, bulbs, etc., a store of food is formed and preserved in readiness for the next season. A second short and less pronounced period of plant activity occurs in the autumn, but for most of the year until the next spring the ground appears bare.

According to differences of climate and soil within the steppe region, there are differences in the kinds, and the abundance, of the plant-forms. In the better-watered, northern and western parts of the true steppe there are areas of " meadow

steppe," of tall tufted grasses and gay flowering plants such as campanula and clover, which make a continuous thick cover to the ground ; even in a natural state, this can be mown to obtain a rich harvest of hay for use in the dry and cold seasons. In the less-watered districts, less succulent grasses and herbs which grow closer to the ground and are rather sparsely scattered form the greater part of the vegetation ; this can be utilized for grazing rather than for the cutting of hay.

As in the case of the more fertile forest regions, so here on the steppes the more productive areas have been much changed by man, both by pastoralists mowing or grazing the natural growths, and by agriculturalists cultivating the land for crops.

The Semi-desert Vegetation.—In the poorer steppe lands there appear some shrubs which have deep and long roots to obtain as much water as possible, and whitish, felted leaves from which the moisture is but slowly transpired ; there are also plants which are protected against the wind and the resultant loss of moisture by growing close to the surface of the ground. In the semi-desert, such forms of life adapted to an arid climate represent an increasing proportion of the vegetation as the grasses and herbaceous plants become fewer ; the amount of vegetation of any kind is but small and the bare soil is everywhere visible. As protection against still greater aridity, the woody growths commonly have their leaves reduced to spines. Also, as the conditions approach those of the deserts in which there are only occasional rains, the annual plants remain dormant below the surface for longer periods ; but whenever in the summer the soil receives a supply of water, they may appear, and pass rapidly through their very short vegetative period.

In the small areas in the extreme south-east which may properly be called desert, the vegetation is very scanty indeed, and only the " halophytes " adapted to living in salty soils, or plants which can find sufficient moisture in the sand-dunes, can exist.

The "Mediterranean" Vegetation.—As the winter temperatures are generally above the limit of growth, trees and woody shrubs which live throughout the year are the characteristic plant-forms ; they are protected against the loss of water in the dry summer by various devices, including deep and wide root development, a thick, rough bark, such as cork, and leaves of a different kind from those of the more northerly forest trees.

As the winter allows growth, there is no common period of leaf-

fall, nor need there be the extreme adaptation of a reduction of the leaves to needle-form ; the trees are evergreen and the leaves are broad, but their glossy and hard surface prevents rapid transpiration. The evergreen oak, cork oak, olive, holly, laurel and myrtle are of this kind and are typical of the region, although some of them may grow also in the south-western parts of the deciduous forest region where the winters are sufficiently warm.

Yet these broad-leaved evergreen trees are not the Only plants which can live under Mediterranean conditions, and an important group consists of low shrubs : e.g. heaths which are evergreen but have small and narrow leaves ; thyme, lavender and other aromatic shrubs ; the brightly flowering cistus, and many others.

Originally the Mediterranean region was largely forested, but these forests have almost disappeared ; now the natural vegetation, in the sense of that not deliberately planted by man, is only exceptionally forest or woodland, and that is found mainly on mountains or uplands where the temperatures are lower and the rainfall is greater than is normal. In such situations there are woods of evergreen oak or cork oak, as in the Iberian Peninsula, and there are also areas where the trees are those which are more common in other vegetation regions, such as the beech and edible chestnut, which extend southwards along the mountains of Italy, or the pines which grow on the uplands of the Balkan Peninsula.

Much more extensive are the thickets of evergreen shrubs which have replaced most of the original forests ; these growths may include low trees, such as the laurel and myrtle, and bushy plants, such as tree-heaths, cistus, broom and juniper. Such thickets are known as maquis in France, macchia in Italy and monte bajo in Spain.

Still poorer growths of lower bushes are formed of thyme, sage, lavender, small heaths, etc., with thistles and various flowering herbs, such as the asphodel and iris. These associations show bare earth between the plants; they are widely developed on the drier soils and are known as garrigues in France, tomillares in Spain and phrygana in Greece.

Meadows of the north-western European type are rare ; in well-watered situations there are associations of grasses and bulbous plants which give pasture, but these commonly dry up in the summer.

On the other hand, in very dry areas, such as the interior plateaus and the south-eastern lowlands of Spain, the climatic conditions and the vegetation approach those of the steppes of eastern Europe ; here grasses may predominate, and esparto grass is still the vegetation cover of some districts in Spain.

The natural or semi-natural vegetation is now found mainly on the higher parts, the steeper slopes and the poorer soils of the Mediterranean region ; most of the lowland and much of the hill-country has been taken in for cultivation.

SOILS

It might be expected that the nature of the soil is largely determined by the geological factor—the rock from which it is derived, for in England differences between soils often correspond to differences of the parent material. This view was generally held until Russian scientists, studying the soils of their vast country, which has such contrasted climates, realized that the climatic conditions are the main cause of the striking contrasts in the soils. To appreciate this, as well as to understand the essential character of the soils and their relation to agriculture, we may examine in turn the main soil types and soil regions of Europe, beginning with those of eastern Europe.

The Podsoles.—Beneath a thin superficial layer formed of fibrous vegetable material, the podsoles have an upper level, or "horizon," of an ashen-grey colour from which they were named (Russian : pod = under, zola = ash). This upper horizon has a loose structure, and consists of sandy and gravelly material. Both colour and structure are due to the washing down, or leaching, of the soluble salts, the lime constituent (calcium carbonate) and the clay from the uppermost to the second horizon, situated a foot or more beneath the surface. This second horizon, because of the materials washed into it, is usually compact, and often contains a layer cemented together by iron into an impermeable "pan." The essential process of leaching is the consequence of the downward drainage of water, and this occurs when the precipitation exceeds the combined loss by evaporation, the surface run-off and the transpiration of water by plants.

Hence climate is the main control of the development of the podsoles, and, moreover, the degree to which soils are leached is, directly and indirectly, due to the climate. The map in Fig. 17

shows the distribution of two types, the strongly leached and the moderately leached. The former extends widely over north-eastern Europe (excluding the tundra and mountain areas, which will be considered later), where the summer warmth is not enough to cause great evaporation. Also, the climate has here an indirect effect, since it allows the growth only of the coniferous forest, of which the vegetable residues tend to accumulate as a peaty layer, giving almost permanently wet conditions. The abundantly watered western side of Scandinavia also has soils of the same type. Farther south the coast-lands around the south-eastern corner of the North Sea have similar conditions, for the predominantly sandy character of the subsoil allows easy downward movement of the rain-water.

Soil conditions react upon the vegetation ; for example, the northern limit of the oak is partly determined by climate and partly by the difficulty with which this tree grows on the more strongly leached podsoles. Moreover, these strongly leached podsoles, having lost much of their plant-food constituents from the upper horizon, are unfavourable for cultivation ; to be productive, they need to be supplied with a considerable amount of lime and other manures and to be very thoroughly tilled.

The moderately leached podsoles are found in warmer well-watered regions, and in these the less-marked grey colour of the upper soil and the usual absence of a compact and cemented lower horizon bear witness to the retention of more of the plant-foods in a condition available for plant-life. The deciduous forests, too, supply an annual leaf-fall which is incorporated with the soil.

The map shows that the moderately leached podsoles extend over the deciduous forest regions of eastern Europe and over much of the north-western coast-lands of the continent, excepting the mountain areas ; they are also found on interior uplands. As there are no definite limits to climatic conditions and seldom sharp changes in the vegetation, so the resultant soil types usually merge into one another.

In areas of abundant water together with poor drainage, the podsol regions are characterized by the development of peaty soils. Moorland peats form acid soils of little value to man, but since the fen peats found in lower situations form less acid soils and contain more plant-food, they may prove productive when drained.

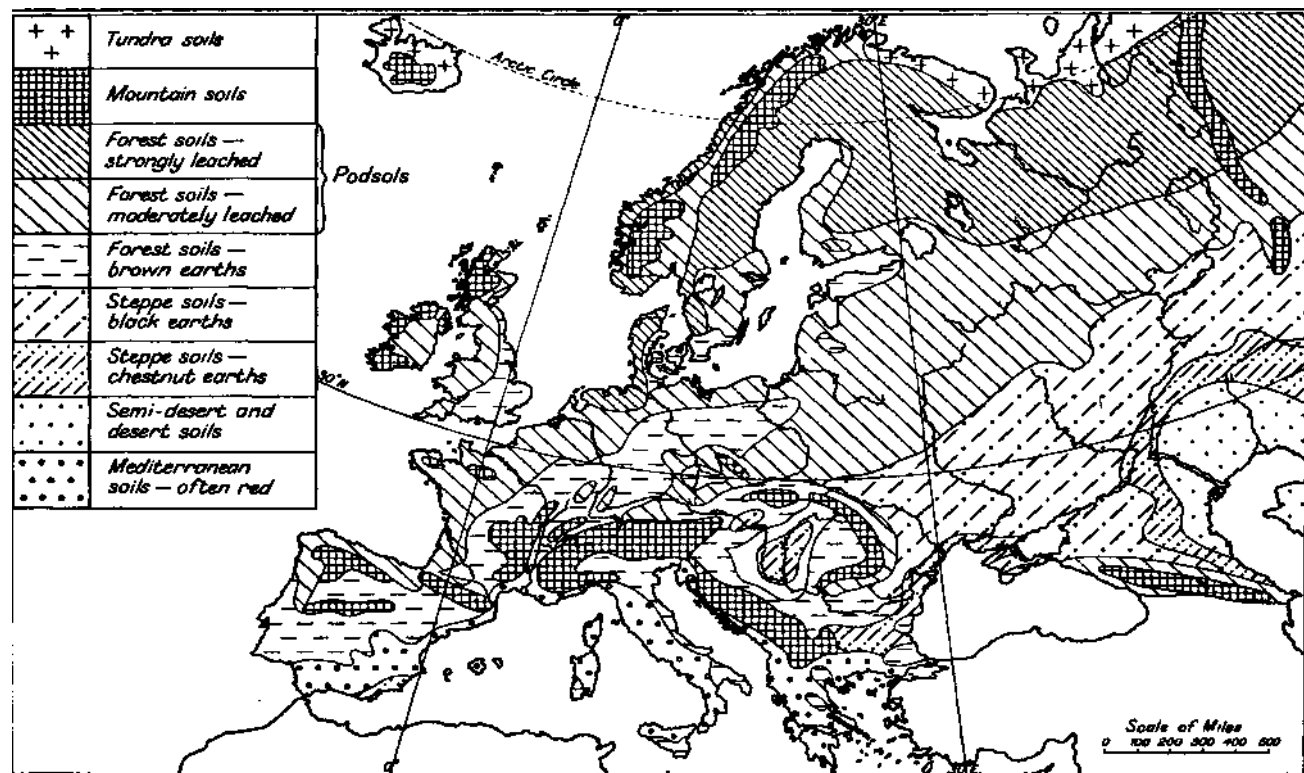


FIG. 17.—SOIL REGIONS OF EUROPE.

The Tundra Soils.—These soils of the far north are largely the result of their water-logged condition and the low temperatures. Evaporation is very slight and the subsoil is permanently frozen below a depth of 2 or 3 feet. Humus, the partially decomposed organic matter formed from plant residues, remains as a surface layer, for downward leaching is impossible, and the low temperatures hinder chemical or other changes ; peat is commonly formed.

It thus appears that an abundance or an excess of water is the main factor in determining the soil conditions in all the northern part of eastern Europe. In the south-eastern part, on the contrary, seasonal or permanent aridity is the controlling factor.

The Black Earths are the characteristic soils of most of the steppe areas, where they are known as chernozem. The black colour is due to a large proportion of humus in the upper horizon, which is usually about 3 feet in depth, and at the base of this there is an accumulation of calcium carbonate, before a transition to the parent material. This parent material is often, but not always, loess.

The humus is derived from the annual addition of vegetable matter from the grasses and herbaceous plants ; the decomposition remains incomplete, because it depends upon the activity of bacteria and other soil-organisms, which is limited, like that of the vegetation, by winter cold and summer drought.

Of great importance is the occurrence of rains and the melting of snow in spring followed in summer by heat and drought. In spring the calcium carbonate is washed down from the surface ; in summer the surface soil becomes dry, and by capillarity the water rises from below and brings up soluble matter, including calcium carbonate, which is then deposited as the water evaporates. There is thus an accumulation of the calcium carbonate at the base of the upper horizon—an indication of a balance in this black earth region between the downward leaching of the well-watered north and the upward movement which becomes most important in the arid south-east.

In the black earths there is an abundance of plant food, and cultivation is made easy by the crumbly structure of the humus-bearing layer ; consequently the black earths stand among the best of the world's soils from the point of view of fertility.

The Chestnut-coloured Soils.—On the northern side the

black earths pass through grades of greyness to the ashy soils of the forest regions ; on the south-eastern side they change to a light-brown, chestnut colour, since the dark humus decreases in amount as the plant-life from which it is derived becomes more scanty. Because of the increasing aridity there is still less leaching than in the black earths, and there is more calcium carbonate in the upper horizon. In themselves, these soils are nearly as valuable as the black earths, but the climate is not so propitious to agriculture.

It should be noted that the steppe soils, besides covering most of south-eastern Europe, are found in the middle Danubian lowlands and in other areas of central Europe too small to be shown on the map.

The Semi-desert and Desert Soils.—The marked aridity in the Caspian Depression continues the change just described, and the upper horizons of the soils progressively contain less humus and more calcium carbonate. Their colour changes through brown to grey, and their fertility decreases. In the most desert-like areas, blown sand is accumulated and even heaped up in dunes. Also, in some parts there appear upon the surface thin crusts, or efflorescences. These are formed by water from the occasional rains sinking some distance into the soil, which then again dries ; the water, after a period during which it dissolves the salts in the soil, works upward by capillarity and evaporates on the surface, where it leaves saline or alkaline deposits.

In these arid regions soil conditions combine with climate to make them inhospitable to man.

Brown Forest Earths.—From the point of view of the formation of productive soils, northern Russia suffers from an excess, and southern Russia from a deficit, of water ; the best balance occurs in the central Russian regions. A similar balance as regards the water-supply occurs in much of central and western Europe, and here it is associated with less severe temperature conditions than in the eastern part of the continent.

Consequently in these regions there is less leaching than in the case of the podsoles, while a greater activity of the soil organisms reduces the amount of humus as compared with that of the black earths. With a natural vegetation of deciduous forest, there is an annual leaf-fall which UNIVERSITY LIBRA

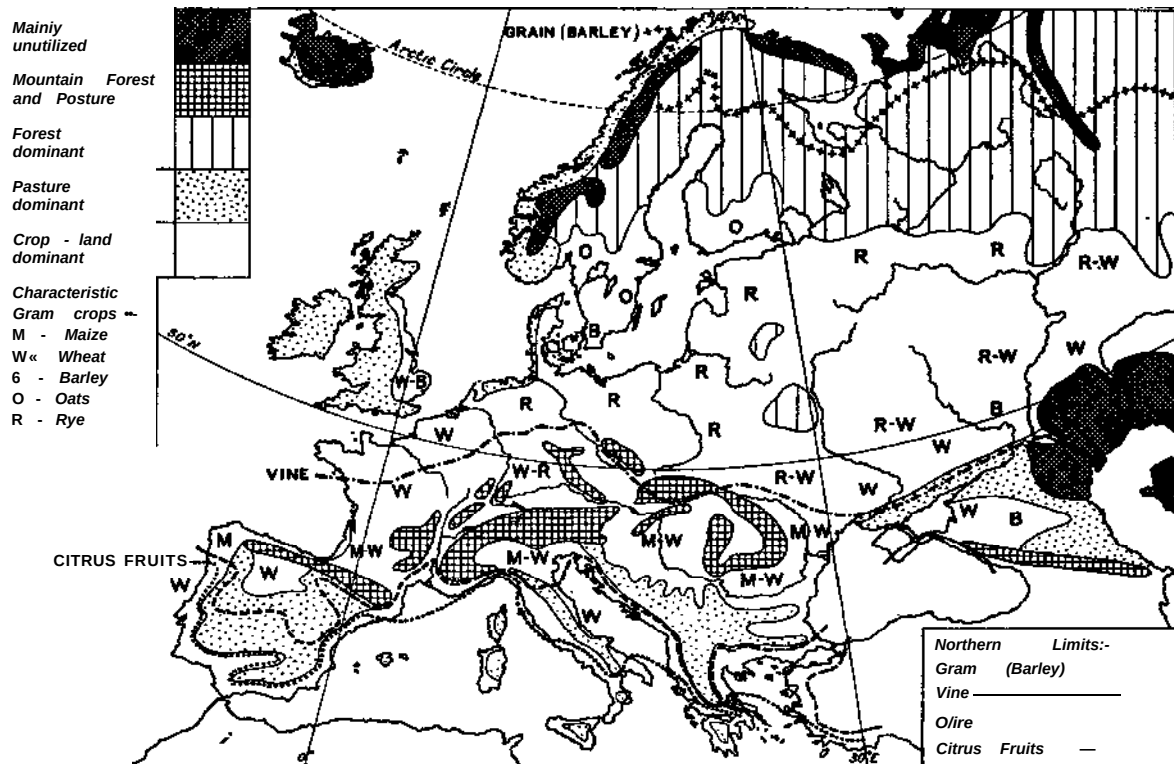


FIG. 18.—LAND-USE REGIONS OF EUROPE.

[Adapted from Jonasson.

the soils for cultivation, and their generally crumbly structure aids tillage.

This group of soils is a large one, and there are many differences in the colour and the other conditions, partly because with this "balanced" type of climate differences in the nature of the parent rock show themselves in the soils, as is well illustrated in the case of south-eastern England.

Moreover, since these soils are generally quite remunerative and have been worked by farmers for centuries, they have often been transformed from a natural to an artificial state.

Mediterranean Soils.—These are varied in character, but frequently have a reddish colour, and although they are often derived from limestone, they are typically fairly heavy clays; unfortunately soil science has not advanced far enough to reach an unquestioned explanation of their mode of origin. In several parts of the Mediterranean lands the red clays provide "oases" of cultivable land in otherwise almost barren limestone areas.

Mountain Soils.—Because of the low temperatures the weathering of the soils of mountain regions has been largely physical, and their development has not in general proceeded far. In the soils of areas above the forest limit there may be a humus layer, recalling that of the tundra, and below this a tendency to a podsol character shows itself. On the slopes there is usually only a thin covering of coarse rock fragments, while the finer material may be deposited as a deeper, and sometimes fertile, soil in the valleys.

LAND-USE AND CULTIVATION

The use that men make of the land depends partly on their desire for particular necessities and comforts, partly on their knowledge and equipment for obtaining these, and partly on natural conditions of climate, vegetation and soil.

Hence the map showing the main forms of land-use (see Fig. 18) shows certain broad similarities with the maps showing the climatic regions, the natural vegetation and the soil types.

Like those maps, that of land-use regions has had to be generalized, and the respective forms of utilization overlap considerably, but the following regions can be distinguished.

The "Mainly Unutilized" Areas.—In the cold north there are the tundra lands which offer practically nothing except a little pasturage for reindeer, the northern Urals and the parts of

the Scandinavian Mountains to which at best cattle may be driven for a few weeks in the year, and the greater part of Iceland, in which there are some areas of summer feeding for sheep. In the arid south-east of Europe there are only poor exclaves of the steppe-lands and small areas where irrigation is possible.

Dominant Forest areas are those of the coniferous forests in the broad belt of country forming the northern portions of Sweden, Finland and Russia. They are still mainly unbroken, although there are occasional clearings in which some agriculture and pastoral work are carried on. In the extreme north only vegetables can be grown, but in the remaining area barley, the grain crop which can ripen in the shortest vegetative period, is cultivated. . It should be noted that this grain is the " six-row " barley which is used for man's food ; it is an entirely different plant from the much more productive " two-row " barley which is grown in England mainly for malt, and in the south-west Baltic lands also as food for pigs. Farther south there are many " islands " of uncleared forest in the region marked on the map as dominant crop-land ; two of these are diagrammatically shown, one being the lake-studded area where Latvia, Lithuania and Russia adjoin, and the other the great Pripet Marshes.

Mountain Forest and Pasture.—These regions are the uplands and highlands of Central Europe and the Caucasus Mountains. In general, they are characterized by having deciduous forest with coniferous forest at higher levels, and then alpine pastures, and in some cases these are succeeded by culminating areas of bare rock and perpetual snow ; only in the valleys is cultivation possible. The use of the land varies from region to region, as will be explained in more detail in later chapters.

Dominant Pasture areas are those in which the main occupation of the people is the keeping of animals and in which a high proportion of the land is used for growing hay or for grazing, although there may be some crops grown either for fodder or for human use, and there may also be forests, moors or heaths. These largely pastoral areas fall into three main groups :

(i) Over much of north-western Europe, including the southern coast of Iceland, the climate is too wet for grain growing to be the most remunerative form of farming. In

Iceland sheep are reared ; in Britain both sheep and cattle are kept; in Norway, and in parts of the North Sea Lowlands, the keeping of cattle and the production of milk, butter and cheese are the main objects of farming. Grasses, clover and root crops are therefore grown and, as food for men, potatoes and oats—a grain which can ripen in relatively cool and wet summers.

(ii) In the Mediterranean region poor pasture has to a considerable extent superseded the forests of the uplands, while in parts woods of evergreen oak yield acorns as mast for animals. Not all the upland areas are used for pasture, however, for there are woods of cork oak, as well as of chestnut and other trees which yield their fruit. Sheep and goats are the animals most commonly kept, and in the Balkan Peninsula swine, too, are numerous. In the northern uplands of this peninsula, where the climate is not of the Mediterranean type, the forests have been so largely cut that even here pastoral work is now dominant ; cattle are relatively more important in these Balkan regions than in the other two southern peninsulas of Europe.

(iii) In the steppe-lands of south-eastern Europe the growing of crops gradually becomes less, and the work of the people becomes more restricted to the keeping of animals, towards the south-east. Cattle are reared in the rather better-watered part of the predominantly pastoral area around the Sea of Azov, and sheep mainly on the still drier country draining to the Caspian Sea.

Dominant Crop-land areas form the largest, as well as the most productive, group of agricultural regions of Europe. They are very varied in type, and one useful way of distinguishing them is according to the grain which is most commonly grown, although almost everywhere the keeping of animals is one aim of the farming, and generally vegetables are a product of considerable importance.

Grain Crops.—*Oats*, as stated above, form the characteristic crop over much of the pasture-lands of the north-west, and the crop-land in which they are predominant extends over southern Scandinavia to the lands north of the Gulf of Finland. Yet other grains, as well as root crops, are grown in the same area, and the two-rowed barley is particularly important in the region around the entry to the Baltic Sea. In eastern England, too, barley is largely grown, and here it rivals wheat as regards the amount of land devoted to it.

Rye.—The rye belt stretches from central Europe south of the North Sea and Baltic Sea across the middle of Russia as far as the Ural Mountains. Although rye requires a longer vegetative period than barley, and drier conditions for ripening than oats, it is a hardy grain and is largely grown on the inhospitable podsols of Russia and the glaciated areas of Germany and Poland. Rye bread has now been displaced by wheaten bread in western Europe, but it is still largely used in central Europe, and remains the staple food in the east. In Russia buckwheat and oats are also grown in the region in which rye is dominant.

Wheat.—The wheat zone is the most extensive, for its northern margin forms a great curve stretching from eastern England into central Europe and across Russia south of the rye belt, while it is largely grown in the warmer parts of central Europe and in the Mediterranean region. Thus wheat overlaps with barley in England, with rye in the Rhine-lands and in the black-earth areas of Russia, and with maize in the southern part of central and western Europe. Comparing the map of crop distributions in Fig. 18 with that of the duration of warmth in Fig. 11, it will be noticed that the northern part of the rye belt has a warm period lasting about four months, that of the wheat belt about five months and that of the maize belt over six months.

Yet the climatic conditions are, of course, by no means uniform over the whole range of wheat production of Europe, and the methods of cultivation consequently vary. In the west "winter wheat" is cultivated; that is to say, the grain is sown in autumn, remains dormant during the winter, grows as soon as the vegetative period begins in spring and is harvested in late summer. In the east the winters are too severe for this type of wheat, and "spring wheat" takes its place; though it is not sown until well in the spring, the hot summers allow a rapid growth and the harvest occurs rather late. In the Mediterranean region the wheat is sown in autumn, slowly continues its growth during the winter and ripens in the dry weather of the early summer.

On the map showing the crops, wheat is marked as the "characteristic" grain of certain regions, either with or without others indicated on this map, but it is almost always only one of several crops grown in rotation in successive years.

Maize.—In its climatic requirements this is the most exacting of the common grain crops of Europe, for it requires both con-

siderable heat and also a good supply of moisture ; hence it is grown in the parts of temperate Europe which have the warmest summers, but not commonly in the Mediterranean region nor in the eastern part of the steppe-lands, where there is a lack of rain in summer.

Barley.—Barley, and particularly the six-rowed varieties, can mature with little heat and with little moisture. Accordingly, barley is the marginal crop, not only in the cold north, but also in the dry south-east ; here and in the neighbouring parts of Asia it is the grain grown by the semi-nomadic peoples in the areas dividing " the desert " from " the sown."

Other Crops.—Space does not permit a separate comment on the distribution of all the other crops. Some are grown as food for men or animals, including grains such as rice, buckwheat and millet, potatoes, root crops, and vegetables of many other kinds. Other are " industrial " crops from which other products are obtained ; e.g. sugar-beet, flax and tobacco. Among these, the sugar-beet is largely grown over an area which almost coincides with the northern part of the wheat belt, that is, from eastern England across the north of France into Belgium and Germany, and thence across Poland and Czechoslovakia into the black-earth region of Russia. Flax is another important industrial plant, from which the fibre is used for manufacturing linen and the seed is crushed for oil and cattle - food. It has a fairly wide climatic range and is cultivated in districts as far apart as northern Ireland, and northern and southern Russia.

Fruits.—The northern part of the area shown as crop-land can allow the growth only of the more hardy kinds of fruit, notably apples and cherries ; in the central part appear others, such as pears and plums ; in the south there is an increasingly great variety. The northern limits of three fruits of considerable importance are drawn on the map. The vine is very widely cultivated, and the wine made from it is used both as a common drink in many of the vine-growing countries and for export as a luxury in cooler lands. It is significant that although the greatest amount of wine is produced in the Mediterranean region or on its margins, some of the most valuable kinds are obtained from near the northern limit of the vine, e.g. in Champagne in France and by the middle Rhine and its tributaries in Germany.

The olive, the most characteristic tree of lands with the Mediterranean type of climate, yields oil which is locally used to supply fat in the diet as butter is utilized in the cooler cattle-rearing countries. Citrus fruits, mainly oranges and lemons, need higher temperatures for ripening than generally occur in the northern part of the Mediterranean region ; therefore, although their limit is shown on the map to approach this margin in the Riviera district of the Gulf of Genoa, the yield here is neither so good nor so great as farther south. Indeed, the distribution of the citrus fruits indicates fairly well the extent of a " very warm," as distinct from a " warm," variety of the Mediterranean climate. As in the case of the other fruits of southern Europe, the oranges and lemons are grown partly for local use and partly for export, particularly to central and north-western Europe.

Besides citrus fruits, olives and grapes, many other fruits are cultivated in the Mediterranean region, e.g. apricots, peaches and edible nuts, such as almonds and walnuts.

So important is fruit growing, and so much of the work of the people is directly or indirectly bound up with it, that the area of the Mediterranean climate may almost be labelled as the fruit-growing region of Europe.

QUESTIONS

1. Describe the *transitions* between tundra, forest, steppe and desert in Russia.

2. Show how the natural vegetation is adapted to the climatic conditions of the " Mediterranean " region.

3. Give a description of the typical " black earth " of Russia, and account for its characteristics.

4. Distinguish between the various types of pastoral work in Europe, and give reasons for the differences.

5. To what extent, and in what ways, is the cultivation of wheat related to climatic conditions.

6. Explain how the differences between types of forest found in Europe are related to climatic differences.

7. Describe the nature and distribution of the podzols of Europe, and show how they are interrelated with both climate and natural vegetation.

8. Discuss the truth of the statement: "Natural vegetation regions are also regions of characteristic types of farming."

GEOGRAPHICAL REGIONS

IN the preceding chapters we have considered separately the most important factors in the geography of Europe, viz. relief and structure, climate, natural vegetation, soils and the use of the land ; in connexion with each of these factors a map has shown its special regions. Now, as geography concerns itself with the interaction of the various factors, we shall indicate regions, each of which has a character depending upon a special grouping and a special form of interaction of all the factors. These regions we call " geographical," preferring that term to " natural," which is likely to be regarded as equivalent to " physical," because here the human factors are also considered ; indeed, in some of these geographical regions man has very greatly modified, and even transformed, the natural conditions.

The geographical regions form definite and distinct environments of man, where people work in certain ways and in which they have developed characteristic modes of life ; in one sense, however, the regions are more than environments, for man himself is an essential element in them.

From the preceding chapters it will have become evident that climatic conditions occupy a pivotal position in this study of Europe ; in the first place, they depend upon the position and the relief of the constituent areas of the continent, and, secondly, climate very largely determines the natural vegetation, the soils and the use that is made of the land. Hence it is not surprising that the larger geographical regions correspond very closely with the climatic regions, as may be seen by comparing the maps in Figs. 15 and 19. That is true of the major geographical regions, but within these there are minor geographical regions which are distinguished from one another sometimes by minor climatic differences, and sometimes by other differences, particularly those of relief and structure.

Because the climatic conditions in the east and south of Europe extend over the adjoining parts of Asia and Africa, the major regions of eastern and southern Europe stretch far

beyond the limits of this continent; the map in Fig. 75 should be studied to see the relation between Europe and the other continents in this respect.

The Arctic Region.—The Arctic Region is primarily characterized by its cold climate, which has already been described, and it is to be noted that the region is considered as including both the tundra lands within the Arctic Circle and also the higher areas of the Scandinavian Highlands. When the minor regions of Arctic Europe are studied separately, the differences between these two parts must be taken into account. It may here be pointed out that the common climatic conditions of extremely long, cold and dark winters, with very short and cool summers, in both parts of the Arctic Region have resulted in similar conditions as regards the soil, which is wet in summer on the surface, but below this is permanently frozen. Consequently the natural vegetation is mainly of small growths, such as mosses, lichens and low shrubs, and man has been able to make little use of the region.

To the southern part of the Scandinavian Highlands cattle are driven in summer from the neighbouring lowland areas of Norway, while the northern part of these uplands and the tundra region are traversed by reindeer, which seek as food the sparse pastures of "reindeer moss," growing so slowly that it needs several years to form a fresh pasture after it has been cropped by a herd. The people who own the reindeer are necessarily nomadic and few in number; they retire in winter to the forest, where hunting is possible, and in summer advance to the coast, where fishing adds to their scanty resources. Since this region offers little which can be exchanged for the products of other regions, and since its position is so remote and the means of communication are so poor, there is very little contact with the rest of Europe, and the inhabitants live in a relatively primitive manner.

The Boreal Forest.—This is the region with the Boreal type of climate and with a natural vegetation cover of coniferous forest; the soils have been in general strongly leached and the surface is often swampy. Largely because of the unfavourable physical conditions, only small clearings have been made in the forests. This is most markedly the case in the east, where the winters are coldest and longest, and where the rivers, which offer the easiest routes, drain to the Arctic Sea. During the

winter the snow accumulates on the land, but with the rapid rise in temperature in spring it melts and floods the country; in this region the thaw occurs in the southern part while the lower courses of the northward-flowing rivers are still ice-bound. The inundations are therefore serious, and work on the land and traffic on the rivers are both delayed; the effective period of activity in summer is thus curtailed, and agriculture, pastoral work and trade are further handicapped.

In the north vegetables are the main crop; in the south barley is grown, and some oats and rye; some cattle, sheep and horses are reared, but the amount of farming is very small in relation to the great extent of the region. The maps in Figs. 18 and 19 show that only along parts of the southern margin have crop-lands extended into the Boreal Forest region.

In the main, forestry is still the characteristic occupation, and even this is largely limited to the southern part and to the neighbourhood of the rivers. Another resource is the hunting and trapping of the fur-bearing animals, though these have now been much reduced in numbers. With the exception of some towns situated on the rivers, and mostly either by the northern seas or near the southern margin, the settlements are small and widely scattered, and the population is scanty.

On the eastern margin of the region in Europe, the Hercynian block of the Urals yields mineral ores which have made possible industrial development.

The western part of the Boreal Forest region, in Finland and Sweden, is made more accessible by the existence of the Gulf of Bothnia, towards which the rivers drain; here there has been more development in connexion with all the resources of the lands and the waters. This is especially the case at the mouths of the rivers and around the coasts of the Gulf of Bothnia, where agriculture and pastoral work gain from some amelioration of the climate, and where the timber from the forests is worked up in saw mills and factories run by water-power from the streams. Moreover, in this western area the ancient rocks of the Baltic Shield emerge from below the sedimentary deposits of the Russian Platform; some minerals are obtained, and by the Gulf of Bothnia a little iron-working utilizes ore from inland mines. The population following these occupations is therefore more considerable in this narrow coastal belt than elsewhere in the Boreal Forest region.

The Sub-boreal Farmed Forest.—The more favourable conditions of the Sub-boreal climate region are reflected in the "mixed" character of the natural vegetation and the less thorough leaching of the soils. To these conditions is added greater accessibility from central Europe, whence came the greater developments in regard to the use of the land. Consequently the clearings have been more extensive than farther north, and now the region may be conveniently labelled "farmed



FIG. 19.—GEOGRAPHICAL REGIONS OF EUROPE.

forest." There are considerable areas of still virgin forest where timber is cut for export, but most of the region may be regarded as crop-land, oats and rye being the chief grain crops.

In the Baltic Shield area in Sweden there has been a development of mining and manufacturing, and around the shores of the Baltic Sea there have grown up a number of towns and cities dependent upon the agricultural and industrial occupations and the associated commerce. In the Russian area are the past and present capitals, Leningrad and Moscow, while industries and trade have grown up at a number of other large centres.

Yet in general the Sub-boreal Farmed Forest region is predominantly agricultural, and it is one of the less densely populated regions of the continent, with the exception of the Tundra, the Boreal Forest and the arid Caspian depression. The map of the geographical regions should be compared with that in Fig. 82, showing the density of population in Europe.

The Steppe Lands.—The steppe lands offer greater returns to agriculture than the forests situated north of them, because of their easier working and the greater fertility of their soils, especially in the belt of the black earth. The climate, too, is more favourable, with its longer summers and the higher temperatures in the growing season, except where the supply of water is scanty, as on the south-eastern margin. Although agriculture has only relatively recently superseded a primitive form of pastoral work, and although modern scientific methods of cultivation have still more recently been introduced, nevertheless this region has a wide range of products and is capable of giving high yields. This is particularly true in the western part of the steppe-lands, where the more valuable grains, maize and wheat, are grown in great amount, together with beet, flax and other industrial crops, and where the vine and other fruit trees are cultivated.

Towards the east the variety of products is reduced by the more extreme temperatures and the poorer supply of water; also the normal yield of the crops is less, and the keeping of animals is relatively more important than in the west. Moreover, the rainfall is more variable in the eastern steppe-lands and failure of the harvests is a serious menace. For these reasons, the population dependent upon agriculture is considerable in the west, but decreases greatly towards the east.

Mineral resources are associated with the two areas where the older rocks come to the surface in southern Russia. Within the eastward bend of the Dnieper the ancient rocks yield ores of iron and manganese, and where the river cuts through the resistant outcrop the rapids give enormous water-power, which is used for the production of electricity. In the Hercynian block of the Donetz region is a large coalfield which has also led to the growth of industries in southern Russia. There are oilfields on the margins of the Carpathians in the south-west, and of the Caucasus in the south-east, of the steppe-lands.

In spite of various drawbacks to navigation, the rivers, as

well as roads and railways, carry traffic through the steppe-lands between the Black Sea and the interior of Russia and Rumania.

With these varied resources and activities, the western part of the steppe-lands has much urban as well as rural development, and the density of population is greater than in any other part of eastern Europe. Indeed, the manner of life of the people is becoming similar to that of the central countries of the continent.

At its south-eastern margin, the region adjoins the Caucasus Mountains, which are geographically more closely related to the highlands of south-western Asia than to the neighbouring regions of Europe.

The Arid Caspian Lowland.—The low and irregular rainfall, the infertility of the soils, the lack of other resources and the remoteness of the position combine to make this extreme south-east of Europe a region of difficulty to man, and comparable in this respect with the extreme north-east of the continent. The lower valley of the Volga, with its port, Astrakhan, is the main exception to this rule.

The Mediterranean Lands.—To its position on the globe this region owes both its general climatic conditions of a mild, moist winter and a hot, dry summer, and also its general structural characteristics of fold-mountains enclosing sea-filled subsidence basins, as a result of which there are commonly narrow coastal lowlands rising rather steeply to hills or mountain ranges.

In the eastern part of the Mediterranean lands of Europe the climate tends to dryness and there is relatively little lowland ; here the growing of the characteristic fruits is one of the main occupations of the people, who have terraced the lower slopes for this purpose, while at higher levels there is little more than poor pasturage.

Around the western basin of the Mediterranean Sea and by the Atlantic coast in the same latitude, there is generally a better rainfall or better possibilities of irrigation, while there is also a greater area of lowland. Consequently there is a wider range of products, and grain and vegetables, in addition to fruits, are grown to a considerable extent.

The interior of the Iberian Peninsula is largely plateau, and while some higher ranges are well watered and bear a vegetation cover of woodland, much of the remainder tends to aridity

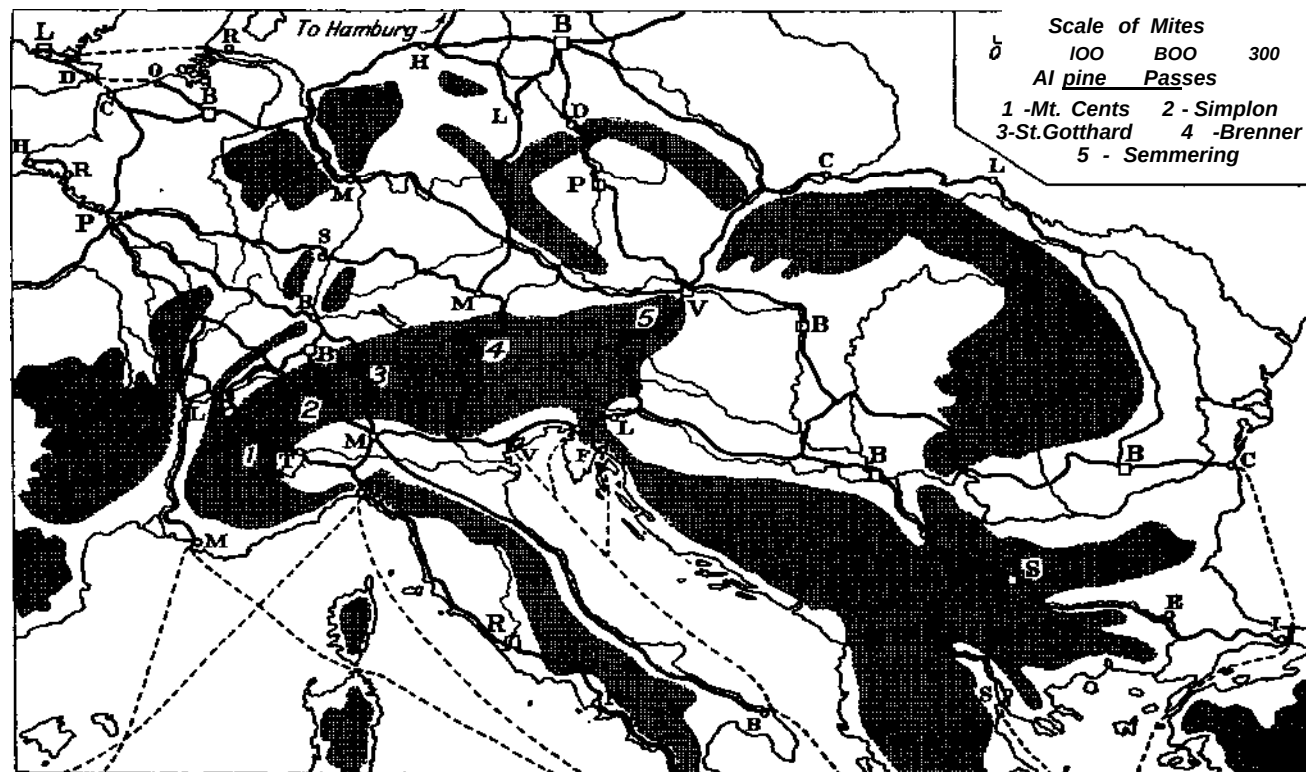


FIG. 20.—RAILWAY ROUTES AND COMMERCIAL CENTRES.

and is dependent upon an artificial water-supply for its utilization.

Coal deposits are lacking, and only in scattered areas are there other forms of mineral wealth, and in the Mediterranean region industrial development is mainly limited to certain ports at or near river-mouths.

The Mediterranean Sea and its extensions, the Adriatic, Ægean and Black Seas, give access from the ocean to a great part of southern Europe, and with the cutting of the Suez Canal the Mediterranean Sea links Europe with the Indian Ocean and the Far East. But the mountain-folds encircling the sea impede communications between the Mediterranean lands and those of the remaining part of the continent, and land traffic is restricted to a few breaks or passes in the mountain barriers ; hence in a few ports on the northern shores is concentrated a considerable amount of commerce, both in local products and in goods of wider origin. (The situation of the chief ports and their relation to the routes leading to central and north-western Europe is shown in the map in Fig. 20.) Trading is therefore important in certain parts of the Mediterranean region, and this occupation and the intensive agriculture and horticulture of the larger coastal lowlands have together given rise to some great cities and some areas of dense population.

Temperate Europe.—The region with a temperate climate is the only major geographical region which is entirely European, with the exception of the adjacent Sub-boreal Farmed Forest, for all the other major regions extend far beyond the limits of the continent. As shown on the map of Europe in Fig. 19, this temperate-climate region appears very extensive, but the map in Fig. 75 of the major regions of Europe and north-western Asia shows that its area is not remarkably great as compared with those which overlap the continents.

It has within it, however, such a variety of relief and structure that its constituent areas vary considerably, and no single descriptive label, such as " lowland " or " forest," would be applicable to it as a whole. It is, therefore, convenient to term it simply " Temperate Europe." The differences within it are so marked that it is necessary to divide it into three minor regions, as shown on the maps in Figs. 19 and 21, and these minor regions will now be separately considered.

The Atlantic Margins.—The characteristic feature of the

climate of Temperate Europe is the influence of oceanic winds during the whole year. This influence is particularly marked along the Atlantic Margins from the north of the Iberian Peninsula to the northernmost part of the continent, and throughout this extent it produces a very equable and rainy climate.

Also, along this marginal belt, the earth's crust has suffered dislocations which have resulted in the drowning of large areas and the upraising of most of the remainder, and hence the lands have a considerable elevation. Their altitude combines with the rainy character of the climate and the associated leaching of the soils to handicap agriculture. Forests, moors and heaths cover the highland and upland areas, and the relatively small areas of lowland are mainly given over to grass ; with the rather higher temperatures of the southern part, however, there is more cultivation.

There are scattered deposits of minerals, but only the coal of the British portion has served as the basis of manufacturing to any extent. Elsewhere, besides farming the chief resource is fishing, for the region is too remote from the busier districts of the continent for trading to be important. Hence the population is, with small exceptions, rather scanty. Even in Britain, as was explained in Volume I of this series, the Atlantic Margins differ markedly from the English Lowland, which belongs to the next minor region.

The Developed Lowlands and Wooded Uplands.—The map of climate regions in Fig. 15 shows that within this minor region there are modifications in the climate, particularly noticeable in an approach to extreme conditions towards the east. Moreover, a relief map shows that, apart from the Alps, there are in Central Europe considerable upland areas which are high enough to have distinctly cooler and wetter conditions than the adjoining lowlands ; these uplands areas are indicated also on the map of structural regions in Fig. 1 as belonging to the Hercynian group or as due to foldings of the Alpine type.

Putting these facts together, it will be seen that this minor region of Temperate Europe comprises (a) lowlands of sedimentary material, and (b) uplands of generally older and more resistant rock, and that each of these groups is composed of a number of relatively small areas with climatic differences corresponding to their respective positions (see Fig. 21).

The former group is here labelled as " developed lowlands,"

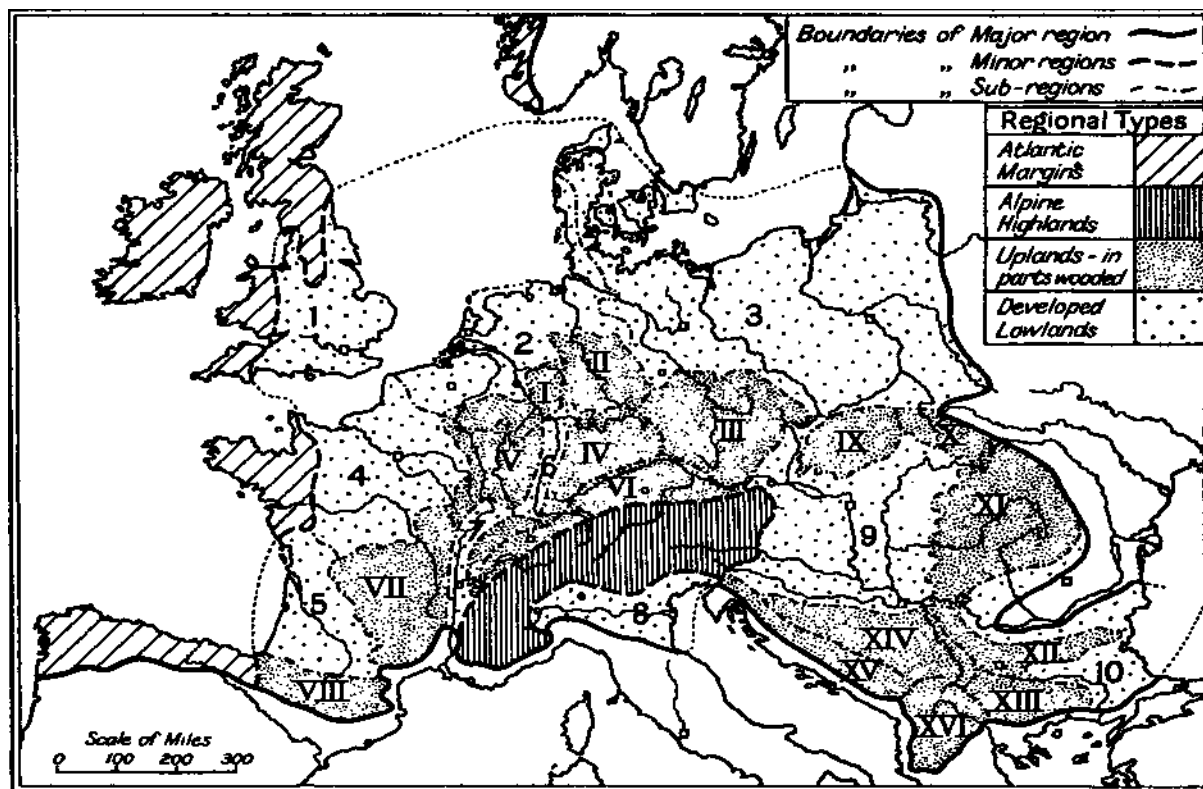


FIG. 21.—REGIONAL TYPES OF TEMPERATE EUROPE.

because their resources have been very thoroughly exploited and in them a number of districts have been largely transformed by human agency. In general, the climate and soil favoured early settlement, and for centuries men have used and improved the natural conditions, while even less-favoured parts, such as the marsh areas near the delta of the Rhine, have for various reasons also attracted settlers, who have converted them into productive lands.

Practically the whole of the lowlands are farmed, and much of the area is cultivated in an intensive manner, with a high yield as well as a great variety of products. According to the varying climatic conditions, rye, barley, wheat and maize are characteristic in different localities, generally associated in a rotation with other grains, industrial crops or fodder crops. Pastoral work in many parts is carried on in its most remunerative form, viz. dairy farming, to meet the needs of large urban populations. Minerals, too, have been exploited where they exist, particularly where coalfields dip down from the Hercynian Uplands under the margins of the lowlands, and some of the greatest and most densely populated industrial regions of the world have grown up in these lowlands.

The "drowning" of the continental margin has brought the sea far into the region, and from much of the interior of Europe the rivers bring traffic to the English Channel, the North Sea and the Baltic Sea. Because of the great amount of manufactured goods produced in the region, and the need of the dense populations for raw materials and food, commerce has developed here as in few other parts of the world and many important trade routes meet in the lowlands, as is shown in Fig. 20; there are also great ports, especially near the mouths of the rivers on the continental and English shores of the North Sea. Manufacturing and trading have thus led to immense urban development in the more northerly of the lowlands, viz. the English Lowland (numbered 1 on the map in Fig. 21), the North Sea Lowlands (2), the South-West Baltic Lowlands (3), and the North French Lowland (4).

On the other hand, some of the more southerly regions have more favourable climatic conditions and give a greater return to agriculture, as is exemplified in the Basin of Aquitaine in France (5), the Rhine Rift Valley (6), the Rh6ne-Sa6ne Trough (7) and the North Italian Plain (8). On the eastern side a lack

of rain may be a handicap in the Middle Danubian Lowlands (9), while a transition to steppe-like conditions is observed in the drier South-eastern Lowlands (10), which include the Walachian Hill-lands and the East Balkan Lowlands.

Each of these ten areas has sufficient unity within it, and sufficient difference from its neighbours, to be regarded as a distinct sub-region of the " Developed Lowlands and Wooded Uplands " of Temperate Europe.

The uplands of Temperate Europe, with their cooler and wetter weather, are less suited to crop growing ; they have considerable areas given to pasturage, but their characteristic vegetation-cover is forest. There is quite a variety of trees, and forestry is one of the chief occupations. The minerals, which in a number of districts first attracted settlers, have in several cases been largely worked out, and only relatively small industries are based upon them. Trade naturally avoids the higher areas (again see Fig. 20), and because of these combined conditions, the uplands are, in general, the homes of much smaller populations than the lowlands.

These uplands form a number of distinct sub-regions, which may be grouped according to their position. The Central Uplands of Europe comprise the Rhine Plateau (marked I in Fig. 21), the Weser-Saale Hill Country (II), the Bohemian Diamond and its margins (III), the East Rhine Scarp-lands (IV), the West Rhine Scarp-lands (V), the Jura Mountains and the Alpine Foreland (VI). In western Europe are the Central Plateau of France (VII) and the Pyrenees (VIII). On the eastern side are the three Carpathian sub-regions (IX, X and XI), and five more constitute a great part of the Balkan Peninsula (XII—XVI).

The Alpine Lands.—The great differences in elevation make it difficult to summarize the characteristics even of this relatively small minor region. It may be briefly said that the valleys provide sites for settlement, and offer opportunities of farming and other occupations which support the comparatively small numbers of inhabitants, while through some of the valleys pass routes connecting central and north-western Europe with the Mediterranean region. At higher altitudes forests supply timber, and still higher are summer pastures to which animals and people migrate for a few months. Above this habitable zone, dwarf shrubs, low cushion-like growths, lichens and other forms of alpine flora appear in summer and recall, in the heart of

Temperate Europe, the plant-life of the Arctic Region ; in the highest zone of all, only steep slopes and culminating peaks of bare rock emerge from snow-fields.

Peninsular and Trunk Europe.—We may regard Peninsular Europe as that part of the continent which adjoins the Atlantic Ocean and has been given peninsular form by the penetration of the North and Baltic Seas on the north and the Mediterranean Sea on the south. It may be broadly limited eastward by a line drawn through the Gulf of Bothnia and the Baltic Sea to near the mouth of the Niemen (Memel) River where Temperate Europe adjoins the Sub-boreal Farmed Forest Region, and thence the limit approximately follows the boundary of Temperate Europe to near the delta of the Danube.

By such a division, both Peninsular and Trunk Europe include portions of several geographical regions, but the former is more open to maritime and western influences, while the latter has a continental and eastern orientation. The physical causes of the differences have now been shown ; corresponding contrasts in the human geography of the two areas will be brought out in several sections of the next chapter.

QUESTIONS

1. Define the limits of the " Arctic " region of Europe, and show how the geographical factors within it interact with one another.
2. What justification is there for regarding the Boreal Forest region as a geographical unit ?
3. Describe the common characteristics of the Mediterranean geographical region, apart from its climate.
4. Discuss whether it would be better to incorporate the region here termed " Sub-boreal Farmed Forest " into one or more of the neighbouring regions.
5. Consider whether the areas marked as " Atlantic Margins " should be distinguished as a separate minor region of " Temperate Europe."
6. It is difficult to find short names which well denote geographical regions. Discuss, and suggest alternatives to, two names adopted here for major regions, which seem rather unsatisfactory.
7. Discuss the possibility of dividing Europe simply into two great regions, " Peninsular " and " Trunk," on the basis of their general character.

THE PEOPLES OF EUROPE

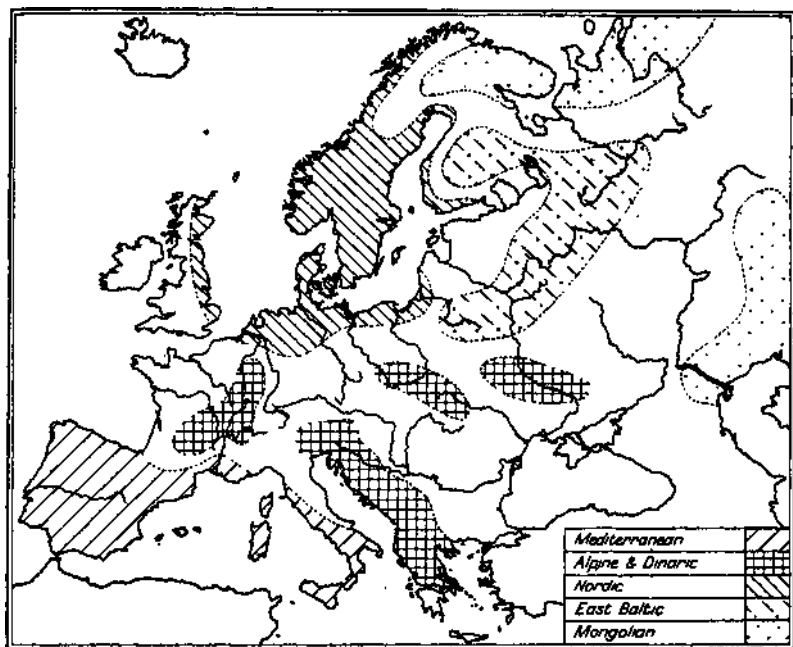
IN the preceding chapters the people who live in the various parts of the continent have been referred to mainly in relation to their respective environments ; we will now consider the peoples themselves.

The Racial Elements.—The physical characters of people are fundamentally determined by their descent, being handed down from generation to generation, and are therefore taken as indications of the race to which people belong. It is important to restrict the term " race " to groups of people who have in common a number of physical characters due to a more or less common ancestry, and never to use the term to denote groups who, although speaking the same language, or having the same religion, or being members of the same political State, nevertheless differ from one another physically because they have a mixed ancestry.

Anthropologists classify the greater part of mankind into three main racial or ethnic groups, distinguished from one another by the structure of the hair and the colour of the skin. These three groups are : (i) that of the negroes with woolly hair and black or very dark skin ; (ii) that represented by the Chinese and other Mongolians with straight, lank hair and yellowish skin ; (iii) the group to which the peoples of Europe mainly belong, with wavy or curly, yet smooth and not woolly hair, and with skins which are more or less white or light brown.

Among the Europeans, the various shades of skin colour are often, but by no means always, associated with the colour of the hair and eyes : a fair skin is in many cases accompanied by light-brown or even yellow hair and by blue or grey eyes, while the rather darker-skinned people commonly have dark-brown eyes and black hair. These contrasts between fair and dark are very clearly seen by comparing the typical Scandinavians showing the former characters with the inhabitants of southern Italy showing the latter, and they are so marked that they are taken as indicating distinct racial or ethnic stocks, to which the terms

"Nordic" and "Mediterranean" are respectively applied. People belonging to the Nordic type constitute a considerable proportion of the inhabitants of the northern plains of Europe west of Russia, and those of the Mediterranean type form a majority of the population of the western Mediterranean lands (see Fig. 22). Between them, in the highlands and uplands of Central Europe, most of the people have an intermediate



After Giinther.

• FIG. 22.—DISTRIBUTION OF PREDOMINATING RACIAL TYPES.

Note.—The shaded areas are those in which the respective racial types are common. In the intervening areas the mingling is so great that no type can be regarded as characteristic.

grade of coloration with chestnut-brown to black hair, and hazel-grey to brown eyes. Moreover, the people of the Nordic stock are generally tall, those of the Mediterranean stock are relatively short, while those of the central uplands and highlands are of medium height.

Yet these intermediate conditions of coloration and stature do not result from a mixing of the other two racial stocks, for they are commonly associated with a quite different shape of the head. Both the Nordic and the Mediterranean stocks are

characterized by " long " heads, that is, the length of the skull from front to back is markedly greater than the breadth from side to side, whereas the inhabitants of the central uplands and highlands usually have rather broader heads. Hence the peoples here are representatives of another racial stock, and to these people the name " Alpine " is applied.

Closely associated with these Alpine peoples are another group who are also broad-skulled, but do not resemble them in appearance, for they have a greater stature, a more slender figure and a longer face. They are numerous in the coastlands north-east of the Adriatic Sea, and for that reason this group is known as " Dinaric " or " Illyrian." Judging by the physical criteria, members of this stock spread northwards and now form one of the important racial elements in the plains of Silesia and south Poland.

The three ethnic groups—Mediterranean, Alpine-Dinaric and Nordic—together comprise the greater part of the population of Europe, and it is therefore commonly stated that there exist these three European races.

The ancestors of these groups worked their way into Europe thousands of years ago, displacing or mingling with the scattered hunting peoples who had occupied the south of the continent during the Ice Age and had moved northward as the climate improved and the ice retreated.

Of the three main races, the Mediterranean stock peoples were the first comers. It was probably before 4000 B.C. that they settled on the warm and fertile shores of the great sea ; there they had opportunities for growing grain and fruit, and for extending westward in Europe the civilization which had arisen in Egypt, Mesopotamia and the lands around the eastern part of the Mediterranean. In course of time they passed around the Iberian Peninsula to the Atlantic coasts, and thus reached the west of France and the British Isles (see Fig. 23).

Later, when climatic conditions in central Europe had become more favourable, the Alpine peoples migrated from Asia Minor and extended their settlements along the uplands and the neighbouring lowlands drained by the Danube. The loess areas of central Europe, fertile and free from forest, favoured the agriculture and pastoral work upon which they depended. They gradually worked their way westward into the valleys of the Alps and over the upland areas of what are now southern

and central Germany, Belgium and central France. The related Dinaric peoples followed those of the Alpine stock by much the same routes through the Balkan Peninsula and into central Europe, but they did not penetrate so far westward.

At a very much later date one branch of the Alpine stock spread from the Carpathian region into the adjoining plains to the north and east which now form part of Poland and Russia. These peoples are known as Slavs, and their descendants form a considerable proportion of the Russian people. A further migration southward gave rise to another group, the South Slavs or Yugoslavs, who occupied much of the Balkan Peninsula.

The ancestors of the Nordic peoples seem to have entered Europe after the Mediterranean and Alpine immigrants; originally pastoralists, they migrated across the plains of southern Russia, and eventually settled in the lands around the Baltic Sea.

Associated with the greater stature of the Nordics is usually greater physical strength than that of the peoples of the other stocks, and this doubtless helped them, at a much later date, to spread southwards and, in many instances, to conquer other peoples and to occupy parts of western, central and even southern Europe. For example, there were the settlements in Britain by the Angles, Saxons, Jutes and Norsemen, the incursions of the Goths into the Balkan Peninsula and Italy, and the penetration by the Vandals into the Iberian Peninsula and even into northern Africa.

Besides these peoples who have been so long established in this continent that they are regarded as truly "European," there are others whose origins are more recently Asiatic, and who are related to the Mongolian races of Asia. The Samoyeds have migrated from Asia into the northern forests and tundra of Russia, and the Lapps have spread even into the north of Scandinavia. They belong to the Ugrian racial group, who are characterized by broad heads and rather short stature, and often have a flat face and prominent cheek-bones ; the slanting eyes which are shown most strikingly among the Chinese and Japanese appear among the Samoyeds, and occasionally among the Lapps.

Allied to the Ugrian folk are the Finnish group of peoples who had earlier worked their way across the Ural Mountains into

northern Europe, and now occupy the greater part of Finland and the adjoining region of Karelia across the Russian border. Yet the Finns of the present day do not show the characteristic Mongolian features to the same degree as the Lapps or the Samoyeds, probably because the original Finnish immigrants here settled in an already populated area. It frequently happens that a group of intruders may dominate an area and intermarry with the inhabitants, upon whom they impose their name,

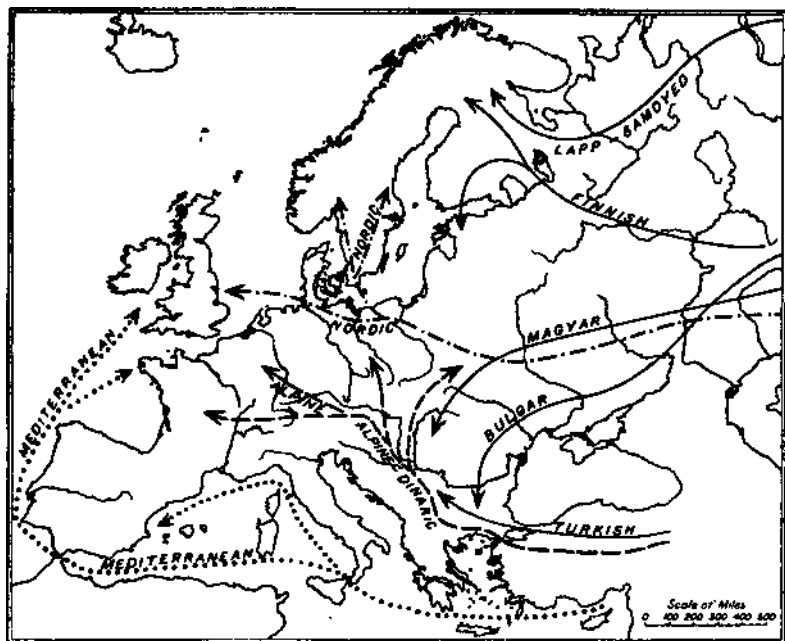


FIG. 23.—RACIAL MIGRATIONS INTO EUROPE.

language and traditions ; yet, if these subject people are relatively numerous, in the course of generations the blood of the dominating group becomes progressively diluted, as it were*. Hence, anthropologists are frequently faced with the fact that the name and speech of a people suggest one origin, and their physical features another. In the case of Finland it is certain that, in spite of the absence of Mongolian features, some of the ancestors of the present Finns migrated from northern Asia.

South of the Gulf of Finland are the Ests or Esths of Estonia, who are closely related to their Finnish neighbours. Moreover, in all the East Baltic region there are many individuals of a

type which seems to have resulted from a mingling of stocks of northern Asiatic and Nordic origin. These people are regarded as having by now been welded into a distinct ethnic sub-group, called East Baltic (see Fig. 22), and they form part of the population of a very wide area extending into Prussia on the west, Russia on the east, Finland on the north, and Latvia, Lithuania and Poland on the south.

Rather more recent immigrants from Asia of definitely Mongolian origin and speaking Ugrian languages came by a more southerly route along the steppe-lands. The Bulgars were nomadic horsemen, who in the seventh century A.D. crossed the lower Danube, conquered the Slav inhabitants and gave their name to Bulgaria. But though their name and some of the traditions of the invaders have survived, the language of the Bulgarians is now in the main Slavonic, and the people show little of the original physical characters of the immigrants.

A century or two later, other Asiatic tribes swept across the steppes, and some of these worked their way across the Carpathian Mountains into the Pannonian or Hungarian Basin. One group of these invaders spoke a language which was compounded of two Asiatic elements, the Ugrian and the Turki; the people of this speech were the Magyars, and the present inhabitants of Hungary still retain the name Magyars and speak the Magyar language, though their physical appearance shows that they have altered but little the predominating Alpine stock of the Slavs whom they conquered.

At about the same time that south-eastern Europe was thus invaded, the Moors of northern Africa crossed into the Iberian Peninsula and for a time ruled much of that region; yet they did not make great changes in the racial composition or the language of the people of the Peninsula, and the results of their occupation will be referred to in later sections.

The last of the great invasions was that of the Turks, i.e. tribes speaking a Turki language; they came from central Asia, and one group, the Osmanli Turks, overran Asia Minor, occupied Constantinople in A.D. 1453, and forced themselves as masters upon the people of the Balkan Peninsula. But throughout their long and victorious advance, they freely intermarried with their subjects, and accepted as "Turks" many who adopted their Moslem religion. Thus the Turkish State known as the Ottoman Empire spread from south-western Asia over much

of the Balkan Peninsula, and imposed its rule upon that region, but, nevertheless, the Balkan peoples still remained mainly of Alpine, Dinaric or Mediterranean descent and retained Slavonic, Albanian or Greek languages.

Other movements of peoples have occurred, some of which must be referred to in the next section in connexion with the spread of languages, but it may already be realized that the contacts and conflicts of the various migrant peoples have resulted in a mingling of the population in such a way that few districts show a uniformity of type.

Languages.—To use the words "Aryan race" for the Nordic ethnic group is doubly misleading, for in the first place the word Aryan applies only to languages, and in the second place it denotes a widespread group spoken by the great majority of Europeans (see Fig. 24). The Aryan languages have extended over almost the whole of the continent of Europe and through south-western Asia into India. Hence they are also known as Indo-Germanic, though they include not only the German or Teutonic family of languages, but also Greek, the Romance languages which have derived from Latin, the Slavonic family and the Celtic languages, as well as others spoken by some of the smaller communities.

Although in some areas, as in Wales, two languages exist side by side and many individuals may speak both, it is nevertheless possible to show the broad distribution on a map. This is done in a generalized form in Fig. 24, and in more detail for the central part of Europe in the end-paper map within the back cover of this book.

It is not possible to say what were the languages of the earliest folk who came into Europe; only the later movements of people, during historical times, can be definitely associated with the spread of the present-day languages.

By the generally westward migrations of conquering tribes the pre-Aryan languages became extinct, the one striking exception being the Basque speech, which has survived in the mountainous borderland of South-western France and Northern Spain. With the language there have remained old customs and traditions, and even a feeling of a distinct nationality among the Basque folk; nevertheless, the physical characteristics of the people do not show a uniformity of racial origin.

Another early language which has survived in the west of

Europe is the Celtic tongue. It is a member of the Aryan group carried across Europe in successive waves of settlement about 1000 years B.C. by folk probably of mixed descent ; later these people were themselves displaced or forced to adopt the languages, Teutonic or Romance, of other conquerors. Hence Celtic is now found, in several varieties, only in the peninsulas and islands of the Atlantic Margins in Brittany, Wales, north-western Scotland and Ireland.

The Greek language is spoken in the southern part of the Balkan Peninsula, and on the islands of the *Mgesm* Sea and Krete.

The Romance languages have a very wide distribution, for their spread resulted from the great extension of the Roman Empire. Italian is most directly derived from Latin, and is now spoken in the Italian Peninsula, the islands of Sicily and Sardinia, the North Italian Plain and some of the coast-lands north-east of the Adriatic ; it is also spoken in the part of Switzerland which projects southward to the edge of the North Italian Plain between Lakes Maggiore and Como.

East of Lake Como there are several small areas of the Alps in which the inhabitants of the mountain valleys speak distinct Romance dialects : Romansch or Rhaetic, Ladin and Friulian,

In the Iberian Peninsula, apart from Basque, are several languages belonging to the Romance family. The difference between them may be related to the invasion by the Moors, who at one time occupied all the Peninsula except the northern mountain regions, where the Christians held out and whence they reconquered the land. One line of reconquest spread the dialect of the north-west corner, Galicia, southward along the Atlantic region, thus leading to the growth of a distinctive language in all this western part of the Peninsula. Later, most of this area formed the independent State of Portugal, in which evolved the present Portuguese language. Hence the Galicians, or Gallegos, speak a dialect akin to Portuguese and markedly different from the Spanish language.

Spain was mainly reconquered from the north by way of the plateaus of Castile ; the Castilian rulers gradually extended their power over the whole of Spain, and thus Castilian became the standard form of the Spanish language.

In the north-east of the Peninsula the defeat of the Moors allowed the return to Spain of refugees from France who brought

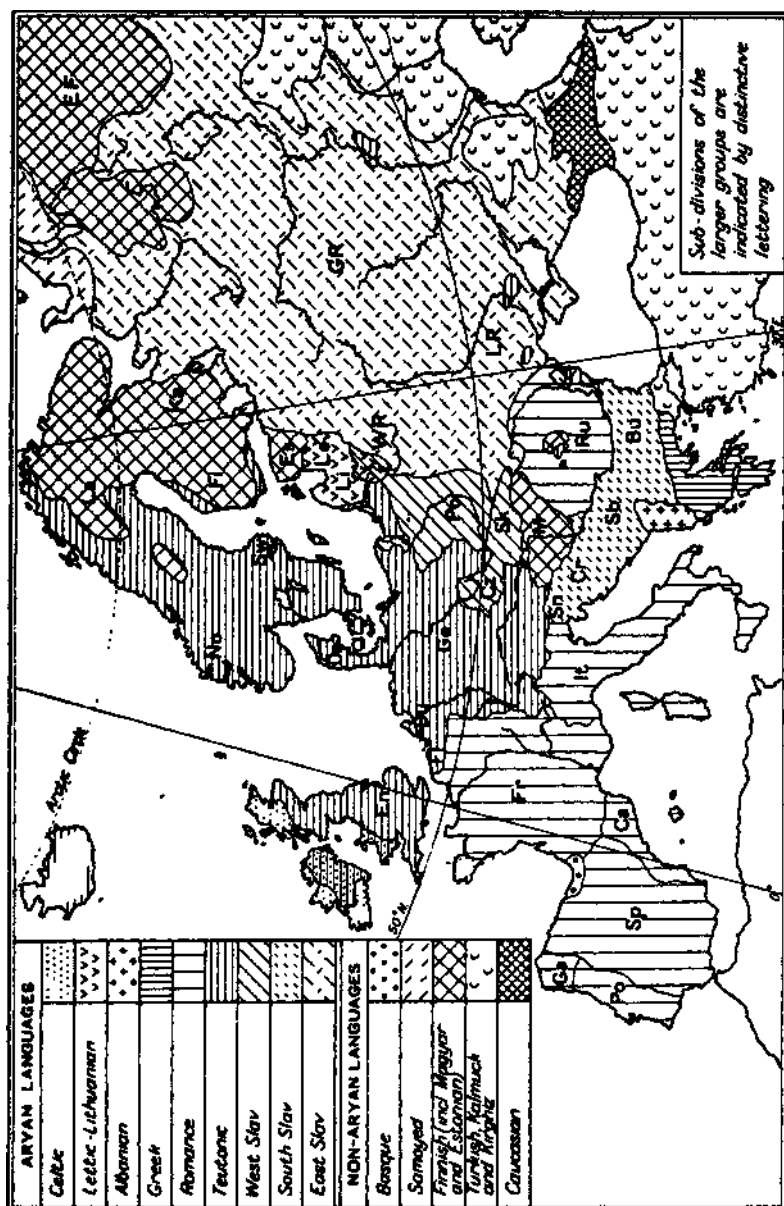


FIG. 24.—DISTRIBUTION OF LANGUAGES.

with them a dialect of the " Languedoc " spoken in the south of that country and akin to the modern French dialect Provençal; in eastern Spain this language became Catalan, and has spread to the Balearic Islands. In Catalonia, the north-eastern part of the Iberian Peninsula, the Catalan language has developed a considerable literature, and the distinctive language, traditions and literature have made the Catalonian people conscious of possessing a unity among themselves, and differing from the other peoples of the Peninsula.

The extent of the French language does not coincide with the territory of the French State, for while on the west Breton is spoken together with French, on the east the boundaries of the language and of the State diverge at several points. This is especially the case in three areas : (i) where the French speech extends into Switzerland, being spoken by about one-fifth of the population of that country ; (ii) where German-speaking peoples live in French territory in Alsace and Lorraine ; (iii) where French is the language of the Walloon people who form the population of the southern part of Belgium, viz. south of a line running approximately from east to west a little south of Brussels.

Rumanian is derived from the Roman language, as is clearly suggested by the native spelling of the name of the country—" Romania." It has been handed down from the provincials of this north-eastern outpost of the Roman Empire, but it has been greatly modified by the Slav-speaking and other peoples who have since then occupied the country. In most other parts of the eastern portion of the Roman Empire in Europe the later invaders have imposed their Slavonic speech, with the exception of Greece and Albania. In the latter mountainous country the Albanian language appears to be a survival of a primitive Aryan tongue.

The Teutonic family of languages probably had its home among the Nordic folk living in the plains around the west of the Baltic Sea and the south-east of the North Sea ; thence settlements and conquests in all directions led to the development of distinct Teutonic languages among peoples of varied origin. In the north there are the Scandinavian languages, of which Danish and Norwegian are almost identical; Swedish is closely related to the other two.

The English language is based in the main upon the speech

of the Teutonic invaders, modified by Romance elements introduced as a result of the Norman conquest. Other westward migrations of Germanic peoples have resulted in the development of the Dutch language in Holland and of Flemish in Belgium. This latter language is very closely akin to Dutch ; it is spoken by the Flemings, who form rather more than half the population of Belgium and occupy the part of the country north of the Walloon area.

Southward the Teutonic languages have had a wide extension over lands in which the people show relatively little influence of Nordic stock, i.e. from the racial point of view. German is spoken not only throughout Germany, but also beyond its borders in the Alsace-Lorraine portion of France, over the greater part of Switzerland, and in the upper Adige basin in Italy (see the end-paper map).

Eastward and south-eastward are " islands " of German speech, some of which are due to past wars between the Teutonic and Slav peoples. The Teutonic Knights won back East Prussia from Slavonic invaders and dominated the country now forming the States of Estonia and Latvia. In Poland, too, there are many German communities bearing witness to a similar ebb and flow of conquest. German settlers also went far into south-eastern Europe—into the Danubian plains and the upland basins and valleys of Transylvania, and even into the steppe-lands of Russia.

The Lithuanian and Latvian (or Lettish) languages, like the peoples of those countries, have a mixed origin. They are alike, and are regarded as a survival of an archaic Aryan type ; in each country the ancient tongue has been modified by the introduction of Slavonic and other elements.

The Slav languages have spread over the greater part of east-central and eastern Europe. There is the western group, including Polish and the closely related Czech and Slovak languages. There is the southern group, which includes Slovene, Croat and Serbian spoken by the three peoples who form the bulk of the population of the Yugoslav State. Bulgarian is another of the South Slav group of languages.

The widest extension of the Slavonic-speaking peoples has been eastward into the previously scantily occupied forests and steppe-lands of Trunk Europe. Of the East Slav languages " Great Russian " is the standard literary form, and is spoken

by the vast majority of the Russian people ; " White Russian " approximates to Polish, as its geographical distribution would suggest; " Little Russian " is the language of the Ukraine. The word " Ukraine " means borderland, and here the Russians had to oppose, and in course of time were to some extent influenced by, the invading horsemen from the Asiatic steppes ; consequently the Ukrainians developed differences from the Great Russians in several respects, and now Little Russian or Ukrainian is claimed to be a distinct literary language.

Lastly, there are non-Aryan languages of relatively recent introduction from Asia. In northern Europe, in addition to the speech of the relatively few Samoyeds, there is the Finnish group ; in the north-east are people speaking East Finnish dialects, while the West Finnish languages are spoken by the Karelians, the Lapps and the Finns themselves. These last people have developed the Finnish language proper and created a Finnish literature. Another west Finnish speech has spread southwards across the Gulf of Finland and has there become the Estonian language.

Magyar belongs to the same Finno-Ugrian family, although it has been carried into distant regions and imposed upon other peoples ; hence the Magyar speech of Hungary and Transylvania contains quite different elements from those of the Finnish group.

Of the other " Asiatic " languages, Turkish is now spoken by few people beyond the borders of the Turkish State, and the allied tongues of the Kirghiz, Kalmucks and other peoples of the south-eastern margins of Europe are giving way before the advance of Russian colonization and government. In the Caucasus and Transcaucasia there are spoken various non-Aryan Caucasian languages.

It will be observed that while Peninsular Europe has been influenced by many language developments and their associated forms of culture, Trunk Europe has seen the extension only of the Eastern Slav and the relatively late Asiatic groups of languages.

Religions.—It would be out of place here to attempt to state the faiths of the various religions or the effects they have upon individual people, but the religions have a geographical significance because the churches into which they are organized have had effects upon political, social and economic affairs, while their distribution is related to geographical conditions.

Christianity was adopted as the creed of the Roman Empire, and its spread was influenced by the extent of that power, but Christian missionaries carried even beyond the Empire both their faith and also such advances as reading and writing, better methods of cultivating the land, and various handicrafts ; hence the spread of religious ideas was often marked by a spread of other forms of culture.

Because the Roman power extended over a great part of western Europe the allied religious and cultural influences had more effect in transforming the lives of the " barbarians " in the west than was the case in the east of the continent, and these influences were one factor in bringing about the greater development in knowledge, in arts and sciences, in forms of government, and in economic matters, which long characterized western as compared with eastern Europe.

In the eleventh century the Christian Church was permanently split into two portions : in the east was the Greek or " Orthodox " Church ruled from Byzantium (now Istanbul), and in the west was the " Catholic " Church ruled from Rome. From the original home of European civilization in the Mediterranean region the line separating the areas influenced respectively by the Roman and Orthodox Churches runs from the head of the Adriatic Sea first north-eastward and the northward to the Arctic Sea, as can be seen from the map in Fig. 25.

In the east of Europe the influence of Christianity was greatly weakened by exposure to the attacks of Asiatic intruders. In the Balkan Peninsula the Turkish occupation resulted in a widespread adoption of the Mohammedan religion, and although the Turkish rule has been withdrawn from nearly all the region, nevertheless the people of parts of Yugoslavia and Bulgaria and of most of Albania remain Mohammedan. Here, in south-eastern Europe, the tall minarets of the mosques give an " oriental " appearance to the villages and towns, and from their summits the muezzins call the people to prayer. The Moslem women are still veiled, and the men still wear the round, tasseled fez, although in Turkey itself these distinctive marks of the Mohammedan religion are banned in order to avoid religious animosities between the different sections of the Turkish population.

Farther to the north-east, over most of Trunk Europe, the spread of religious and cultural influences was hindered by geo-

graphical conditions, for between the Mediterranean region and the homes of the early Russians in the clearings of the "farmed forest" region lay the steppe-lands; along these open lands passed wave after wave of nomadic invasion from Asia, which prevented effective contact between north and south. For the many centuries before the Russians dominated the steppe-lands, the advances made over the rest of Europe could reach the

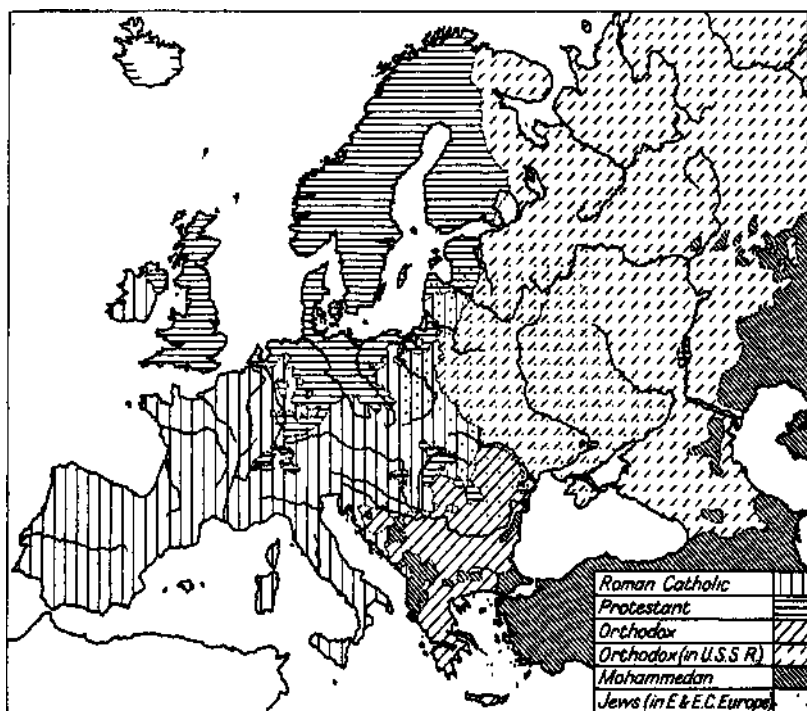


FIG. 25.—DISTRIBUTION OF RELIGIONS.

Russians only by a roundabout route through the Baltic Lands. This retardation is an important factor in explaining the differences between the peoples of Peninsular and Trunk Europe respectively.

The Orthodox faith at last spread over most of Russia and had a great influence for several centuries, but after the revolution of 1917 the new Government was so hostile to the Christian religion that now it is held, as a rule, only by people of the older generation who were brought up in that faith.

Yet one effect of its previous power is shown by the fact that here, as in the other countries in which some form of the Orthodox religion exists, the present alphabet is based upon the ancient Greek alphabet; on the other hand, in the countries to which the Roman Church extended the Latin alphabet is used, even though the language is not of the Romance family. The exception to this rule is Rumania, where the religion is Orthodox, but the Roman characters are used.

Yugoslavia illustrates the influence which religious differences may have on political conditions. The three peoples comprising the majority of the population are the Serbs, Croats and Slovenes, and, as stated in the preceding section, they speak similar languages, but while the Serbs are in the main of the Orthodox faith and have an alphabet derived from Greek, the Croats and Slovenes are Roman Catholic and use the Latin alphabet. These differences add to the difficulty of welding the three groups into one harmonious and firmly knit State.

After the close of the Middle Ages, a number of the States of northern Europe broke away from the Roman Catholic Church, and several Protestant Churches were formed; in determining the distribution of these new Churches the political power of the princes of that time was a greater factor than geographical conditions, and although the religious differences had very important consequences two or three centuries ago, they now count for less when one region is compared with another.

Separate reference must be made to the Jews as a religious community. Although a proportion of the Jews show a facial resemblance by an aquiline nose with a depressed tip and wide nostrils (characteristic of an " Armenoid " ethnic group related to the Alpine race), they have a very mixed racial origin. They have a language of their own—Yiddish—a blend of Hebrew and German elements, but they also speak the languages of the countries in which they have settled. The essential bonds between them are their religion and the traditions associated with it, and their feeling of difference between themselves and other peoples has been greatly intensified in several countries by their being forced into living apart from others. The map shows that they are relatively numerous in the transitional region between eastern and central Europe; here they are largely town-dwellers, engaged in trade, and are not easily

assimilated into States which are mainly composed of peasants. In all Europe, the Jews number nearly 8 millions.

Nationalities.—When a considerable group of people have lived together in one area and feel themselves to be bound by common ties to the extent that they wish to form a Government of their own, they may be said to constitute a "nationality." The ties that unite the members of a nationality are various : belief in a common racial origin (whether this belief is justified by scientific knowledge or not) ; the use of a common language and the enjoyment of a common literature; sharing of a religion ; living in one political state ; association in defence against enemies. Any one or more of these factors may be powerful in creating a feeling of national unity, but any one or more may be lacking among the members of a nationality. Perhaps the most usual indication of a feeling of national unity is the possession of a common language, for this is the result of long association and helps intercourse between those speaking it ; hence the map showing the language of Europe is, as a whole, useful as showing the nationalities of Europe. There are, however, some marked discrepancies ; e.g. the Swiss people certainly form a definite nationality, for they feel among themselves a unity which demands that they form a State independent of any other, yet among them are spoken four official languages—German, French, Italian and Romansch.

If a nationality is able to form a self-governing State, it is fortunate ; if it cannot, it may become a minority within some State in which it is held against its will, and in that case its discontent may be a danger to peace.

Political States.—A State is an association of persons living under one Government and inhabiting a definite territory. The reasons for the existence and extent of a particular State are generally complicated and reach far back into history ; it is clear from what has already been written that the members of a State are not necessarily bound by all the ties which have been discussed, though a feeling of a common nationality usually unites a considerable proportion of the subjects of a State. In the case of Switzerland we have an example of a State coinciding exactly with a nationality, but the Russian Empire as it was in the early part of the present century comprised a number of different nationalities.

It is important to consider the relation of States to geo-



FIG 26 —STATE BOUNDARIES BEFORE AND AFTER THE WAR OF 1914-18.

Note.—The various shadings show the extent of the States before the war of 1914-18; the thick In 1938 Germany incorporated Austria and the north-western margins of Czechoslovakia, and smaller areas of Czechoslovakia were lost to Hungary and Poland.

graphical conditions, and an examination of a map of the political units in Europe shows that they seldom bear any close relationship to natural or geographical regions (see the end-paper map at the front of this book). Indeed, there is a strong tendency to the contrary, for a State may be tempted, if an opportunity arises, to make itself stronger by extending its territory into a region which is of a different type and possesses resources which it has hitherto lacked. A desire to be self-sufficing, or to secure access to trade-routes by which commodities can be secured from abroad, has in many instances been a factor in advancing the frontiers of States across regions of contrasting geographical character.

For this reason, political frontiers seldom coincide with the boundaries of geographical regions, although well-marked natural features, such as rivers or water-sheds, maybe adopted as convenient and definite limits of States ; this is particularly the case when such a frontier offers a useful means of defence.

The difference between geographical and political units is brought out still more clearly when one thinks of the great and sudden changes which the States of Europe have undergone during the last few hundred years : old ones have disappeared, new ones have been formed, and others have expanded or shrunk to various degrees. In the last quarter of the nineteenth century—during the lifetime of many people now living—the Balkan States were carved out of the former Ottoman or Turkish Empire. In the present century, the political map of a broad belt running from north to south of the continent, and overlapping Peninsular Europe on the west and Trunk Europe on the east, has been completely transformed. There is no certainty that political conditions are yet stable in Europe, particularly in this " belt of political change."

The present-day geography has been greatly affected by the alterations brought about by the war of 1914-18; these are shown in Fig. 26. Particular attention must be drawn to the break-up of what were two of the greatest States of Europe before 1914, viz. the " Dual Monarchy " of Austria-Hungary, in which the Austrian Empire and the Kingdom of Hungary were united under one sovereign, and the Russian Empire. Under the strain of war, these great Powers fell to pieces, and several of the nationalities which had been unwillingly included obtained independence.

In the case of Russia, the Finns, Ests, Letts and Lithuanians set up the new States of Finland, and the three "Baltic States" of Estonia, Latvia and Lithuania, and the Poles of Russia united with those of Austria and Germany to re-create an older State of Poland.

Over most of the remaining part of Russia, after a period of revolution, there was formed the "Union of Soviet Socialist Republics" (U.S.S.R.), comprising eleven republics, which may be arranged in four groups on a geographical basis, (i) The "Russian Soviet Federated Socialist Republic" includes the greater part of European Russia, and all the northern and eastern portion of Asiatic Russia; it is the predominant partner in the Union, and at its capital, Moscow, is centred much of the administration of the whole of the Russian territories, (ii) The White Russian Republic (capital Minsk) and the Ukrainian Republic (capital Kiev) make up the remaining portion of Russia in Europe (see the map of eastern Europe in Chapter 17). (iii) The three republics of Georgia, Azerbaijan and Armenia together form the Russian territory of Transcaucasia, (iv) Across the Caspian Sea, in the south of Asiatic Russia, is another group—the Turkmen, Uzbek, Tadzhik and Kirghiz republics.

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When the Austro-Hungarian Monarchy fell to pieces, the hitherto subjected Czechs and Slovaks formed the new State of Czechoslovakia in the north, the Slovenes and Croats united with Serbia and Montenegro to form Yugoslavia in the south, the Rumanians of Transylvania were united to those of independent Rumania across the Carpathians. Thus the previously dominant peoples, the Austrians and the Magyars of Hungary, shorn even of parts of lands they themselves occupied, were left in 1919 to constitute the new small States of Austria and Hungary. Nineteen years later, in 1938, Austria was taken into the German Realm, "Deutsches Reich," and became one of the provinces of Germany.

In thinking of the relation between natural and political units, it must be borne in mind that States may have considerable influence on the geographical conditions of the regions they include, and in particular they may modify economic activities. Thus, in later sections of this book instances will be given of the way in which traffic may be diverted from natural routes because of political frontiers. Here special mention must be

made of the policy of "self-sufficiency" adopted very widely after the war of 1914-18.

With a desire to help their own subjects, and often to assure within their boundaries supplies of food and of materials and armaments which would be required for warfare, many Governments adopted measures such as giving bounties to the producers of particular commodities, and erecting "tariff walls" around their territories; by this latter method duties had to be paid when certain goods passed the Customs barriers at the ports or along the frontiers, and thus such goods were prevented either partially or entirely from entering the country. By such means States have stimulated certain forms of production at the expense of others, and have thus modified the natural economic development of the regions they comprise.

QUESTIONS

1. How can the "race" of peoples, as related to their descent from a common stock, be determined? Illustrate by reference to the Nordic race.

2. What is the "Mediterranean race"? Why is it so called, and in what ways might the term be misleading?

3. What are the Romance languages? Give an account of their spread in southern and western Europe.

4. To what extent does the extension of the German language correspond to the distribution of people of Nordic race?

5. Which peoples may be termed "Slavs"? Give reasons for your decisions, and comment upon any doubtful cases.

6. Magyars and Finns may be grouped together as regards their language. To what extent are they alike (a) in their speech, and (b) in other respects?

7. The Roman Catholic and Orthodox faiths have a markedly contrasted distribution over much of Europe. How is this distribution related, either as cause or effect, to geographical conditions?

8. Show how the entry of Mohammedanism into Europe was connected with the physical geography, and how it has affected the human geography.

9. Distinguish between (1) "language group," (2) "nationality," and (3) "State," quoting examples from Europe.

10. Discuss what truth, if any, there is in the statement that the people of European Russia are more Asiatic than European.

PART II

THE REGIONS

CHAPTER VI

THE NORTH SEA LOWLANDS

THE traveller from England to the Continent, crossing the Strait of Dover towards Calais, sees before him the chalk cliffs of France which are the counterpart of the North Downs. As he nears the coast, however, he observes that his boat passes to the east of the chalk country and approaches a low shore which stretches eastward as far as the eye can see.

Calais marks the beginning of a great lowland region, which forms the north-eastern corner of France and extends behind the North Sea through Belgium, Holland and northern Germany, and along the western side of Denmark (see Fig. 30).

With occasional breaks there is a coastal strip of dunes, and this has behind it a belt of natural marsh-lands, much of which is now transformed into polders, interrupted by shallow inlets of the sea. Behind the marsh-lands is a rather higher area, partly sandy country to which the term "geest" is applied, and partly fertile agricultural plains or low plateaus. Near the uplands of central Europe which form the boundary of the lowlands occur coal deposits, and associated with the mining of the coal are important industrial areas (compare the map in Fig. 80 with the section in Fig. 27). Thus the whole of the North Sea Lowlands region is composed of a series of belts running in a general south-west to north-east direction as far as the south-eastern angle of the North Sea; here, in the peninsula of Jutland, the coastal belts change their direction and run from south to north, while the belt of fertile plains is no longer to be observed, but gives place to another type of country near the Baltic Sea. The North Sea Lowlands region has characteristics marking it off from the neighbouring areas, and it may therefore be regarded as one of the sub-regions of the "Developed Lowlands and Wooded Uplands" of Temperate Europe (marked "2" in Fig. 21).

The surface conditions of the region are in the main due to its position on the south-eastern margin of the shallow depression now invaded by the waters of the North Sea. To this depression rivers drain through the North Sea Lowlands from all the surrounding regions: the Schelde (Scheldt or Escaut) and its tributary the Lys from the scarp-lands of northern France; the Meuse (Maas), the Rhine and the Weser from the Central Uplands of Europe; the Elbe from the South-west Baltic Lowlands and the Central Uplands. Consequently these rivers deposit alluvium in the marsh-lands of this lowland. The sea, too, plays its part in the building up of the coast; strong tidal currents drag sand eastwards along the shores, and the prevailing and occasionally stormy westerly winds heap it up to form the belt of dunes.

In the past, however, conditions have been different, particu-

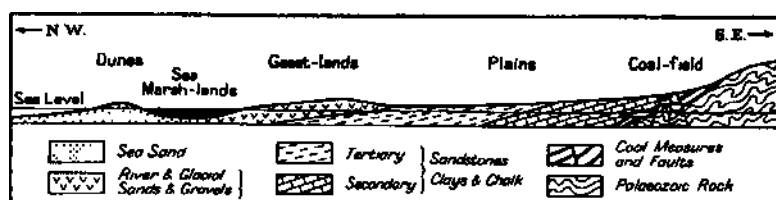


FIG. 27.—DIAGRAMMATIC SECTION THROUGH NORTH SEA LOWLANDS.

larly because of changes in the relative levels of land and sea. During parts of the Secondary and Tertiary Eras, the sea covered much of the region, and beneath its waters were laid down marine clays and sands, and in parts even chalk, which now constitute the fertile interior plains. In the later part of the Tertiary Era, moreover, the rivers accomplished much more work than they do at present: they deeply dissected the uplands to the south, and with the eroded material they built up the huge accumulations of sand and gravel which form much of the geest type of country.

Oscillations of level have characterized also the later geological history of the region. Thus at the close of the Ice Age the land was relatively higher, and the present area of the North Sea was above the sea-level. Since then, however, there has been a general rising of the sea-level, and in early historical times the waters had advanced to the line indicated by the islands and dunes on the outer edge of the present coast. Here

was a continuous line of dunes behind which lay marshes broken only by one great lake in the Zuider Zee hollow. These marshes were gradually drained and occupied by men, but Nature has worked against them: the alluvium tends to consolidate and settle down, and very possibly a relative sinking of the land occurred, and in consequence in the Middle Ages the sea broke in; moreover, wars caused the neglect or destruction of the defences, and altogether some thousands of square miles were lost. In modern times the work of protection has been resumed, and now, in spite of occasional and local floodings, the struggle goes in favour of man.

The position of the region determines its climate, which is broadly similar to that of eastern England, although its continental situation gives it rather colder winters, particularly in its eastern portion (compare the temperature statistics for London and Brussels, given in the table on p. 26). Consequently, the farming possibilities of the North Sea Lowlands are in general like those of eastern England, and differences in production are due largely to soil or economic conditions. We will now consider in turn each type of country constituting this region.

The Dune-lands.—The sand is least in amount in the French and Belgian part of the region, where the available material is mainly that which has been driven through the Strait of Dover, but becomes far more abundant by accumulation towards the east. Moreover, the dunes are highest and broadest where a stretch of north-to-south coast directly faces the westerly winds, as in Holland and in Denmark. The line is, however, broken at areas of relative depression, and channels are kept clear where the currents due to the high tides of the region sweep up and down the entrances to the great rivers.

Where the sand-dunes form a protection against the flooding of the marsh-lands, they have been strengthened by the planting of grass, shrubs or trees and by the construction of groins. Upon the dunes have been built fishing villages and health resorts, e.g. Scheveningen near The Hague in Holland, and Ostend in Belgium; the latter town is also a port with rapid communication across the North Sea to England. Similar ports, but with much more traffic, are Calais, which has the shortest crossing, and Dunkirk (Dunkerque), for these are the French outlets of the industrial area which depends on the coalfield of north-eastern

France. Farther east are " out-ports " at the entrances to the great rivers, e.g. in Holland are Flushing by the Schelde, and the Hook of Holland by the Rhine.

In Germany, the dune-lands are represented only by the Frisian Islands, but in the Danish part of Jutland they again form part of the mainland. Here has been constructed the port of Esbjerg, connected by railway with the east of the country in order to facilitate the rapid transit of its dairy produce, especially to England,

Throughout their extent, the dune-lands are of similar origin and characteristics, and they therefore constitute a distinctive though small region, to which we give the term " tract." It must be observed, however, that this tract is not continuous, as most others are, because it is broken by the waters ; it may therefore be regarded as a " discontinuous tract."

The Marsh-lands.—Behind the line of dunes and islands, the shallows are constantly covered by water only over a relatively small extent. There are other areas, particularly marked behind the various Frisian islands, which are mud-flats at low tide, but water-covered at high tide. These are known as *watten* or *wadden*; they may be regarded as land in the making, and the natural deposition of mud and sand is aided by fences built out from the land, the resultant accumulation being used for summer grazing as soon as it is covered by vegetation.

The Sea-marshes.—Much more work has been required to form the polder-lands. Near the coast are the sea-marshes, which in Holland are even below the mean sea-level, and everywhere are liable to inundation at high tide or in times of storm ; farther inland are the river-marshes, which, though well above sea-level, need protection from flooded streams.

Reclamation of the sea-marshes is still going on. The Zuider Zee (the name " South Sea " was given by Frisian fishermen) is now shut off by a dyke across its mouth, and four polders with a total area of about 800 square miles are being formed on its margins, the water area being limited to a central " IJssel Lake " fed by the waters of the IJssel distributary of the Rhine, as shown by the broken lines in Fig. 30.

The utilization of the polder-land varies partly according to the nature of the soils, sometimes clayey and sometimes sandy, and partly according to the traditions of the people or the economic demands of the neighbouring regions. In the small

strip of the French marsh-lands behind Calais and Dunkirk there is intensive cultivation of industrial crops, mainly beet, flax and chicory, which is associated with the manufacture of their products, sugar, linen and chicory ; wheat and barley are also grown. In the Belgian strip similar crops are produced, though cattle-rearing assumes some importance. In the broader polder-land region of Holland, there are again the cereal and industrial crops, but pastoral work predominates, and butter, cheese and milk are the main objects of the farming.



[Netherlands Information Bureau.

FIG. 28.—VIEW NEAR HAARLEM.

Note.—The polder-land has been adapted for the cultivation of bulbs by drainage (note the canal), and by making the clay lighter by mixing sand from the pine-clad dunes shown in the background.

In Holland are two areas of special character. In a narrow strip behind the dunes near Haarlem the sand has been mixed with the muds and clays of the marsh-lands to produce a soil exceptionally well adapted to the cultivation of flowers. The horticultural industry, like several others, began when the Netherlanders were one of the foremost maritime peoples of Europe ; tulips, hyacinths and other plants were brought from the East, and centuries of experience and organization have made the growing and export of many kinds of bulbs, flowers, shrubs and fruit an important occupation. The proximity of the port

of Rotterdam, with its rapid communications, has been a significant factor, and now a neighbouring aerodrome offers still quicker facilities for transport.

Farther south, the shelter of the dunes allowed woods to grow in past centuries, and here the counts of Holland had a hunting-box. This became their residence and was called " s'Graven - hage "—"the Counts' Hedge," in its English form, The Hague ; it has now grown into a city of nearly half a million inhabitants, for it is the capital of Holland, and is also the seat of the International Court of Justice.

In Germany the marsh-land again narrows to a belt bordering the coast and the estuaries of the Ems, the Weser and the Elbe, while in Denmark it is not quite continuous but appears as areas surrounding lagoons. (These lagoons are known as Fjords, but like the neighbouring Lim Fjord, they are shallow depressions quite unlike the Fjords of Norway.) In the eastern part of the North Sea marsh-lands cattle rearing is the main occupation, and supports a less dense population than the more intensive farming common in the central and western polder-lands.

The River Marsh-lands.—Although lying above sea-level, these areas are subject to inundation by the rivers ; in some parts they have needed reclamation, but in other parts they require only protection by dykes from occasional floods. These floods generally occur in winter, for most of the rivers have a " regime " in which the flow of water is greatest in the winter season, after the relatively heavy rainfall of autumn and when the run-off into the streams is least reduced by evaporation and the demands of the plant-covering of the land. The Rhine has a more uniform regime than that of the other rivers, for its headwaters come from the Alps, where the melting of the snow in the upper part of its basin provides additional water in summer; consequently, the main stream brings down a summer supply which balances the winter maximum of the tributaries of the middle and lower parts of the basin, which are dependent upon the rainfall.

Parts of the river flood-plains are used for tillage similar to that of the sea-marshes ; elsewhere are long stretches of grassland, absolutely flat with their uniformity broken only by the dykes ; here villages and even houses are rare.

Waterways and Ports.—Much of the importance of the North Sea Lowlands region is due to the rivers which direct into it-

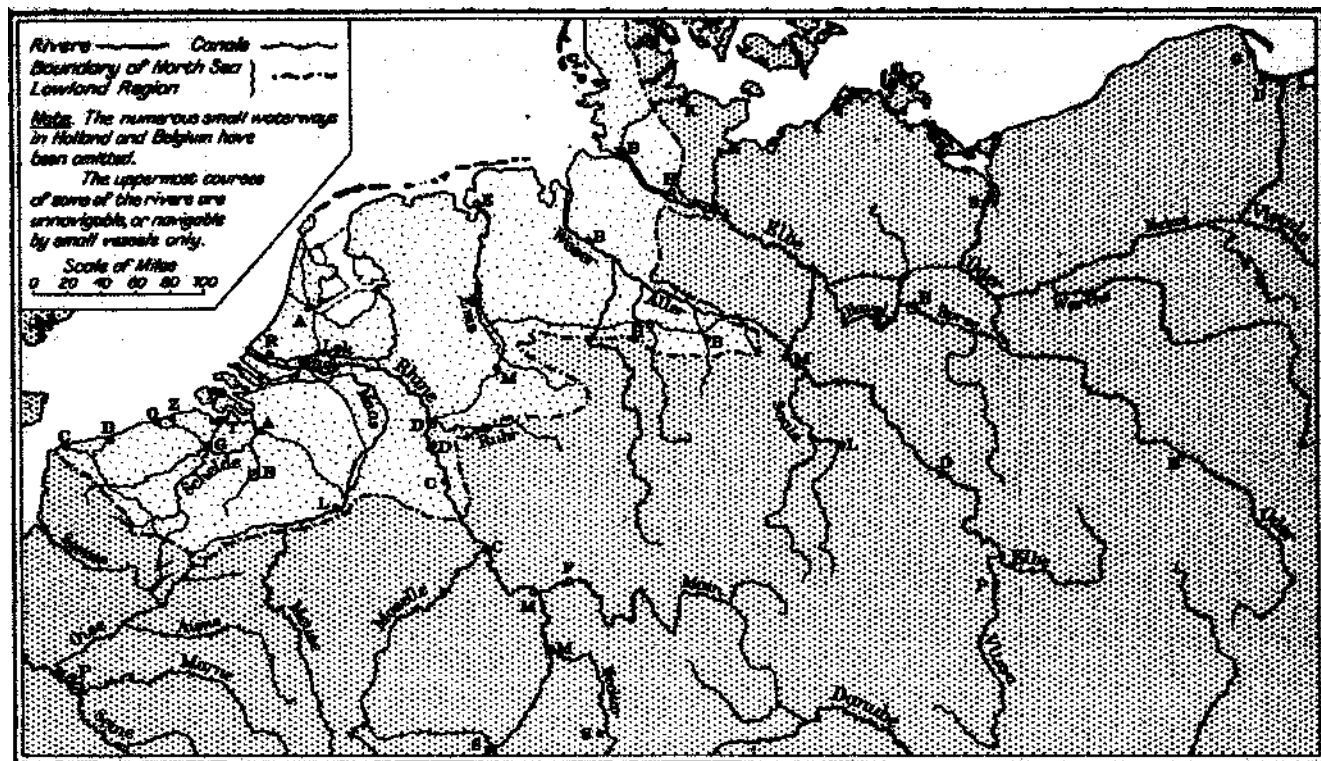


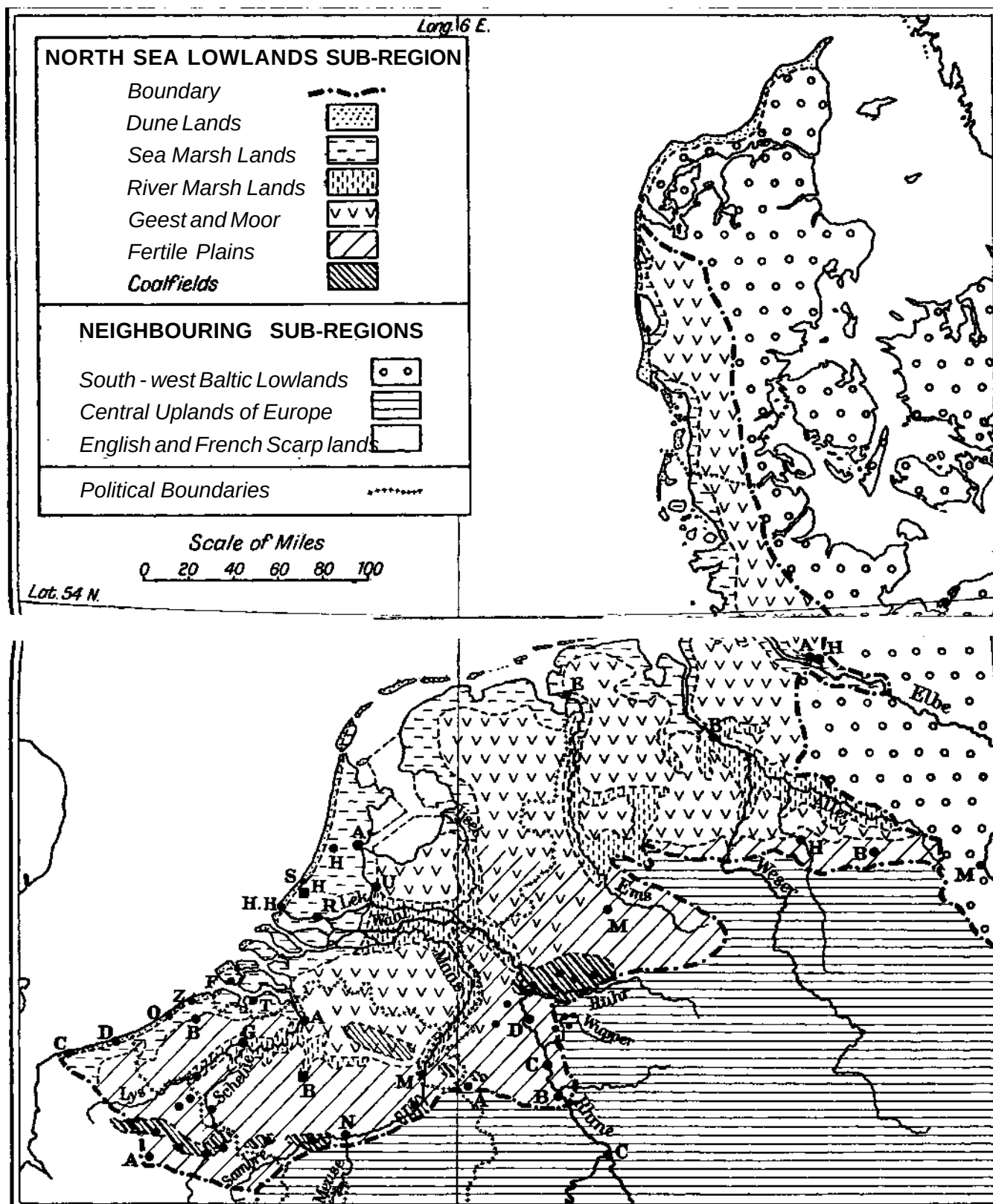
FIG. 29.—WATERWAYS LEADING TO THE NORTH SEA LOWLANDS.

communications from and to a great part of central Europe ; consequently, at or near the mouths of these rivers have grown up several great ports which make the region by far the most important commercial area of the continent of Europe (see Fig. 30). Moreover, most of these ports have been developed at points on the waterways where higher land forming suitable sites for settlement adjoins the marshes ; these sites are mainly at the inner margin of the marshes on the geest lands or the fertile plains, but at the western end of the region they are at the outer margin adjoining the dunes.

The greatest of the ports is Hamburg, on the Elbe estuary, which brings ocean liners 70 miles inland from the North Sea, Fig. 29 shows that while the main stream gives communication with the industrial areas of Saxony and of Bohemia in the Central Uplands region, the Havel tributary leads from the Spree and Berlin ; also a system of canals links the Elbe to the other great rivers of Germany and Poland in the south-west Baltic region. Moreover, a little above Hamburg the Elbe-Trave Canal leads to Liibeck on the Trave, and from Brunsbiittel, near the mouth of the Elbe, the Nord-ostsee (i.e. North-Baltic Sea) Canal leads to Kiel and carries most of the traffic between the various Baltic Sea ports and the outer world.

With such a large hinterland, Hamburg has an amount of trade which makes it rank with London and New York as one of the greatest ports of the world. Its imports consist of all kinds of commodities, while its exports are mainly of manufactured goods ; shipbuilding has developed, and also manufacturing in many forms, particularly the working up of imported materials* Consequently, the conurbation which includes Hamburg and Altona on the north bank of the river, and Harburg on the opposite side, is one of the largest in Germany, and numbers nearly one and a half millions.

Bremen, on the Weser, is nearly as far from the sea as Hamburg ; it is in the river-marsh area, and its trade is chiefly remarkable in that it is the greatest tobacco market in the world ; its population is more than a quarter of a million. At the mouth of the Ems is Emden, but this port is of comparatively little importance, although the river is joined to the Ruhr industrial area by the Dortmund-Ems Canal ; the traffic of the Ruhr region mainly goes by the Rhine to the chief markets and the sources of raw material.



From near the junction of the Dortmund-Ems Canal with the Ems River, another canal leads east near the margin of the North Sea Lowlands (see Fig. 29). This is the Mittelland (Midland) Canal; it crosses the Weser and its navigable sub-tributary, the Leine, on which Hanover stands, and is now continued north of Brunswick to join the Elbe at Magdeburg. By its completion a through route of inland waterways connects eastern Germany and Berlin with the Rhine-lands.

The Rhine is incomparably the most important waterway of Europe. It is navigable for small vessels from Basel downstream, but its great amount of traffic is in the North Sea Lowlands region between the Ruhr and the sea ; while there are river ports of considerable size in German territory, the chief port of transshipment between ocean and inland transport is Rotterdam. This is the one striking exception to the rule that the great ports are on the margins of the marsh-land ; unlike the others it is of recent growth, and became important only when in the latter part of the last century the increase of German trade made it necessary to improve the navigation of the Rhine estuary. Then the " New Waterway " was cut : a deep channel was made from the North Sea at the Hook of Holland, and where the waters of the Waal and Lek were led into this channel at Rotterdam, in the middle of the marsh-lands, great wharfs and basins were constructed, and the port rapidly developed. Of the goods transhipped from sea-going vessels, the greatest amount goes inland up the Rhine, and most of the remainder by the system of canals which forms a network throughout the Netherlands and is without parallel in the world. Railway transport counts for little, one reason being because the traffic consists mainly of heavy and bulky imports, such as iron and other ores and metals for the industrial regions higher up the Rhine and grain for the food-supply of the dense populations of the Netherlands and Germany. With manufactures associated with the imports, particularly for use in Holland, Rotterdam has grown till it has a population of over half a million.

Amsterdam rose to importance centuries ago when the protected waters of the Zuider Zee gave access to the interior of the polder-lands of Holland, but the increasing size of ocean-going vessels made this shallow sea useless ; first the North Holland Canal was constructed through the peninsula to the entrance of the Zuider Zee, and later the North Sea Canal gave a direct

approach available for ships of any size. Thus Amsterdam, although rather off the main lines of communication, has been able to retain a certain amount of ocean traffic, and it affords an example of geographical inertia by the fact that it still remains the chief centre of the organization of the commerce (as distinct from the actual handling of the traffic) and of the financial business of the Netherlands. It also has industries which are traceable to its pre-eminence in trade in the days when Holland was a great colonial power, e.g. cigar making and tobacco preparing, sugar refining and diamond cutting. Moreover, Amsterdam has remained a professional and residential centre, and with more than three-quarters of a million inhabitants it is the largest city in Holland.

The lower Maas is inconvenient for commerce, for being without Alpine tributaries, it is subject to very low water in summer and to floods in winter ; its middle course, however, is connected by a canal in Dutch territory from Maastricht to the Rhine estuary, and in Belgian territory by a canal from Liege to Antwerp on the Schelde (see Fig. 32).

The estuary of this latter river is the entry to a very considerable system of waterways which traverses all parts of Belgium and is joined to the rivers of north-eastern France. Where the Schelde enters the sea-marsh region Antwerp has grown up. This city has a population of more than a quarter of a million ; it is the chief port for Belgian commerce, and its transit trade, mainly for Germany and Switzerland, is of about equal importance. Like Amsterdam, Antwerp has developed industries connected with its import of " colonial " wares. At the junction of the Lys and the Schelde is Ghent, a centre of local trade and small textile manufactures ; from it one canal runs northward to Terneuzen in Dutch territory on the " West Schelde " inlet, and another leads westward to Bruges on the inner edge of the sea-marshes. Bruges was once a port, but its outlet has been silted up, and it is now joined to the sea by canals which cut through the dune belt to Zeebrugge and Ostend.

The canal which runs through French territory roughly parallel with the national boundary shows the influence of political conditions. While the natural waterways would direct traffic from the French coalfield to the Schelde and Antwerp, the desire to keep the trade within France has been an important factor in the construction of the canal which leads to Calais

and Dunkirk; the growth of these ports must therefore be ascribed in part to political causes.

The Geest and Moors.—Behind the tract-group of the Marshlands, extends another and strongly contrasted series of tracts, from near Antwerp north-eastwards to the borders of the Baltic

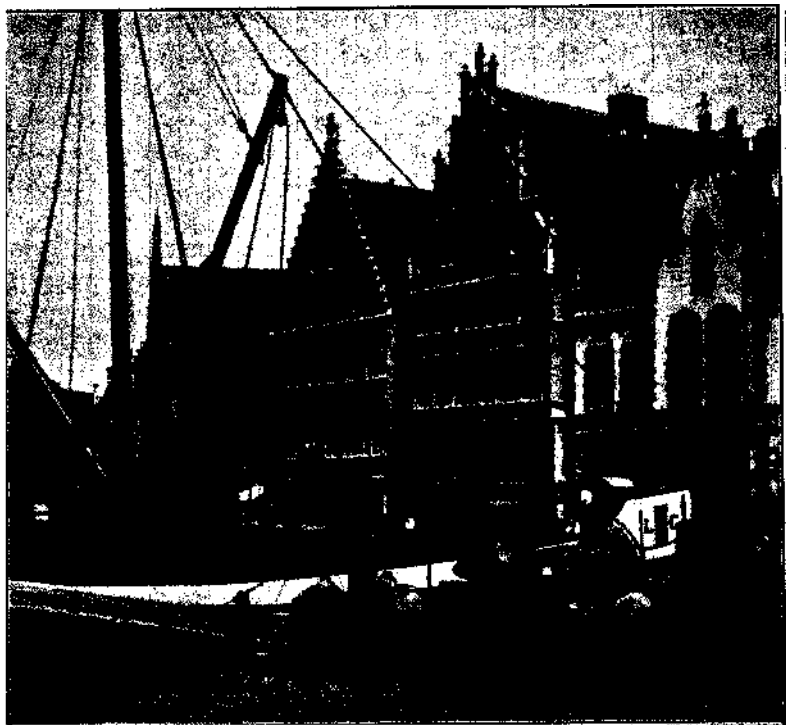


FIG. .31. --VIEW IX GHENT. [Belgian Railways & Marine.]

Note.—The steeply gabled high houses are typical of Flemish-town architecture. The view shows the "Quai aux Herbes," by one of the small waterways, carrying barge traffic, largely used in Belgium and in Holland.

Lands. These areas are in the main wide stretches of heath-land known to the Germans as geest. In the west of the region from near the mouth of the Schelde to about the lower Ems, they have developed upon masses of gravels and sands which were brought down by the Rhine and Maas until the deposits formed a great fan-like plateau. The plateau was highest near the centre of its inner margin, dipping north-westward to the sea (see Fig. 27). Later it was dissected by streams, and great valleys were cut across it. The largest of these valleys are the

two now occupied by the parallel courses of the lower Maas, Waal and Lek and by the Ijssel; consequently, the sandy plateau is divided into three masses : (1) the Campine or Kempenland, which overlaps the boundary of Belgium and Holland within the curve of the Maas ; (2) the Veluwe, between the Lek and the Ijssel; (3) the West Frisian Geest, between the Ijssel and the Ems.

The words " Veluwe " and " Geest " both mean " barren land " and, apart from some woodland on the slopes, the vegetation cover of most of the area consists of coarse grasses and shrubby growths such as heather; the surface is dry and infertile, while in parts the finest sand is blown into small dunes. In other parts iron in the sand has formed a pan of impermeable rock upon which drainage is poor, and moors have developed with marshes, peat bogs and pools of stagnant water.

Reclamation of these lands, for long almost uninhabited, is going on, and " Fen colonies " grow potatoes, beet and some rye and oats. Yet these lands remain scantily populated, and the larger settlements are generally on their margins.

East of the Ems the geest is formed mainly of sands washed away from the morainic material deposited by the ice-sheet which extended from northern Europe, as shown in Fig. 3. The greatest of the moraines are shown on the map, and it is to be observed that they mark out the eastern limit of the North Sea Lowlands region.

Streams brought sandy material from the Baltic morainic areas into the eastern part of the North Sea Lowlands region, where it is widely spread and is the basis of the geest-lands of this part; moreover, among the dry sands occasional sheets of boulder clay play a similar part to that of the iron pans in the western geest-lands and give rise to similar wet moor districts. Reclamation of this type of country has gone on in Germany, but to a less extent than in the Netherlands.

In Jutland, the strong westerly winds have blown the sand from the dune belt inland to combine with that of glacial origin and form a broad belt of dry, infertile country ; the Danes have recently begun to afforest and cultivate the sandy heath-land, but this western part of Denmark remains by far the least valuable part of their country.

In the western part of the geest-land, however, there is another resource which may be developed ; beneath the Campine are

deeply buried coal deposits : a " spur " from the belt of coal-fields of the southern margin of the North Sea Lowlands. The Campine field has a width of about 8 miles and a length of about 40 miles ; working has commenced near the Maas, but whether economic conditions will make a great extension profitable is uncertain.

The Fertile Plains.—To the south of the tract-group of the geest-lands, sedimentary soils of Tertiary and Secondary age emerge from beneath the marshy alluvium and the sandy accumulations (again see Fig. 27), and form plains of relative fertility, while in certain parts this fertility is actually great, due to a superficial deposit of loess.

Owing to the complicated way in which the older rocks of the Central Uplands were faulted, raised and depressed, they project irregularly northward into the lowlands ; consequently, the fertile plains of the latter are in some parts narrow, but in other parts form wide embayments between the upland masses. Thus in the North Sea Lowlands region, four main tracts of generally fertile plains or low plateaus may be observed.

(i) In the easternmost tip of the region is a strip in which the towns of Brunswick and Hanover are situated and which narrows westward where it is crossed by the Weser. This *Loess belt of Hanover and Brunswick* is noted especially for its production of sugar-beet and other industrial crops as well as cereals. Along it run ancient roads and modern railways which skirt the uplands and connect Berlin with the cities of the Netherlands and of northern France.

(ii) *The Westphalian Embayment*, which may be called the Plain of Munster from the town which is its natural centre, is of mixed soils and varied production. On its north-eastern and southern boundaries it is well defined by the edge of the uplands • on its north-western side it passes into an area which gradually becomes more like the geest; in the map of Fig. 30 this area is shown as transitional in its character, by the overlapping markings of both types of country. On the south-west of the Westphalian embayment the agricultural land of the plain is being invaded by the mining of the coalfield of the Ruhr region.

(iii) *The Cologne Embayment* is well defined on its southern and eastern sides, but on the north-west passes into transitional-geest country. The population of the Cologne embayment is great, for its agriculture is intensive, particularly upon a loess

covering in the south, while on the west side of the Rhine near Cologne there are deposits of lignite, or brown coal, a mineral which has been greatly developed in Germany in recent years (see Fig. 32). The Rhine, however, gives the region its greatest significance, for as a waterway it enables sea-going ships to reach Cologne, while its valley provides the most important route between southern and northern Germany and, indeed, between the Mediterranean and northern Europe.

Bonn marks the entry of the Rhine into the lowlands, but Cologne, a Roman "colonia," is a far more important focus of trade, for here the great traffic route which skirts the Central Uplands crosses the river. With industries utilizing both the lignite from the neighbouring deposits and the coal from the Ruhr, Cologne has grown into a city of about three-quarters of a million inhabitants. Farther downstream is Diisseldorf, the river port for the industrial area of Wuppertal immediately to the east in the adjoining upland ; at and about Diisseldorf a population of nearly half a million has congregated. Other centres of industry have developed west of the Rhine, e.g. Munchen-Gladbach and Crefeld, famous for textile production.

(iv) West of the Cologne embayment the fertile belt narrows between the Ardennes area of the uplands and the Campine, and here, near Maastricht, it includes the small southern prolongation of Dutch territory. Beyond the Maas the fertile belt widens to form the *Plains of the Schelde*, a region drained mainly by that river. In central Belgium this forms a low undulating plateau. In this area, again, sedimentary strata have a covering of loess, and there is intensive agriculture yielding wheat and oats, industrial crops, and roots grown as fodder for considerable numbers of cattle. This type of country extends into France.

Farther north, between the Lys and the sea marsh-lands, the plains of Flanders are less productive by nature ; here sandy soils predominate, and arduous toil, involving thorough cultivation and the use of manures, has been necessary to obtain fertility. Cereals are not so widely grown ; moreover, rye is in parts more important than wheat. The predominance of rye over wheat is fairly common on the poorer sandy soils of this section of central Europe, for climatic conditions make both crops possible and the determining factors are the dryness and relative infertility of the soil.

On both the Belgian and the French sides of the political

boundary south of the Lys, a rather scattered form of industrial development has persisted from the days when wool was produced, spun and woven in this region. Other forms of textile manufacture have grown up by "transferred inertia," the traditional skill being adapted first to the working of linen and then to that of cotton. Domestic manufacture still continues, sometimes as a necessary supplement to the scanty earnings of agriculture when winter gives spare time, but most of the work is carried on in a number of towns of moderate size situated to the north of the coalfield: in Belgium are Courtrai and Tournai, and in France are Roubaix and Lille; at these last two towns textile and other machinery is made.

By far the greatest city is Brussels, the capital of Belgium, conveniently situated in the centre of the lowland part of the State. It is at the end of the marsh-land of the Senne, a tributary of the Schelde, and grew up at the head of navigation; now it is connected by canals to the coalfields area to the south, and it has become also a centre of railway communication. As the capital of the country, the seat of much financial business, and the site of manufactures of many kinds, it has grown until its conurbation includes a population of nearly a million persons.

The Coalfields.—Fig. 27 shows in a very simplified manner how Coal Measures, formed in the upper part of the Palaeozoic rocks, have been worn away from the uplands region but outcrop at the surface where this descends to the lowlands, and are buried at increasing depths under the plains. The coal was mined, therefore, first on the inner margin of the lowlands, and the pits were later extended northwards till the deep working became too costly.

The section might suggest that there is a continuous belt of coal-mining all along the edge of the plains, but the geological structure is actually more complicated and the Coal Measures have not been preserved throughout the border of the lowlands; in consequence the coalfields form a series of disconnected patches. The actual mining areas are shown on the maps on Figs. 30 and 32. The most important of the coalfields is in the neighbourhood of the lower Ruhr where the river leaves the uplands to join the Rhine. Here the Ruhr district has become an intensely industrialized region. The industries, like those of the somewhat similar South Pennine coalfields of England, began in the valleys of the adjoining uplands, [where](#) water-power

from the streams was used for an early iron and steel industry which obtained ore and limestone from the uplands and fuel from the forests which clothed their slopes. In some of these valleys geographical inertia has allowed the industries to persist with the aid of the coal from the neighbouring Ruhr field; thus in the basin of the Wupper, the tributary of the Rhine situated a few miles south of the Ruhr, the towns of Remscheid and Solingen have long been famous for fine steel products, while

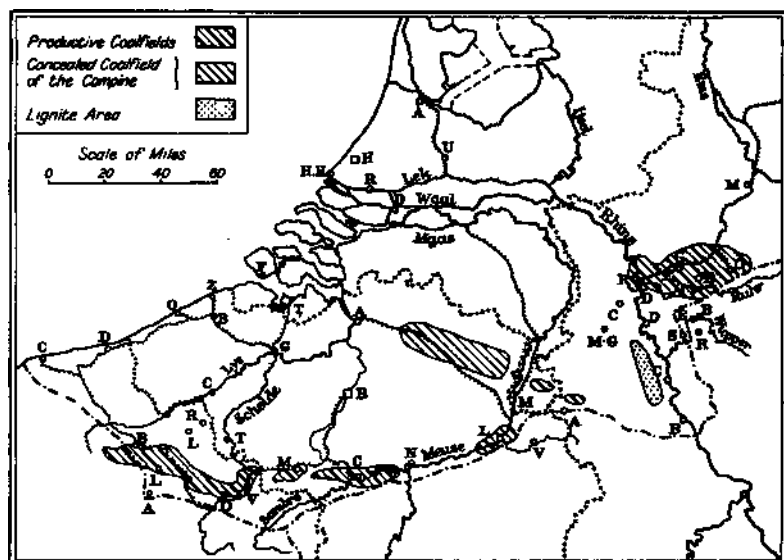


FIG. 32.—COALFIELDS OF THE NORTH SEA LOWLANDS.

a textile industry has persisted, working first wool, and later also cotton and rayon, into many fabrics, notably at Elberfeld and Barmen. These two towns became crowded together into the narrow steep-sided valley of the Wupper above Solingen, and have now been incorporated into one long municipality known as Wuppertal (i.e. Wupperdale) in which nearly half a million people are so packed that the railways have been tunnelled below the houses and elevated above the river and streets.

It is in the plain, however, that the greatest industrial development has occurred. On the Ruhr coalfield a number of towns have grown up, and have so spread that they form an almost unbroken sea of houses north of the river, stretching for about

50 miles eastwards from the Rhine. Where the Ruhr enters the Rhine it is joined by a canal connecting it with the Dortmund-Ems Canal; here a group of river-ports, including Duisburg and Ruhrort, carry on a great traffic in export of coal and import of ore and raw materials, and here are also metallurgical works.

The greatest aggregation of works is at Essen, where, within the municipal boundaries, live two-thirds of a million people, while adjoining it on the east are Gelsenkirchen and Bochum, each of which is about half the size. Several other large towns have sprawled over the coalfield, and the whole region has an unparalleled production of iron and steel goods, among which may be mentioned railway equipment, shipbuilding material, armaments, constructional steelwork, and machinery for manufacturing and agriculture. From the coal are obtained coke and by-products, including tars, dyes and other chemicals. Power stations furnish electricity for the grid system, which, fed also from other centres, distributes power to almost all parts of Germany. Textiles, leather goods and many other commodities are produced, while Dortmund is a centre from which great quantities of coal are sent inland by rail.

West of the Cologne embayment, the coal appears again: a little is mined near the German town Aachen, and also in Dutch territory, where an increasing amount is being obtained east of Maastricht.

The Belgian group of coalfields has a large production. The eastern mining area is in the Meuse valley around Liege, the greatest industrial centre of Belgium; the conurbation has a quarter of a million inhabitants and, owing to an early exploitation of ores of zinc, copper and lead, as well as of iron, metallurgical industries are very varied. In a neighbouring valley of the uplands, at and near Verviers, the manufacture of woollen goods has survived.

West of Namur, the line of the Meuse valley is continued by that of the Sambre, and here around Charleroi is another coal basin and metallurgical industry. Farther west the next outcrop of the Coal Measures occurs north of the river near Mons. Like Charleroi, Mons is itself but a small town, and it is characteristic of these western coal areas of Belgium that much of the mining and the associated work is carried on in groups of numerous small settlements set in rural surroundings.

Just across the French frontier is the last of the series of coal-

fields ; this stretches in a long and narrow belt from near Valenciennes, past Denain, Douai, Lens and Btethune, until its tip ends beneath the chalk sheet of north-eastern France. As in Belgium, there is no large city, but in and around a string of small towns and villages there is a considerable population engaged in the production of coal, coke and chemicals, steel and machinery. A great deal of coal is sent away, much of it northward to the French industrial area or the ports, and the rest southward by water or rail to Paris and elsewhere.

The belt of coalfields of the North Sea Lowlands may be regarded as a discontinuous tract; it supplies by far the greatest part of the coal-supplies of Germany, France and Belgium, and it includes some of the most densely populated areas of these countries.

Thus, with the coalfields of the inner margin and the ports of the outer margin, the North Sea Lowlands is a sub-region with an economic and political importance scarcely equalled in the world.

QUESTIONS

1. Show how the nature of the coastal areas of the North Sea Lowlands has influenced the manner of life of the inhabitants.
2. Show how the rivers of this region have influenced (*a*) the physical conditions, and (*b*) the economic development.
3. Compare and contrast the situation and the functions of three large ports of this region.
4. Write a reasoned geographical account of the Ruhr industrial area.
5. Describe and account for the differences between the farming of various parts of the North Sea Lowlands.
6. State and explain the main facts of the distribution of population in this region.
7. Briefly state how men have transformed three different types of country in the North Sea Lowlands.

SOUTH-WEST BALTIC LOWLANDS

EAST of the North Sea Lowlands is a region which, because of its position, is different as regards its climate, its surface conditions and its relations with other parts of Europe.

Climate and Vegetation.—As was explained in Chapter I I, in summer the temperatures of the lands south of the Baltic Sea are very similar to those south of the North Sea ; but in winter the conditions are more severe. Broadly speaking, the Baltic Lands have a mean January temperature below freezing-point and as one goes eastward still lower temperatures are experienced. As a consequence, the harbours of the Baltic Sea unlike those of the North Sea are normally ice-covered in winter, the period increasing eastwards, e.g. about two months at Stettin and nearly four months at Königsberg; during this period the ports have to be kept open by ice-breakers.

The gradual eastward change to a continental type of climate is also expressed, though less clearly, in the amount and character of the precipitation ; the annual total decreases, mainly due to a lessened amount in the winter half of the year (compare the figures for Brussels, Berlin and Warsaw in the table on p. 26). Moreover, at this season, with the greater cold the precipitation takes the form of snow, and this commonly remains for weeks upon the ground. Yet the sun is often bright, and clear skies are more often enjoyed in the Baltic regions than in the neighbourhood of the North Sea. Because of the above facts the South-West Baltic Lowlands region is included in the " Interior Temperate " climate region.

The natural vegetation shows changes which accord with the shorter period of vegetative growth towards the east. In the region here called the Baltic-Entry Lands the beech is dominant; from the neighbourhood of Lübeck eastward to the lower Vistula the deciduous beech and the evergreen coniferous pines form the " mixed " forest cover; from the lower Vistula to the lower Niemen pines and spruce are the most common trees, but with them are some beech and oak; beyond the

Niemen the length of the winter does not permit the growth of the beech.

The eastern limit of the beech is broadly taken as the boundary of this region, but the precise course of this boundary will be indicated later.

Surface Forms.—The surface conditions of the region are to a large extent determined by the effects of glaciation, e.g. the occurrence of great areas of boulder clay deposited as ground moraine under the ice, broken by great lines of hills formed by the terminal moraines, which have a general east and west direction and are composed of clay, sand and gravel and boulders of all sizes (see Fig. 33).

Beyond the successive margins of the ice-sheet, the water resulting from the melting formed large rivers, which occupied valleys probably existing in some form before the Ice Age ; they are known to German and Polish geologists as "primitive valleys." Along these valleys the great ice-water rivers drained westward, deepening and broadening them, and depositing in them masses of sand and gravel. Now that the ice has gone, the valleys are occupied only by smaller rivers coming from the south, and at a number of places these break through the morainic accumulations northward to reach the Baltic Sea, or in the case of the Elbe to reach the North Sea. Hence the primitive valleys have wide expanses of deposit in which there are either relatively small streams or none at all.

Consequently, in the northern part of the region there are three main types of country : (i) In the *Baltic Entry-lands* behind the line of terminal moraine which almost bisects the Jutish Peninsula is a ground-moraine area in which boulder clay predominates. These lands form the region marked (I) in Fig. 33. (ii) Farther east are the *Baltic Plateaus* (marked II), on which varied morainic material is thickly heaped, (iii) South of this belt is that of the *River Lowlands* (III), where the terminal and ground moraines of the earlier stages of the Ice Age were cut by the waters from the ice in the later stages ; here the primitive valleys are important elements in the geography.

Finally, in the south, beyond the limits of all but the earliest extension of the ice, and therefore where glaciation has had relatively little effect, the underlying rock formations have a greater influence on the geography ; here are the relatively fertile *Interior Plains and Plateaus* (IV). These areas in some

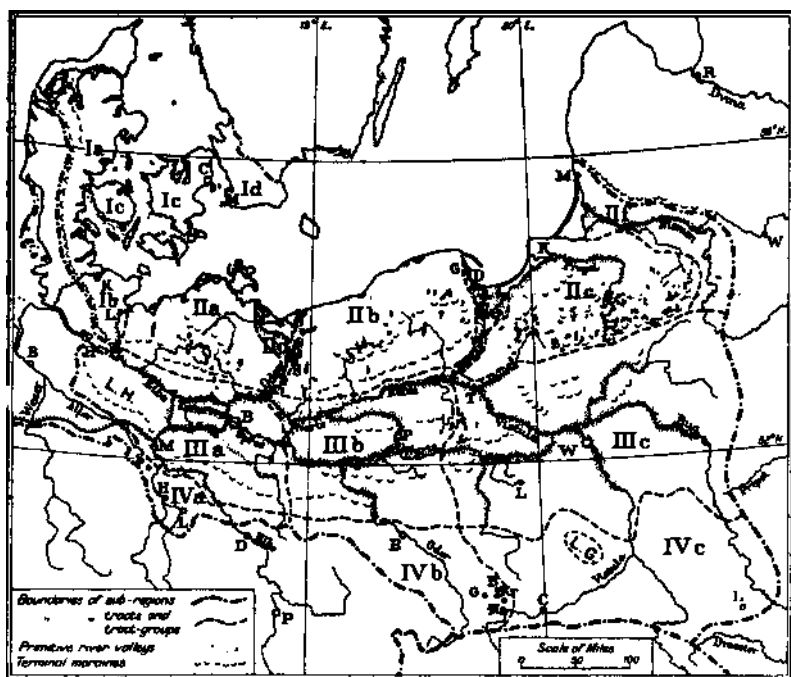


FIG. 33.—REGIONS OF THE SOUTH-WEST BALTIC LOWLANDS.

ways resemble the fertile plains in the south of the North Sea Lowlands. Moreover, adjoining the Central Uplands which form the southern limit of the South-West Baltic Lowlands are some coal deposits, though of less extent than those of the North Sea Lowlands.

The eastern limits of the South-West Baltic Lowlands have been drawn in Fig. 33 as follows : the northern belt of Baltic Plateaus ends where, on the north-eastern side of the lower Niemen valley, a line of terminal moraine (the " Baltic Border-moraine " of Lithuania) marks the beginning of a rather different type of country in the East Baltic area; the River Lowlands belt ends with the basin of the Vistula, beyond which are the great Pripet Marshes of East Poland and Russia ; the Interior Plains and Plateaus end at the water-parting between the Vistula and the Dniester, which drains to the Black Sea. Together these boundaries approximate to the eastern limit of the beech, and so correspond with the change to the Sub-boreal climate region.

The Baltic Entry-lands.—The terminal moraine which almost bisects the Jutish Peninsula forms a narrow belt of hilly country, a few hundred feet above sea-level, mainly covered with beech and oak trees. Behind this, on the eastern side, the boulder-clay country is low, sloping down to inlets of the Baltic Sea, which represent former glacial lakes, now "drowned" by a slight sinking of the whole area, or by an equivalent rising of the sea-level.

This change of level has also changed earlier river valleys into the three Baltic entries which now separate what was previously one area of almost uniform character; hence the present similarity of all these Baltic Entry-lands, marked I in Fig. 33, including Scania, the extreme southern tip of Scandinavia. Throughout the region beech woods alternate with the fields and meadows. The main aim of the farming is the keeping of cattle, pigs and poultry, and the consequent production and export of butter, bacon and eggs. The land is therefore utilized mainly for obtaining grain, roots, clover, grass and hay for the animals and to a much smaller extent for growing crops for human use, especially barley, oats and beet; closely associated with the agricultural production and keeping of animals are small industries of making sugar, brewing beer and dressing leather.

Along the north coast of Jutland the sand-dunes have been drifted as far as the point Skagens Horn, and the northern part of the peninsula is in parts sandy rather than clayey, but apart from this there is much similarity throughout the Baltic Entry-lands. Scania (Id) differs very markedly from the rest of Scandinavia, fundamentally because along its north-eastern boundary are a series of faults which have let down and preserved sedimentary rocks on the south-western side, while crystalline rocks of the Baltic Shield form most of the country on the north-eastern side. How this has influenced the farming is shown by the fact that on the south-western side 80 per cent, of the land is cultivated, while the proportion on the north-eastern side is less than 30 per cent. ; a population map shows a correspondingly sharp contrast. Climatic factors, too, play some part in bringing about the difference, for southern Scandinavia as a whole has the Sub-boreal type of climate, but in Scania the beech can thrive.

In addition to relatively favourable conditions of climate and soil, the Baltic Entry-lands, as the name implies, have a favour-

able commercial situation. This was more important in the past before railways, good roads, and canals diverted traffic from the seas, but there are still several ports at the eastern end of the Baltic. In the German part of the region (marked lb), Ltibeck is an " old-world " town, once the chief seat of the Hanseatic League dominating the trade of the Baltic lands ; it is now eclipsed by Kiel, a naval fortress at the end of the North-Baltic Sea Canal. On the Danish portion of the Jutish



FIG. 34.—VIEW ON THE ISLAND OF FUNEN.

[Danish Tourist Bureau.

Note.—The ground-moraine landscapes of Eastern Jutland and the Danish Islands have numerous low rises and small hollows, many of the latter being occupied by lakes or ponds ; by the coasts the " drowning " has converted these into small inlets. As in this view, the farms are commonly set among pastures and beech-woods ; in the foreground the foliage of a beech tree can be recognized.

Peninsula (marked la), there are only smaller ports, but on Zealand, the largest of the islands (marked le), is Copenhagen. It is situated on the Sound, the shortest route between the Kattegat and the Baltic, though its growth to a great city of more than three-quarters of a million inhabitants is due largely to the fact that it is the capital of Denmark. In Scania, Malmo is connected by train-ferry with Copenhagen ; it is the chief port of this part of Sweden, and in size is the third town of that State.

The Baltic Plateaus.—East of Lubeck, the Baltic coastlands become on the whole higher and form a series of plateaus

sometimes known by the name of the Baltic Heights, which alternate with low and broad river valleys. The Mecklenburg plateau (IIa) is followed by the Oder Valley, the Pomeranian plateau (IIb) by the Vistula valley, and the East Prussian plateau (Iie) by the Niemen valley. The highest parts of each plateau are covered by terminal moraines, rising to several hundreds of feet. These are to a considerable degree wooded, but as a legacy of the ice the drainage is in general poor, marshy areas abound and there are so many lakes that the regions are often referred to as the "lake plateaus." On the northern slopes, boulder-clay areas provide better soils, and agriculture yields crops of rye and potatoes, but the productivity is never high and decreases towards the east. On the southern slopes, outwash sands from the ice form but poor soils, and woods and pastures give a living to a scanty population. The low river valleys are naturally marshy and liable to flood, but where the alluvial plains are protected by dykes there is fertile ground, on which cereals, sugar-beet and other crops are grown, and animals are pastured.

The coasts vary in conformity with the lands behind them. Projecting from the Mecklenburg plateau are islands with low cliffs, as on Riigen, and parts of the coasts of the other plateaus are also cliff-edged. The valleys end in funnel-shaped estuaries in which the rivers have built deltas; sand drifted from the west has formed spits which almost shut in lagoons and, where the coast faces west, there are high sand-dunes.

These river and sea deposits hamper navigation, which also suffers from the formation of ice in winter, but ports have grown up at the mouths of the largest rivers. By the Oder is Stettin, which has some importance from the trade of Berlin, with which it is connected by canals.

At the end of the Vistula valley are two ports: Danzig is a German settlement which, situated by an old mouth of the river, has for centuries been the outlet for the trade of the Vistula basin; Gdynia, away from the river itself, is a new creation of Poland constructed to give that country an independent port at the end of the "Polish Corridor" which runs between East Prussia and the rest of Germany.

At the mouth of the smaller River Pregel is Konigsberg, a large German city; its development was in part due to trade from Russia, which came here in preference to the more easterly

ports because of the shorter time during which ice prevented navigation.

At the far east of the region is Kaunas (Kovno), the capital of Lithuania, where the Niemen, or Memel, River turns westward, and the port Memel is situated where the river leaves its lagoon.

The River Lowlands.—Not all this region marked **III** is low, for there are lines of terminal moraine forming belts of hilly country ; these are, however, neither so high nor so wooded as those farther north, and frequently form heath-land, e.g. the Liineberg Heath west of the Elbe (marked L.H. in Fig. 33). More extensive are the areas of ground moraine, generally covered by a relatively fertile loamy soil, on which corn, especially rye, sugar-beet and potatoes are grown.

The characteristic areas of the region, however, are the broad, primitive valleys. One series is just within the northern boundary of the region ; with the aid of canals it connects the Vistula above Thorn with the Netze and Warte tributaries of the Oder, and a short reach of that river with the lower Elbe. The second important line of valleys runs along the middle of the region ; it joins the Bug tributary of the Vistula to the upper Warte, and this river by the Spree to the Elbe. The Elbe above Magdeburg flows in another glacial valley, but below the town the river breaks off to the north ; its earlier valley is continued westward towards the Aller and is occupied by the new Mittelland Canal.

These and other glacial valleys have facilitated water communication, but they did not easily lend themselves to other use, for they are partly marshy and the natural vegetation-cover is commonly heath on the drier sands and dense thicket in the damper parts. But now considerable areas have been drained and dyked and transformed into fields and meadows.

Of the three areas comprising this River Lowlands region, that drained by the Elbe (marked **IIia**) is particularly important because Berlin has grown up within it. The rulers of the district around Berlin, the " Mark," during several centuries increased their power until they became Kings of Prussia and, at last, Emperors of Germany ; Berlin was the seat of their Government and is now the capital of the German State. Its position in the centre of the waterways is shown on the map, and when railways were constructed they were made to centre upon the city. Its development as an administrative and com-

mercial metropolis aided the establishment of many forms of industry, until it is now the largest manufacturing city of Germany. It is also the chief German centre of education and of many professions. As a consequence it has spread until it occupies an area of over 300 square miles and the city itself has a population of about 4½ million persons; it is thus the greatest city on the continent of Europe. Magdeburg is a large town which owes its growth mainly to its position on the Elbe.

The Oder Lowland (IIlb), has been less developed than the Elbe Lowland; it is a rather sparsely populated rural region, and has smaller towns. The most considerable of these is Poznan, formerly known by its German name, Posen.

In the Vistula Lowland (IIlc), with which part of the upper basin of the Warta is here included, the terminal moraines are less developed, and in addition to the wet river valleys, even the areas of ground moraine have large marshy spaces. There are other districts of woods and heaths, and in general the amount of cultivated land is less than in the more westerly lowlands. In the centre and on the Vistula is Warsaw, the capital of Poland, with about 1½ million inhabitants. The Polish Government, and before that the Russians, aided manufacturing in this region by customs barriers. Consequently, industries which here lack any special natural advantages are carried on in several towns, including Warsaw and the large manufacturing city of Lodz, which has more than half a million inhabitants; metal goods and machinery are made, but the greatest development has been in connexion with textiles, and especially cotton goods.

The Interior Plains and Plateaus.—It has already been suggested that this most southerly belt of the South-West Baltic Lowlands, with its less-marked glaciation and its greater fertility, may be compared with the "Fertile Plains" belt of the North Sea Lowlands.

This is certainly true of the area which is drained to the Elbe, and may be called the *Leipzig or Saxon embayment* (IVa), for it resembles the Cologne embayment in several respects. The sedimentary rocks are covered with loess in the southern part, and the region as a whole has intensive agriculture, in which the growing of industrial crops is important. Moreover, there are great deposits of lignite, extending from near Magdeburg southwards past Stassfurt, Halle and Leipzig, which supply power for local industries. These industries are aided, too, by

the occurrence of common and potassium salts in the districts adjoining Stassfurt and Halle, where there are great chemical works. At Leipzig there are varied manufactures which have grouped themselves around an older commercial settlement; this grew up because here an ancient east-west route avoiding the Saxon Uplands found a convenient crossing-place in the otherwise marshy valley of the River Elster, by which Leipzig stands. The city is also noted as a centre of printing and publishing. It has become one of the most important railway junctions of central Europe, and its population is now about three-quarters of a million people.

Farther east, the broad upper valley of the Oder forms the *Silesian Embayment* (IVb). While the south-eastern part of this hollow is covered with sandy and rather infertile glacial deposits, the lower north-western part has more clay and loess or loamy soils on which industrial and other crops are grown. On the Oder is the large city of Breslau, with over half a million inhabitants—another of the commercial centres which have arisen where land routes which skirt the uplands cross riverways leading to the lowlands and the seas.

At the south-eastern end is the Upper Silesian coal basin, of which part is in the Oder valley, and part drains to the Vistula. Coal is not actually mined in all parts of the basin, but iron, zinc and lead deposits are worked in the area ; as a consequence there are considerable metallurgical industries. The Upper Silesian coalfields are shared by three States, as shown in Figs. 78 and 80. In Germany there is a large industrial population in and around the towns of Beuthen, Hindenburg and Gleiwitz ; in Poland there are three smaller manufacturing areas, one at Krolewska Huta and Katowice, a second at Rybnik, and a third between Teschen (Cieszyn) and Moravska Ostrava ; in Czechoslovakia there is a much smaller district in and adjoining Moravska Ostrava.

The South Polish Plateaus.—This region (IVc), mainly drained by the Vistula, rises from the River Lowlands southward to the Carpathian Mountains. As a whole, it consists of a number of plateau-like areas, but the upper courses of the Vistula and its tributary, the San, flow through lower country, while north of this upper Vistula valley the land rises in the Lysa Gora (marked L.G.) to a height of almost 2,000 feet. This variety in the relief corresponds to a variety in structure, for the greater part of

the region is formed of limestones and other sedimentary strata of Secondary or Tertiary Age, much dissected by the rivers, but faulting of the earth's crust has resulted in the emergence of blocks of more ancient and more resistant rock in the Lysa Gora area. Surface conditions, too, vary considerably, for in parts glacial deposits cover the sedimentary strata, while in some areas, especially in the southern part, there is a thick mantle of loess in which streams have cut canon-like valleys.

With the variation in relief and soils, the fertility and the utilization of the land vary, but in general it is an agricultural region suited to the growth of grains and industrial crops, and noteworthy, as compared with the more northerly Baltic lands, for a relative importance of wheat production. The southern portion of this region forms part of Galicia, which extends also into the Carpathian Mountain region, and the famous salt-mines of Galicia are at Wieliczka, near Cracow (Krakow).

Cracow is situated where the Vistula was crossed by an old route following the northern side of the Carpathians, and another old commercial centre with a somewhat similar position is Lwow, or Lemberg. This latter city, however, is unusual in being situated on no large river; it is on the water-parting between the streams draining to the Baltic on the one hand and to the Black Sea on the other. Its significance is due to the fact that it is near the meeting-point of several natural regions, and therefore at the focus of routes by which products of different character are interchanged.

In this neighbourhood, we reach the limit of Temperate Europe, and therefore return to deal with the lands situated on the Atlantic side of the North Sea Lowlands.

QUESTIONS

1. Compare and contrast the south-west coasts of the Baltic Sea with the south-east coasts of the North Sea.
2. Show how the glaciation of the South-West Baltic Lowlands has influenced land-utilization in that region.
3. Give an account of the inland navigation system of North Germany, with reference to physical conditions and economic developments.
4. Write a systematic account of the geography of Denmark, relating the facts as closely as possible.
5. Make a comparative study of the situation and development of the three capitals : Berlin, Copenhagen, Warsaw.

NORTHERN FRANCE

The North French Lowland.—West of the North Sea Lowlands rises a belt of chalk country which reaches the Strait of Dover in Cap Blanc Nez, the counterpart of the cliffs of Dover. From this cape southward to the Central Plateau of France, and extending from the Central Uplands of Europe in the east to the Breton Peninsula in the west, is the North French Lowland (see Fig. 35). In its build this sub-region resembles the English Lowland: it is formed in the main of low plateaus, which are cut by river valleys, are sometimes edged by escarpments and sink in parts to low basins or marshy plains.

From the geological point of view, the North French Lowland occupies a great hollow known to geologists as the Paris Basin. Within the hollow the land is composed of strata lying one above another upon a platform of ancient rock which rises in the east to form the Ardenne and other parts of the Central Uplands of Europe, and in the west to form the Breton Peninsula, while on the southern side it is upthrust in the Central Plateau (see the section in Fig. 08, and note that the succession of the strata is set out in Appendix I). Broadly speaking, the lower sedimentary layers outcrop near the margins of the basin, while the uppermost ones appear in the central part.

The strata of the North French Lowland, like those of the English Lowland, differ markedly from one another in their composition, and thus give rise to differences in the relief, in the soils and in the utilization of the land; hence the structure largely determines the varying conditions within the region.

The North French Lowland has a more southerly and a more continental position than the English Lowland, and consequently its summers are warmer and its-winters rather colder, as may be seen by comparing the temperature figures for Paris and London in the table on p. 26. There is not much difference in this respect between the districts near the two sides of the Channel, but in the more southerly part of the French region the greater heat in summer becomes more marked and makes pos-

sible the growth of plants, particularly the vine, which cannot ripen their fruit under normal conditions in England. Such differences, allied to traditional differences between the English and French people in the modes of cultivation, lead to considerable contrasts in the appearance of the landscapes and the mode of life of the population in the two countries.

The Ile de France.—The central part of the North French Lowland (marked I in Fig. 35) lies around the capital, Paris, towards which the streams draining the area converge. Here, in past centuries, was the heart of what was then the Kingdom of France, its eastern side being protected by a cliff-like line of escarpments¹ which raised it, island-like, above the surrounding lowland ; hence this central region became known as the " Ile de France."

It is a group of tracts consisting of gently inclined table-lands, rising in the eastern escarpments to about 800 feet above sea-level, and in parts deeply cut by the valleys of the Seine and its tributaries.

The strata of which the lie de France is formed differ in composition, and as they are slightly tilted, they outcrop in various parts of the region and hence lead to differences which mark out the respective tracts. For example, south-west of the Seine is Beauce, which has characteristic features due to the subsoil being a layer of permeable limestone ; the country is a flat, monotonous and rather dry plateau, though a thin, loamy soil allows cultivation of great quantities of wheat. Usually water can be obtained only by boring deep wells ; these are therefore costly and not numerous, and around them the farm-houses are grouped in large villages, whence the treeless fields of the whole community spread out to considerable distances.

Between the Seine and the Marne is situated another wide and generally level tract, Brie, where the subsoil consists of a lower sheet of limestone of a siliceous, " millstone " type and includes clay, which prevents downward drainage. Consequently the surface is often wet, there are groups of trees, and the characteristic occupation is the keeping: of cattle and the production of milk and cheese ; with no difficulty in obtaining water, the farms are conveniently situated within their fields and the population is of the dispersed type.

¹ These escarpments, and also geological faults in other parts of France, are shown in Fig. 86 by symbols which are explained on the map in Fig. 44.

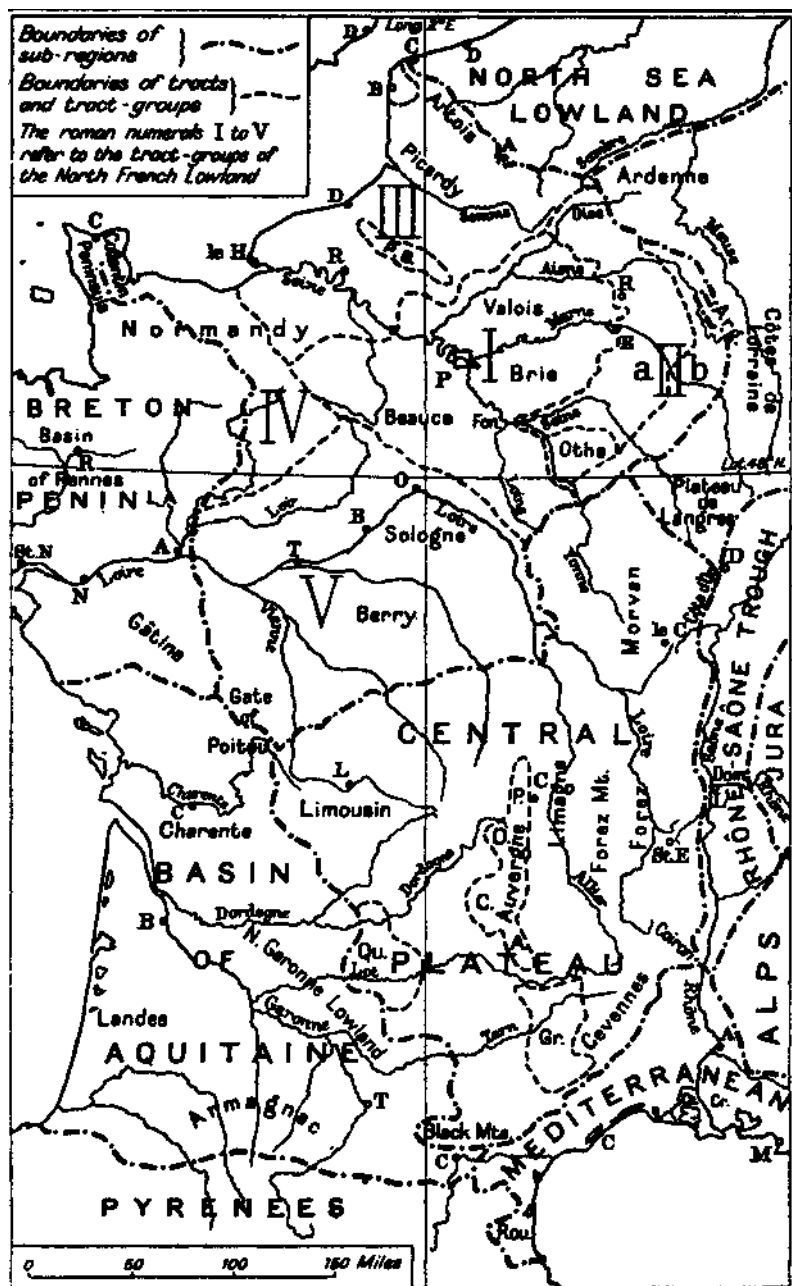


FIG. 35.—REGIONS OF CENTRAL FRANCE.

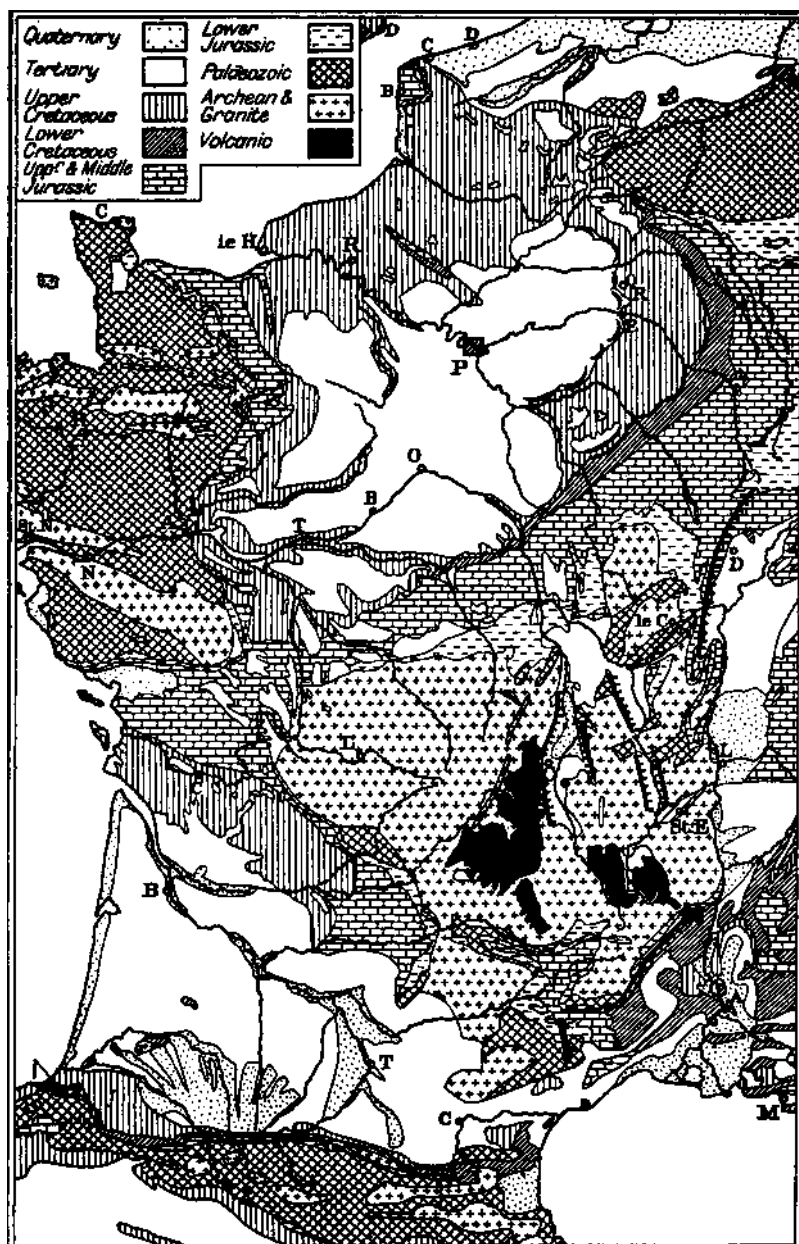


FIG. 36.—STRUCTURE OF CENTRAL FRANCE.

Between the Marne and the Oise is another tract, Valois, distinguished by the occurrence of a still lower stratum of limestone, generally covered with a fertile loam, but there are also patches of sand on which are woods. Elsewhere, too, in the lie de France wooded, sandy or clayey layers outcrop ; e.g. the forest of Fontainebleau (Fon.) is on a sandy stratum situated between the limestones of Beauce and Brie.

The plateaus are separated by broad and often marshy

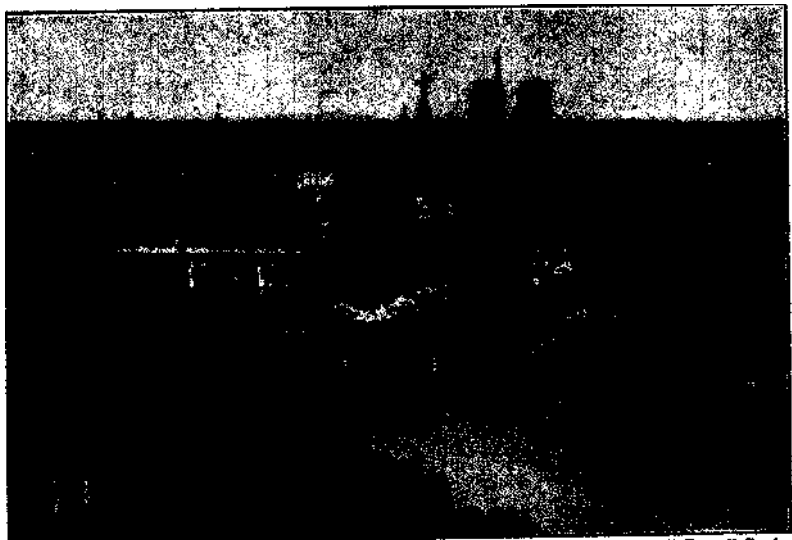


FIG. 37.—VIEW IN PARIS.

"Yoon," Paris.

Note.—The photograph was taken looking up-stream to the island in the Seine, the "He de la Cite," the nucleus of Paris; on the island are to be seen the towers of Notre-Dame. The view shows the shorter bridges spanning the Seine on either side of the island as compared with that across the undivided river; below this bridge are a few of the many barges which load and onload on the quays of Paris.

valleys, and in that of the Seine Paris grew up at a site where an island facilitated the bridging of the river. The position of Paris ensured its future importance : a north—south route here crossed another leading from east to west down the Marne and the lower Seine ; further, its central situation in the He de France early made it the natural seat of the kings of France, and with the development of the French territory it became the capital of the modern State.

As the seat of the Government and at a meeting-place of routes, it became a trading and residential centre, to which new roads were made and railways were built from all parts of France,

and indeed from all western Europe. Also, the River Seine is now navigable between the sea and the capital, and from the neighbourhood of Paris canals complete the natural communications of its tributaries : the Oise is joined to the North Sea Lowlands, the Marne to the Rhine valley, the Yonne to the Saône valley, and the Loing to the Loire valley. With this increase in its commercial significance and with the accompanying growth of its population, Paris was in a most favourable position for manufacturing and for the production of goods of almost all kinds; it is famous for articles of clothing or adornment for which skill and artistic taste are required. Paris is the artistic and intellectual, as well as the political, capital of France, and its great treasury of art, the Louvre, draws visitors from all parts of the world.

Paris now has a population of nearly three million persons, while the whole conurbation of which it is the centre has spread along the neighbouring valleys and on the adjoining plateau areas, absorbing many outlying towns, until the total population exceeds four millions.

The east-facing escarpment of the *He de France* has a peculiar importance, for on its lower slopes limestones with a covering of vegetable humus provide a suitable soil for the vine, and where there is a favourable exposure are the famous vineyards from which champagne wine is obtained. Also the Marne has here cut through the escarpment and formed a wide valley, into the opening of which the champagne vineyards extend. At this opening is the town of Epernay, and some miles to the north, at the foot of the escarpment, is Reims (Rheims); these two towns are the great wine centres of the district. At the base of the escarpment of Tertiary rocks, the chalk of the Upper Cretaceous comes to the surface, and at and near Epernay and Reims it has been hollowed out into great labyrinths of caverns ; here, where the underground temperatures remain even, the wine is matured.

The " Dry " and " Wet " Champagne Regions.—The term champagne as applied to wine comes from the name of the old French province, which included this vine-growing area. The province, however, extended far to the east, where it comprised the greater part of two markedly contrasted geographical regions; these have long borne the names *Champagne pouilleuse* and *Champagne humide*, indicating the beggarly and dry nature of the one **and** the wet condition of the other.

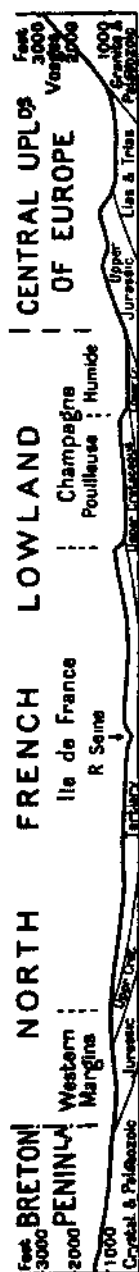


FIG. 38.—SECTION THROUGH NORTHERN FRANCE.

The contrast is due directly to the Secondary strata which rise from below the Tertiary escarpment of the He de France (see the section in Fig. 88). Immediately to the east the Upper Cretaceous chalk comes to the surface, forming at first a low belt of country, but then rising to the bare plateau of the "Dry" Champagne (IIa in Fig. 85); here there is little cultivation, and poor pasture lands on which sheep feed are the chief resource of a small and scattered population. At the northern and southern ends of this chalk plateau, coverings of Tertiary deposits give rise to more wooded landscapes; the southern area, that within the great westerly bend of the Seine, is the Forest of Othe.

Eastwards the chalk forms an escarpment, beneath which outcrop the Lower Cretaceous clays to which the character of the "Wet" Champagne (lib) is due. Although naturally forested and marshy, when drained its soils are capable of producing crops and rich pastures, and now it is a tract of agriculture and cattle rearing. This low Champagne region is bounded eastward by the wooded heights of the Argonne (Arg.) and by the more gradually rising uplands of the C6tes de Lorraine; these may be regarded as the beginning of the Central Uplands of Europe.

The Channel Plateaus.—From beneath the Tertiary layers of the He de France, the chalk emerges northward to form a series of plateaus (III in Fig. 85); these extend to the coast of the Channel, largely in the form of low cliffs, though where the coast faces westward between Dieppe and Boulogne the westerly winds have built up sand-dunes.

At the north-eastern end the chalk is bent up into the "swell" of Artois, which is a lower continuation of the Wealden Uplift of south-eastern England. Adjoining the channel the anticline is sufficiently great for the chalk top to be worn off,

as it has been in the Weald; the underlying strata, among which is a good deal of clay, have been exposed and worn down into a lower area around Boulogne known as the Bas Boulonnais. This low country is a relatively wet, cattle-rearing district, while the surrounding chalk regions of the Haut Boulonnais and the hilly Artois are drier.

This Artois plateau is not, however, poor country like the Champagne pouilleuse, for the chalk is largely covered by deposits of loam or loess with a fertile soil producing much wheat, fodder crops such as clover, colza, from which oil is obtained, and beetroot; after the harvests sheep are turned out to graze on the fields. Continuing the Artois tract to the south-west is Picardy, essentially similar in character; here the folds of the chalk, almost parallel to that of the Wealden-Artois anticline, give rise to an undulating country with the trends running south-east to north-west, and in the same direction the rivers drain to the Channel, the largest being the Somme. On the south-western border of Picardy, one of the anticlines is so marked that the chalk top has been worn away, and the resultant long and narrow Pays de Bray ("P.B." on the map) is a relatively low tract much like the Bas Boulonnais.

South-west of the Pays de Bray the chalk appears again in the low plateaus of Normandy; much of it is covered with "clay with flints," or, south of the lower Seine, with Tertiary deposits, often loamy in composition. While the plateau areas show much open cultivated country, the valleys have more trees and pasture; as a whole, Normandy is a province of varied productions and varied relief. The most marked features of the relief are seen in the valley of the Seine; here the river has been incised deeply into the plateau.

Near the head of the tide on the Seine is Rouen, and here is much interchange of goods from sea-going vessels to inland barges; here, too, was the lowest bridge-place on the river. Now Rouen has a greater amount of traffic than any other port of France. In and around the city are many factories in which cotton and other textiles are manufactured, while there are also other industries in the neighbourhood; Rouen is consequently one of the larger cities of France.

The coasts of the North French Lowland are on the whole not such as to facilitate maritime activities, but the easy crossing to England has given rise to the ferry ports of Boulogne, which

is also an important landing-place for fish, Dieppe and le Havre. The foreign trade of le Havre is very considerable ; it is the outport of Paris and Rouen, specially constructed to accommodate the large vessels which cannot proceed up the Seine ; it imports the cotton for Rouen and the other manufacturing towns of North France, and through it passes much of the foreign produce needed for Paris and for the North French Lowland in general.

In the *Western Margins* of the North French Lowland (marked IV), there is a gradual change to a more diversified region. Here the Cretaceous and Jurassic strata which rise to the surface are not so thick nor have they the same clearly contrasting characteristics as in the east, though limestones, sandstones and clay still bring variety to the country; the strata, however, rise in parts to greater elevations than are found elsewhere in the North French Lowland. Near the coast is the dry limestone plateau of Caen ; elsewhere fields alternate with heaths and woods, and the general appearance of the landscape suggests a transition to the adjoining Breton Peninsula.

The Middle Loire Basin.—The River Loire, between its exit from the Central Plateau and its lower course across the region of the Breton Peninsula, traverses and drains a broad and generally low area which continues the structure of the North French Lowland. This Middle Loire Basin is marked V on the regional map.

Here are all the strata found elsewhere in the North French Lowland region, but they are generally thinner and have narrower outcrops, and also they have been less upraised than in the more northern parts of France ; consequently they do not form wide plateaus, nor have they been etched out into such marked escarpments. Moreover, the Middle Loire Basin includes in the south a part of the belt of Jurassic limestones which, farther east, have been raised to form part of the north-eastern projection of the Central Plateau and also the C&tes de Lorraine (compare the regional and geological maps). Here in the Middle Loire Basin, on the western side of the Loire, the belt is lower and the limestones form the dry plains of Berry.

Although there are not marked differences in the relief of the Middle Loire Basin, its varied structure expresses itself in a diversity of scenery and productions, so that it is difficult to give a short summary of the characteristics of the region from

these points of view. But the generally low altitude and the more southerly situation of this part of the North French Lowland result in relatively high summer temperatures, and of these the people have taken advantage to grow great quantities of vines in the valley of the Loire and its southern tributaries.

Agriculture is the predominant occupation of the region, which as a whole is of moderate fertility. Cereals, especially wheat, are the main product; in addition, fodder for animals is grown, for on the better watered areas cattle are largely kept and sheep in drier parts, such as the open lands of Berry and also in the Soioigne, once marshy but now drained.

In past centuries the basin of the Loire was relatively a more important part of France than it is at present; Orleans at the nearest point to Paris served as a link between the metropolitan region and the centre of France, and from Orleans down the valley there is still to be seen a succession of finely built castles, e.g. at Blois, Tours, Saumur and Angers.

At its south-western end the basin of the Middle Loire narrows to the Gate of Poitou, which leads to south-western France.

The Breton Peninsula.—By comparison with the broad open fields of the North French Lowland, the Breton Peninsula is shady country, with small fields enclosed by hedges and with a good deal of tree growth. The distinction is largely due to the irregular relief of the land and to the abundant surface water, and these characters are themselves the result of the occurrence of older and impermeable rock and the heavier rainfall of the region. Hence the boundary between the North French Lowland and the Breton Peninsula is drawn where the impermeable rocks of Palaeozoic and Archaean age emerge from beneath the sedimentary strata already described, and project westward between the Channel to the north and the Bay of Biscay to the south. Since the greater part of this area formed the old province of Brittany, the name Breton Peninsula is here used, although the region includes the western part of others of the old provinces, notably Normandy and Maine. The peninsular position of the region gives it the equable and rainy climate which marks it out as part of the Atlantic Margins minor region of Temperate Europe. The contrast between the conditions at Brest and at Paris are shown by the figures on p. 26.

Moreover, the structure of the Breton Peninsula, one of the " Hercynian " uplands, distinguishes it from the neighbouring

regions of France and, together with the climate, makes it resemble the Devonian Peninsula of England in many respects.

The plateau was raised a relatively little distance above sea-level, and rivers have etched out the less resistant rocks, leaving the more resistant ones as ridges or bosses of moderate height. The direction of these elevations corresponds with that of the old mountain systems : in the north from west to east, and in the south a tendency to the south-east; consequently the present triangular-shaped region shows, at the Atlantic corner, parallel ranges near the north and south coasts with a narrow low belt between them, while on the continental side of the triangle there is a broader northern upland area forming the heights of Normandy and Maine, then a wide lowland through which the Loire enters the sea, and in the south the Gatine upland trending south-eastward before it disappears under the Gate of Poitou.

Uplands versus Lowlands.—The structure is the main cause of the differences between the uplands and the lowlands of the Breton Peninsula—one of the three great contrasts which the region offers to the observer.

The uplands, both those near the western extremity and those near the eastern margin, reach 1,000 feet and more above sea-level ; frequently they are in the form of long ridges composed of Archaean crystalline rocks, such as gneiss or quartzites, or of resistant sandstones ; in other cases they are broader and more rounded in form and composed of granite. On these rocks poor stony soils have developed, and the wind-swept, rainy uplands generally bear a heath-land type of vegetation ; in parts water collects in the hollows of the impermeable rocks and forms pools, while marsh plants grow in a peaty soil.

Between the uplands the lowlands have been worn down in the less-resistant slates or shales ; here clayey soils have been formed, and though naturally ill-drained and wet and once densely forested with oaks, they have proved capable of utilization. There are meadows on which many cattle are reared, largely for the production of milk and butter ; there are fields in which cereals and vegetables, especially potatoes, are grown ; there are orchards from which large amounts of apples are obtained, and in this part of France cider made from the apples takes the place of wine. The most extensive lowland area is the "Basin of Rennes," in the centre of the region, situated between

the generally higher elevations of the western extremity and the eastern margins.

The mineral resources of the region are very small, and apart from some iron in the north-east margin in Normandy, the chief products are granites and slates, quarried where they can be transported easily by water.

East versus West.—Because of the triangular shape of the Breton Peninsula, the narrow and projecting west is much more exposed to the influence of the sea than the broader east which adjoins the North French Lowland ; the former is wetter and more wind-swept, although more equable, while the latter has warmer and drier summers. Moreover, there is a greater extent of the clayey areas in the centre and east, and consequently the more valuable crops of wheat and oats are obtained in these parts, while buckwheat and rye are grown in the west.

Because of its remoteness from the rest of France, the people of the west have been more isolated, and this feature of their lives is increased by the method of farming: the peasants mostly live in scattered houses, surrounded by their patches of arable land, pasture, and vegetable and fruit garden, enclosed by hedges and trees, and connected with the outer world only by a muddy cart-track. Old ways and old ideas tend to persist, and Breton is still widely spoken.

Coast versus Interior.—The Celtic word " Armor " meant the -coastal belt, in opposition to " Archoat," the wooded country of the interior, and the life of the region has been greatly affected by the character of the coast itself.

The breaking up of the old massif led to the broad outlines of the present peninsula, but the numerous bays of moderate size are due to more recent changes of sea-level, involving the " drowning " of the earlier valleys ; in the far west the hollow between the northern and southern ridges has been deeply invaded by the sea, and the great bays of Brest and Douarnenez are the result. This irregularity of the coast has been accentuated by the wearing action of the stormy seas, which have fretted the shores, wearing them back into cliffs and detaching the outstanding parts of headlands to form rocky islets.

Such a coast, although at times dangerous to shipping, gives abundant harbourage, and fishing and trading have been encouraged. From the north coast fishermen go as far away as the Newfoundland and Iceland cod fisheries, and on the south

side tunny fishing and more especially sardine fishing is important ; everywhere there are fishing villages, and in the larger centres preserving and canning are important industries.

No other region of France has such a coast, and from the people of the Breton Peninsula a large part of the personnel of the French fleet is recruited ; moreover, Brest, with its position at the entrance to the Channel and its situation in a land-locked harbour with deep water, is a naval station of great importance.

The far west, however, is so remote from the rest of France that it has not an advantageous position for import and export. The north-east and the south-east parts of the coast on the other hand, have more commercial significance. At the end of the Cotentin Peninsula is Cherbourg, which is a port of call for liners from Southampton and the North Sea on their trans-Atlantic passages, as well as a naval station. More important is the trade from the Loire estuary : Nantes is the old-established port of the Loire Basin, situated where roads from either side converged at the lowest bridge-place on the river. When larger vessels were built, Nantes could not be reached by them, and St. Nazaire became its deep-water outpost; still more recently, engineering works have forced the waters of the Loire to scour the channel, and once again Nantes can receive liner traffic. Now both ports share the trade and subsidiary industries, including shipbuilding.

The coastal belt of the Breton Peninsula has another advantage over the interior in that its mild winter climate and its facilities for rapid export have enabled it to develop a great production of early potatoes, cauliflowers, artichokes and peas. Agriculture is helped in yet another way by proximity to the coast, for the soils have been greatly enriched by manures obtained from seaweed gathered at low water, and also from banks of sand formed of shells, which give valuable material for plant food.

With this variety of natural opportunities of getting a living, the population along the Breton coasts is much greater than that in the interior, and indeed is greater than that of most of France, with the exception of the manufacturing areas of the north-east and the districts near the great cities.

(Questions are given at the end of the next chapter.)

SOUTHERN AND CENTRAL FRANCE

The Aquitaine Basin.—The latitude of south-western France accounts for its higher temperatures both in summer and in winter, as compared with those of the Paris region (see the figures for Bordeaux on p. 26), and the direct exposure to the Atlantic winds accounts for heavier rainfall. These conditions make possible a widespread cultivation of maize, which becomes more important than wheat as a cereal crop in the south, and there is a wider extension of vine-growing in the Aquitaine Basin even than in the Middle Loire Basin. On the adjoining Central Plateau and the Pyrenees fall heavy rains, and from these the rivers bring down great quantities of water, particularly to the Garonne, which is in consequence subject to great floods. Moreover, the bottom of the great trough between the two highland areas has been largely filled in with material brought down in the past, and alluvium is still being deposited in the valley of the Garonne and is rapidly filling up the Gironde, the common estuary of the Garonne and the Dordogne. The Garonne is not navigable above Bordeaux, except for small boats, and large liners have to use outports near the mouth of the Gironde if they serve this region at all.

Indeed, in spite of the long coast-line, the natural conditions do not favour maritime activities, for in this angle of the Bay of Biscay the currents sweeping southward have accumulated sand, which has been heaped up by the prevailing westerly winds into an almost continuous belt of high dunes. These are known as the *Great Dunes of Gascony* and are shown on the geological map as among the Quaternary deposits. The belt of sand has enclosed a number of lagoons, all except one now being completely shut off from the sea.

Moreover, behind these coastal barriers is the tract of the *Landes*, consisting of great flat plains of wind-blown sand, below the surface of which iron has cemented the sand into an impermeable pan. The region was therefore a marshy heath-land with innumerable pools ; in these, mosquitoes bred and carried

malaria among the few people who kept sheep on poor pastures.

Now, however, the inland drift of the sand has been checked by planting grasses and trees on the dunes, and the drainage has been improved by breaking through the pan and by cutting dykes ; then, some thousands of square miles were planted with

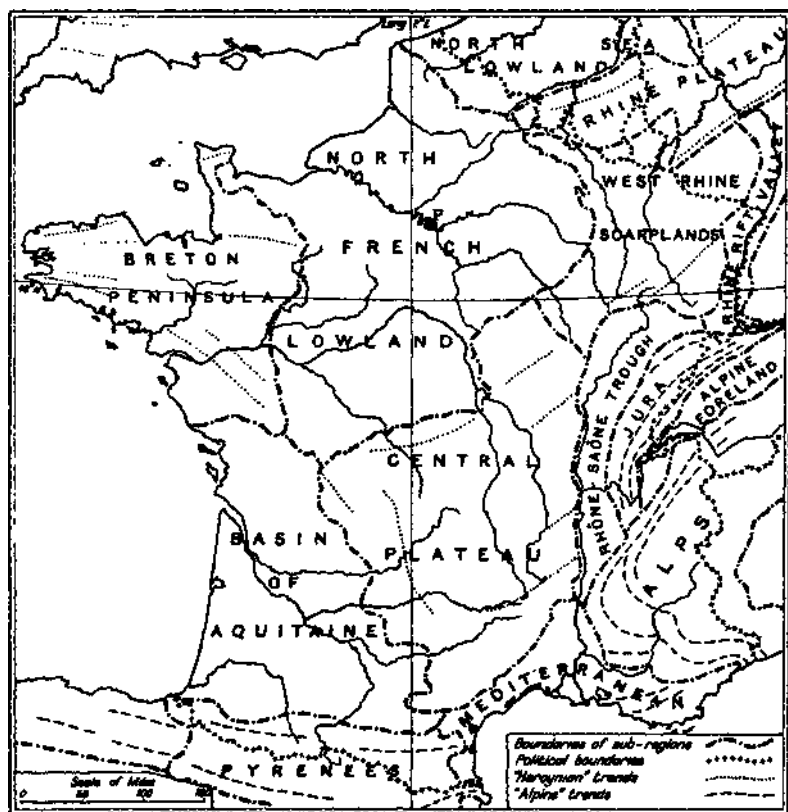


FIG. 39.—REGIONS AND STRUCTURAL TRENDS OF FRANCE.

the maritime pine, which yields timber, resin and turpentine,, while improvements in pasturing have allowed many more sheep and also cattle to be reared on the Landes.

The other tracts of the Aquitaine Basin are much more productive. The country which adjoins the Gate of Poitou is called the *Charente Region*, for it is drained by the River Charente to the Bay of Biscay. The soils are fertile, producing

wheat and maize, and along the whole course of the middle and lower Charente there are vineyards; from the wine a great deal of brandy is obtained—a famous kind is that known as Cognac, from the town in the centre of the district.

The *Garonne Valley* is another important vine-growing region. " Bordeaux wines " is the general name given to the wines made in the lower part of the area, but far up the courses of the river and its tributaries there are also extensive vineyards ; some of the more choice wines are exported, but by far the greatest amount is consumed in the country. In general, the Garonne valley is the most productive and the most populated part of Aquitaine. Wheat and fruit trees are grown throughout the area, and on the wide plains of Toulouse, below that city, maize and early vegetables are important productions ; tobacco is also grown in some parts of the Garonne valley.

Bordeaux is the port of the whole Basin, with about a quarter of a million inhabitants. Toulouse is not quite as large ; it is the trading centre of the upper part of the region, and is a focus of routes up the valleys of the Pyrenees and through the Gate of Carcassonne to the Mediterranean region of France.

Between the Garonne valley and the Central Plateau is a region which may be called the *North Garonne Lowland*. Its characteristic features are due to the subsoil being largely formed by Tertiary deposits known as " mollasse "—sandy and clayey accumulations worn down from the Pyrenees during and after the upraising of those mountains ; it was spread out over almost all the Basin, although now covered by later deposits on the Pyrenean side of the main valley. The region has a rather monotonous appearance, for on the mollasse have developed gently undulating plains, remarkably uniform except for the river valleys that have been cut into them. Wheat and fruit, especially plums, and fodder for cattle, characterize the agriculture.

Between the great curve of the Garonne valley and the Landes is an almost semicircular region rising gradually to the Pyrenees ; the name of the central district, *Armagnac*, may be adopted as a convenient label for the whole region. Here an immense alluvial fan has been formed of material brought down from the mountains : first the mollasse, then later Tertiary gravels, sands and clays, and on top of all Quaternary sediments.

Into this broad " cone " the rivers have cut valleys spreading out fan-like and draining either to the Garonne or to the angle

of the Bay of Biscay. In their upper parts these valleys are deeply cut into the plateau of the higher country where heathlands pasture sheep during their annual passage between wintering on the lowlands and spending the summer in the mountains. In the lower parts the valleys are wider and the climate is warmer and drier; here maize is widely grown, fruit trees and the vine become increasingly important as the region becomes lower, and Armagnac brandy is one of the well-known exports of the district.

Thus the Basin of Aquitaine, taken as a whole, is a sub-region of predominantly agricultural character and of a markedly southerly type; with a lack of mineral wealth and almost shut in by mountains and a difficult coast, it has had very little industrial or commercial development, and in consequence its population is not great and is mainly scattered in isolated farms or in villages and small towns.

Between the Pyrenees and the Central Plateau is the broad Gate of Carcassonne, whose fortified walls and castle still bear witness to its strategic importance in past centuries.

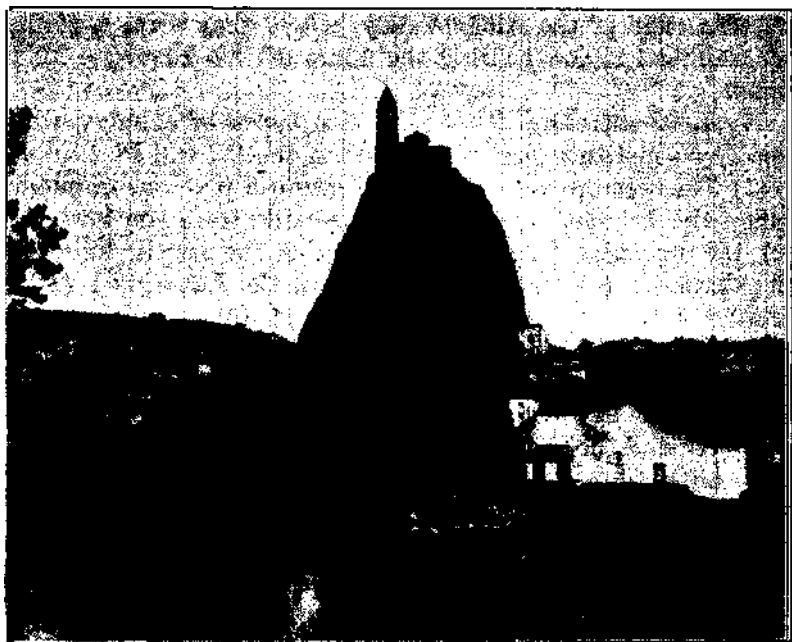
The adjoining region of the Pyrenees has a greater extension in Spain than in France, and will be dealt with in the chapter on the Iberian Peninsula.

The Central Plateau.—Although this region, frequently called the Massif Central by French geographers, appears on a relief map as an upland with few breaks in its continuity, it includes areas of extraordinarily contrasting character. Even where the surface shows little change in altitude, the appearance of the country and the mode of life of the people may change suddenly with the occurrence of a different bed-rock; hence, the geological structure is the key to the geography.

In this Hercynian Upland, the structure is complicated, for the "Armorican" foldings, with a north-west to south-east direction, approach the "Variscan" foldings, which run from south-west to north-east.

Moreover, in the upraised massif of the Central Plateau, marginal areas of Secondary sedimentary strata were incorporated. These areas can be seen by comparing the limits of the region as shown in Fig. 85 with the occurrence of the various strata as shown in Fig. 86; of special interest are the masses of Jurassic limestone in the regions of the south and south-west marked "Gr." and "Qu." on the regional map.

Another most significant feature of the Central Plateau is the existence of many great faults. Of these, one series forms the steep eastern margin of the region where it overlooks the Rhone-Saone trough.¹ Consequently, while in general the Central Plateau rises gradually from the west, its eastern boundary is almost mountain-like, and its high south-eastern edge, reaching about 4,000 or 5,000 feet, is known as the Cevennes.



(French Railways—National Tourist Office.)

FIG. 40.—VIEW AT LE PUY.

Note.—"Puy" is a common name for a summit in the Central Plateau, and it has been adopted as the name of the town "Le Puy" in the volcanic region west of the Upper Loire. North of the town rises the volcanic rock named "Rocher d'Aiguille," shown in the view; it is nearly 300 feet high, and on the top is a chapel built in the tenth century.

Another series of faults has produced two marked valleys in which flow the upper Loire and its tributary the Allier. That of the Allier is called the Limagne; it is a rift valley between faults running in a general north-to-south direction, and in it have been preserved Tertiary deposits and material worn down from the surrounding upland. The corresponding valley of the Loire takes the form of two down-faulted basins, also filled in

¹ In the geological map in Fig. 86 all these faults could not be shown without obscuring other features.

by Tertiary deposits ; the southern is known as the Forez Basin. The narrow upland left between these valleys of the Allier and the Loire is called the Forez Mountains.

Still another important element in the structure of the Central Plateau is associated with these dislocations, for through such cracks volcanic material was forced out and accumulated on the other rocks. In this region such recent volcanic rocks are found in great amount near the head-stream of the Loire, and on the western edge of the Allier Valley, where they form a distinct geographical region bearing the name of the Auvergne Mountains.

We may therefore distinguish five types of country which together constitute the greater part of the Central Plateau.

(1) The western crystalline and granitic plateau, frequently called the Limousin, which rises gradually from the lowlands ; (2) the upraised limestone plateaus of the south, known as the Causses ; (3) the volcanic region of the Auvergne ; (4) the faulted valleys of the Allier and Loire ; (5) the high eastern margin of complicated structure, including the Cevennes in the southern part and certain coalfields in the northern part. To these may be added two projecting spurs, the broad Morvan in the north and the Black Mountain in the south. These regional units differ from one another considerably in structure, altitude and position, and consequently in climate and utilization.

Limousin.—Where this plateau rises from the North French and Aquitaine Lowlands it is about 1,000 feet above sea-level, and it slopes gradually upwards towards a higher eastern part, frequently known as the Plateau de Millevaches, which gains an elevation of nearly 8,000 feet.

The lower western area has an equable, and on the whole warm, climate with a moderate rainfall, and its crystalline rocks have weathered to soils which have been improved by long manuring and by bringing chalk up from the neighbouring lowlands. There are arable lands, on which wheat and buckwheat are grown, but most characteristic are meadows, generally irrigated and cut for hay twice in the year, and plantations of edible chestnut trees. The farming is concerned mainly with cattle-rearing, and the chestnut trees yield both timber and also the nuts which form an important part of the people's food.

On the higher eastern part of the plateau the climate is colder and more cloudy; there are heavy rains and in the winter

frequent snowfalls. On the rounded heights are granitic tors, also hollows filled with waterlogged sands ; heaths abound, and there are woods of oak and beech. There is little cultivation, though some rye is grown, and cattle are bred to be sent to lower areas for fattening and sale.

The settlements in the Limousin are generally small; Limoges, on a tributary of the Loire, is the natural centre and market town of the lower plateau, and at this town are pottery and porcelain works having the advantage of kaolin from granite quarried in the neighbourhood.

The Auvergne.—This region, named after an old French province, consists of four main tracts, all volcanic, but of different origin, appearance and use.

In the north, overlooking the Limagne, is a relatively narrow belt marked P. on the regional map. This is formed of a considerable number of relatively recent cones, known as " Puy " ; the best known is the Puy de Dôme. Though the volcanoes are extinct, their forms are still fairly well preserved, and on some of the lava fertile soils have developed. At their general elevation of nearly 3,000 to 5,000 feet, however, these lands have a comparatively severe climate and the heavy precipitation commonly takes the form of snow. Hence only such hardy crops as potatoes and rye can be produced, and, as on the neighbouring plateau, pastoral work is the main resource of the scanty population.

Farther south the belt widens to the mass of Mont Dore (D.), formed by the eruption of material from many neighbouring vents ; here the volcanic accumulation reaches its greatest elevation, over 6,000 feet. Farther south again is the widest area, the Cantal (C), once a volcano of still greater elevation than the Mont Dore mass, but of older date and now worn down to a rather less height. On these mountains the snow may lie for half the year, but their sides are deeply eroded, and in the lower parts of the valleys there are good soils and abundant water, and here fields, fruit trees and villages are found.

The " tail " of the Auvergne is the Aubrac (A.), an enormous stretch of bleak lava flows, of little value except as a summer pasture for cattle from farther south.

The Allier and Loire Valleys.—The two great head-streams of the Loire system derive their waters from a region where the melting of the winter snows frequently coincides with heavy

rains ; hence they are both subject to enormous floods in spring, in striking contrast with very low water in the usually dry summer. Moreover, at all seasons they are liable to great rises, for upon the surrounding highlands rain-water is not absorbed by the impermeable rocks, but rushes rapidly down the steep slopes into the two great valleys.

In Tertiary times these depressions were occupied by lakes, now drained, and upon the deposits of that period much alluvium has since been spread. The low altitude of the resulting plains, only about 1,000 feet above sea-level, gives them a relatively warm climate which at midsummer may indeed be hot, and the bordering uplands give them shelter. Consequently, where the soils are favourable, they are extremely productive and have attracted relatively dense populations into the heart of the Central Plateau. The Limagne is exceptionally fertile, for the proximity of the volcanic region long ago caused ash to descend upon it, and since then debris of mixed composition has provided material for the development of rich soils. Upon these soils wheat, various fodder crops and sugar-beet are grown, and the numerous villages are almost hidden by great orchards of pear trees, walnut trees and even apricot and peach trees, while vines are grown on the lower slopes of the valley sides.

Towns have grown up, the largest being Clermont-Ferrand on the edge of the valley almost underneath the Puy de Dome ; here have developed manufactures, aided to some extent by a small local coal-supply, but depending almost entirely upon imported material. The central position in France of Clermont-Ferrand would seem largely offset by its situation within highland barriers, but it has risen to considerable importance in connexion with the motor-car industry and there are great rubber factories and also engineering works of various kinds.

The valley of the Loire is less productive, for the crystalline rocks above it have furnished sandy material which renders the Forez and other basins less productive than the Limagne; wheat and potatoes are the chief crops. There is a cotton-spinning industry in the Roanne basin below the Forez, but no industrial development comparable with that of the Allier valley.

The Causses.—The name is derived from an old south French word for limestone, and the permeability of the rocks is the

fundamental factor in the characteristics of the regions. There are two main areas, the Grandes Causses (Gr. on the regional map), situated chiefly in the upper basin of the Tarn, and the Causses of Quercy (Qu.), cut by the middle courses of the Lot and Dordogne.

The Grandes Causses are limestone plateaus at elevations of between 2,500 and 3,500 feet above sea-level; they are separated



[E.N.A.]

FIG. 41.—VIEW ON THE RIVER TARN.

Note.—This shows part of the gorge cut into the limestone of the Grandes Causses. At one place the river-level is more than 1,500 feet below that of the neighbouring plateau. The limestone walls sometimes overhang the stream, where they represent the subterranean tunnels and caverns of an earlier stage of development.

from each other by the deep valleys of the Tarn, its tributaries, and other rivers draining either to the Atlantic or to the Mediterranean. Although the rainfall on these heights is great, the surface is usually dry and rocky; there is little soil except in the hollows or the valleys, and generally vegetation is very sparse and sometimes practically non-existent. The water sinks into the limestone, and collects in cracks, which are widened by solution and corrosion till underground channels

are developed, widening in parts to caverns. In course of time the tunnels become very deep and their roofs may give way; the rivers are then exposed at the bottom of narrow canons in some cases hundreds of feet in depth.

These valleys effectively separate the Causses from each other, and greatly impede communication, which, moreover, is often impossible in the valleys themselves. Surface streams upon the plateau are rare and sometimes suddenly disappear in swallow-holes, perhaps emerging in a canon-like valley far away. Landscapes like that of the Causses are said to be of the " Karst " type, the name being derived from the similar Karst upland near the head of the Adriatic Sea.

With the lack of vegetation, the only considerable resource is the grazing of sheep on the poor pastures, and from the ewes' milk " Roquefort " cheese is made. Conditions of life are hard, especially in times of drought, when water may have to be carried great distances from the larger streams. Necessarily, the population of the Grandes Causses is extremely scanty and, settlements are limited mainly to parts of the valleys where soil has accumulated and water can be obtained.

The Causses of Quercy are essentially similar, but they are of much less elevation, being little more than 1,000 feet above sea-level. Hence the valleys are less deeply cut, and the climate is less extreme ; consequently the pastures are better, life is not so difficult and the population is rather greater.

The Black Mountain and Morvan Spurs.—In the extreme south the Central Plateau almost meets the Pyrenees in the spur of the Black Mountain, a crystalline mass which derived its name from the dark forests still covering it in part.

In the extreme north is the Morvan, whose highest part is of more complicated structure, but of generally similar appearance ; from this it bears the Celtic name Morvan, which meant Dark Mountain. Around this height upraised sedimentary rocks, largely of Lias clay and Jurassic limestone, form a transition both to the North French Lowland and also to the Plateau of Langres, which continues the high ground to the C6tes de Lorraine and the Central Uplands of Europe.

The Eastern Margins.—Here is an area of great complexity which in one part or another includes all the types of country found in the Central Plateau. In the south the Cevennes, deeply scored by rivers running rapidly to the lower Rh6ne

or the Mediterranean, descend from heights of over 5,000 feet and show a zonal arrangement of vegetation as they reach lower altitudes and have higher temperatures : pastures on the heights give place to beech forest, and this yields to great plantations of chestnut trees before the mountains pass into low foothills and plains of "Mediterranean" character. On the edge of the Cevennes, faulting has let down and preserved the small coal basin of Ales, or AJais, and farther to the north-east a projecting spur of volcanic basalt, the Coiron, brings the plateau close to the Alps.

More important coal basins are found on the Central Plateau between the Loire valley and the Rh6ne-Saone Corridor. The direction of the Variscan folding is shown on the geological map by belts of Palaeozoic rock running from south-west to north-east, and in these are productive Coal Measures ; moreover, the rocks have been worn down into hollows which facilitate communications between the Loire and Rhone river basins. There are three such coalfields, and of these the central one has the advantage of neighbouring iron ore ; here are the great armament and other iron and steel works at le Creusot. The southern one is the basin of St. Etienne ; its valley of over 30 miles in length has been described as a "long and infernal street" in which metallurgical industries of all kinds, glass-making and the manufacture of silk and artificial silk goods are carried on. From this coalfield coal is sent to Lyons, where it is used in power-plants when the water-power upon which they normally depend fails during the dry seasons.

Reviewing the characteristics of the Central Plateau, it will now be realized that its geological history has welded into close proximity very different types of country ; consequently it is not a simple sub-region, like the North French Lowland, in which there is much uniformity, but a composite sub-region with little more than its elevated situation in the heart of France as a common characteristic.

The Rh6ne-Saone Trough.—This great hollow is the result of the Alpine disturbances which produced both the folded ranges of the Jura and the Alps on the eastern side and also the faultings which separate it from the Central Plateau and its continuation, the Plateau of Langres, on the western side. At the northern end of the Sa6ne trough are strata of Secondary age, but the

greater part of the hollow is floored by marls and other Tertiary deposits, and glacial material was brought down in great amount where the Rhone enters from the Alpine highlands.

The soils in the hollow are therefore varied, but where they are fertile the region is very productive, for the climate is favourable to cultivation. Because of the almost enclosed situation of this relatively low region, the temperatures approach the "continental" type, as is shown by the figures given for Lyons on p. 26: the July mean of 70° F. and the annual maximum of 95° F. are markedly high as compared with the January mean of 36° F., and the annual minimum of 10° F.; no other part of north-western Europe shows such extremes. The rain is abundant, due to the proximity of the great highlands.

The northern and central part of the broad Saône valley is a fertile country, with great stretches of wheat and maize, sugar-beet, hops and fodder crops for dairy cattle. Especially productive is the zone at the foot of the western hills, part of which goes by the name of the Cote d'Or; all along these slopes are vineyards and orchards of cherry, peach and other fruit trees. The wines are known by the general name of "Burgundy," from the old province of which this zone formed part.

The area of the Dombes (marked "Dom." on the regional map) in the angle east of the Saône and north of the Rhône is very different, for here the morainic material is spread out in broad, terrace-like formation, and on these levels there are impermeable clays. Consequently there is naturally bad drainage, and this area is the least populated of the whole region.

Farther south the trough narrows to the "Rhône corridor." Here fertility is again considerable, and vineyards stretch along its borders, while besides fields of maize there are great plantations of mulberry trees grown for the food of silk-worms; in this way the agriculture is related to the silk industry carried on in a number of small centres, in addition to the great works in and close to Lyons.

The greater part of the silk required for the industry in Lyons, however, has to be imported from abroad; moreover, though the machines are mainly driven by electricity derived from water-power from the Rhône itself and the neighbouring Alps, the chief advantage for the industry lies in the position of the

city in relation to distant sources of raw material and distant markets for the finished goods. Great quantities of silk are brought from the Mediterranean countries and the Far East through Marseilles ; for the disposal of manufactured silk and other goods, the Saône valley gives relatively easy routes in two directions : the first is north-westward to the Paris Basin and the Channel ports by way of Dijon and the railways over the Plateau of Langres, and the other is north-eastward to the Rhine Lands and the North Sea ports by way of Belfort in the Burgundian Gate between the Vosges and Jura Uplands.

With other routes, such as the St. Etienne valley westward and the Rhône valley eastward, Lyons has a most marked nodal position, and it is not surprising that it has developed into a very important commercial centre. Naturally, to the same city have been attracted a number of other industries, including the production of chemicals and machinery. With its population of over half a million, Lyons is the third city of France.

The River Rhône is practically unnavigable, for the masses of water which it receives from the heavy rains on the surrounding uplands and from the melting snows of the Alps make it liable to floods, which occur at various times in different parts of its middle and lower course, and its current is usually too swift for boats to go upstream; it is the valley, not the river, which is so important for commerce.

Mediterranean France.—The traveller proceeding southward through the Rhone corridor, after passing the narrow gap between the Coiron and the western-most Alpine chains (again see Fig. 35), observes a different landscape, for before reaching Avignon above the Rhône delta, he sees extensive olive-yards as well as vineyards and orchards of fruit trees, and as a striking contrast thorny shrubs with bare, stony soil visible between them. The south-eastern corner of France belongs to a different major natural region of Europe.

Yet as it is on the northern margin of the Mediterranean, its climatic conditions differ somewhat from those farther south (refer to the figures for Marseilles on p. 26). In particular, the winter temperatures are lower than is common for places near the sea-level, and the annual minimum is exceptionally low. This is due to the cold "Mistral" which arises when depressions pass along the Mediterranean basin and draw in,

from the chilled Central Plateau, air which descends the Rh6ne valley in bitter blasts. As a consequence, the growing of oranges and lemons is restricted to such parts as the extreme east of the French coast away from the Rh6ne valley.

The varying conditions of climate, relief, soils and opportunities for trade lead to considerable differences in the areas which together constitute the Mediterranean sub-region of France.

Constituent Areas: (i) *Bas Languedoc*.—The western part of Mediterranean France is formed mainly of the lower part of the old province of Languedoc ; it comprises three tracts : (a) Inland is a hilly area largely formed of limestones, on which there are plantations of vines, olive and mulberry trees, though large parts are poor garrigues used only for winter pasturing of sheep sent up to the Central Plateau in summer, (b) Nearer the sea are alluvial plains devoted, to an unusual extent, to vineyards yielding almost half the total amount of wine of France, though its value is not proportionally so great. Such a " one-crop " form of production has its dangers, and this region has suffered greatly from the phylloxera disease of the vines, and also from periods of low prices for wine, (c) The coast is being straightened by material washed from the Rhone delta by the counter-clockwise currents of the Mediterranean Sea ; dunes enclose brackish lagoons, from the waters of which salt is obtained by evaporation. The old port of Aigues Mortes at the edge of the delta is now inland and Cette (Sete), farther west, has an artificial harbour.

(ii) *The Rhone Valley and Delta*.—The formation of deltas is facilitated by the almost tideless nature of the Mediterranean Sea, and the delta of the Rh6ne occupies a considerable area. Near Aries, the river divides into two branches ; between these is the Camargue, the " wet delta," in which drainage is now making pasturage possible, while to the east is the Crau, the " dry delta/" formed largely of pebbly deposits brought down from the Alps by the Durance. Here irrigation is necessary, and with protection from the Mistral by wind-breaks, there are winter pastures for sheep from the Alps, and some cultivation.

The greatest significance of the lower Rh6ne valley is in affording an easy route connecting northern Europe with the Mediterranean Lands and, behind them, the Far East. This

route has been important for more than 2,000 years ; the towns of the Rh6ne valley, such as Avignon, Ntmes and Aries, still have in their buildings the evidence of Roman occupation : fortresses, arenas, temples and aqueducts, and the great commercial city Marseilles is of even earlier origin, for it began as the site of a Greek colony.

Marseilles is not actually in the Rh6ne valley, but is placed by a bay at the side of the delta which is safe from the silting action of the currents, and the harbour has the advantage of deep water. The bay is open, however, and artificial shelter has had to be provided, while to cope with the traffic a great canal has been tunnelled through the ridge north of the bay into a lagoon adjoining the delta. The Rhdne itself is not navigable, and only a small canal leads by the side of the river to Aries.

Traffic has therefore to go northward from Marseilles by rail, and the greatest amount of the imports is destined to serve the needs of the people and the industries of the Rh6ne valley itself; most of the trade of Marseilles, indeed, is between south-eastern France and the French Colonial possessions in North Africa and southern Asia. From north-western Europe, however, there is much passenger traffic, which takes advantage of the quick railway route to the Mediterranean as compared with the long sea journey *via* the Bay of Biscay and the Strait of Gibraltar.

Round the port of Marseilles industries have developed, particularly those requiring imported material, such as the making of soap, margarine and chemicals, and the refining of sugar ; the population of Marseilles is now over three-quarters of a million, and it is therefore the second city of France.

(iii) *Basse Provence*.—The old French province, Provence, extended from the Alps down to the rocky coast, and that part which is within Mediterranean France is largely upland. In this easterly part of Mediterranean France, the Alps to the north give more protection from cold winds, and the pleasant, indented coast has proved attractive to visitors seeking warmth and sunshine ; this is the beginning of the Riviera coast, which is further dealt with in the chapter on the Italian lands. The same favourable climatic situation which has led to the growth of large and fashionable resorts such as Nice and Cannes has also favoured a large-scale cultivation of flowers for export and for the making of scent.

In an almost land-locked bay has been established the great arsenal and naval port of Toulon, by which shipbuilding yards have been constructed; its situation on the direct routes between France and her overseas possessions makes it, politically and strategically, an important feature of Mediterranean France.

QUESTIONS ON CHAPTERS VIII AND IX

1. Consider on broad lines the similarities and dissimilarities between the lowlands of South-eastern England and those of North-eastern France.

2. Discuss to what extent the geological structure, apart from other geographical factors, has determined the characteristics of the North French Lowland.

3. Give a reasoned account of the distribution of the main occupations of the people in North-eastern France (including the part in the North Sea Lowlands region).

4. Examine the situations of the larger towns of North-eastern France, and classify these situations in relation to the physical geography.

5. Examine (*a*) the common characteristics, and (*b*) the internal differences, of the Breton Peninsula.

6. "The Breton Peninsula of France resembles the Devonian Peninsula of England." How far is this true?

7. Contrast the lowlands of South-western France with those of North-eastern France, and account for the differences.

8. Write systematic notes on the wheat and wine production of France.

9. State, and briefly describe, the differences in the landscape to be observed on a journey from the Saone valley near Dijon to the Mediterranean Sea.

10. Examine the statement: "The Central Plateau has little more than its elevated position in the heart of France as a common characteristic."

11. Write an essay on the ports of France.

12. Test the truth of the dictum that river basins are not natural units, by reference to the rivers of France.

CHAPTER X

THE CENTRAL UPLANDS

THE complexity of this part of Temperate Europe is due to the "Alpine" disturbances which, north of the Alps themselves, produced (1) the long, upraised belt of the Alpine Foreland; (2) the folded ridges of the Jura; (3) the upthrust Hercynian massifs of the Harz Mountains (marked "H"), the Rhine Plateau

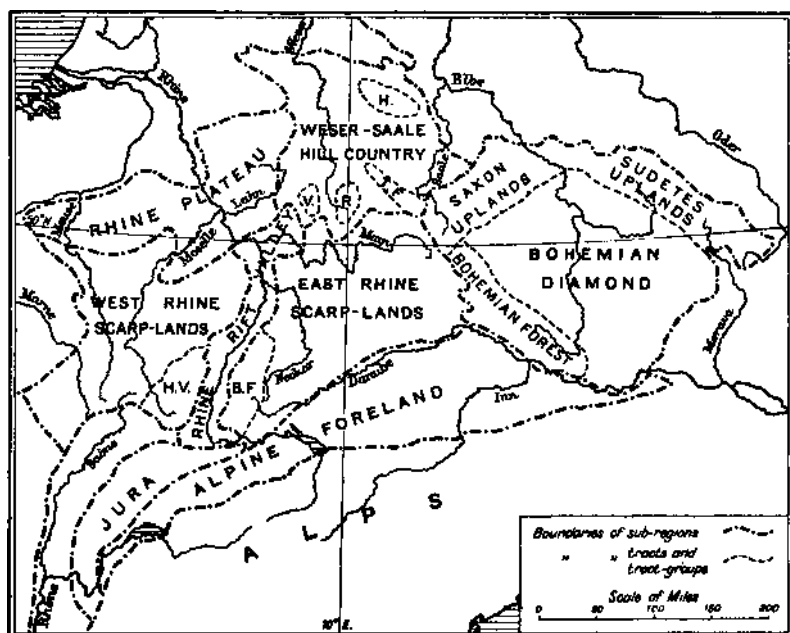


FIG. 42.—REGIONS OF THE CENTRAL UPLANDS OF EUROPE.

through which that river runs between Bingen and Bonn, the Thuringian Forest ("T.F."), the High Vosges, the Black Forest, and the Bohemian "Diamond" and its margins, the Bohemian Forest, the Saxon Uplands and the Sudetes Uplands; (4) the tilted areas of sedimentary strata between the Hercynian fragments, viz. the East Rhine Scarp-lands, the West Rhine Scarp-lands, and the Weser-Saale Hill-country; (5) the sub-

sided Rift-valley of the Rhine; (6) volcanic masses such as the Vogelsberg and the Rhon ("V" and "R").

These structural units, either singly or in a group, form the sub-regions which we will now consider in turn.

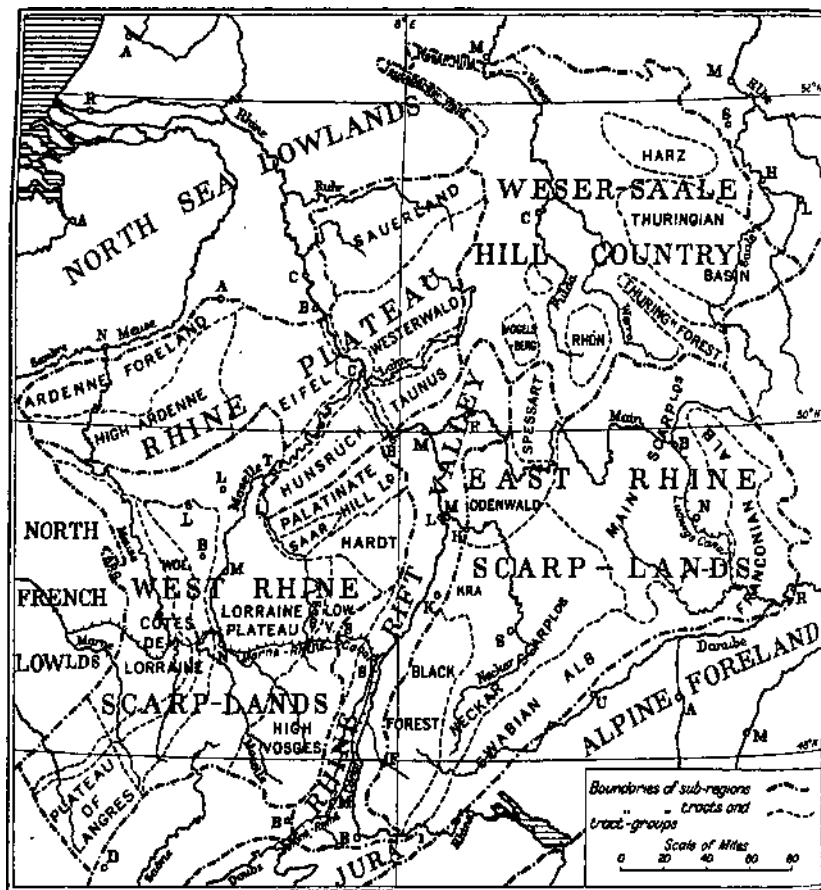


FIG. 43.—REGIONS OF THE RHINE UPLANDS.

Note.—Ludwig's canal is now replaced by the Rhine-Main-Danube canal.

The Rhine Plateau.—This massif is mainly composed of resistant slates, sandstones and quartzites, and in the north of less-resistant limestones, of Palaeozoic Age (refer to Figs. 48 and 44). It has been more or less faulted on all sides, and upraised most markedly on the south-eastern side, where its

gentle meanders, and its tributaries, the Moselle (named Mosel in Germany) on the west and the Lahn on the east, had similar courses. All these streams have continued to cut their valleys into the massif, and their meanders have become incised into the upland. Hence they have very winding courses, and the steep sides of the narrow valleys face in turn towards almost all directions as they overlook the meanders of the rivers.

North of the Moselle and Lahn valleys, the uplands are partly formed of volcanic rock in the Eifel and the Westerwald areas. In the Eifel, a mass of basalt rises to well over 2,000 feet, and there are small volcanic cones and lakes giving variety to scenery which attracts tourists.

Because of its elevation the Rhine Plateau has a markedly different climate from that of the adjoining North Sea Lowlands. The temperatures are lower, the precipitation is greater and the winds are frequently stronger; consequently the winters are severe, heavy snowstorms occur and a snow cover which is commonly some feet deep may last for weeks. The melted snows and rain cannot drain through the impermeable rock of the plateau, and the surface is often wet; many of the wide hollows are marshy or peat bogs. Large areas of the upland and the ridges bear deciduous forests or plantations of conifers, though lower parts of the plateau have been turned into cattle pastures, and some of the land has been ploughed for the hardier cereals, oats and rye, or dug for potatoes, while on the limestone areas of the northern margin even some wheat and beet are cultivated. On the whole, however, the region has not proved remunerative to farming.

In some parts of the north, industries were long ago based upon the occurrence of ores, mainly of iron, worked by fuel from the forests and water from the rapid streams near the edge of the upland. To some extent these industries have survived, importing coal from the adjoining coalfields of Germany and Belgium, but as a whole the plateau areas support few people.

In the deeply cut valleys of the Rhine, Mosel and Lahn, however, conditions are very different. The warmer and sheltered situation allows cultivated fields and rich meadows where the rivers have left fertile deposits beside their meanders, and there are orchards and vines on the slopes which face the sun. The Mosel valley is particularly renowned for the wine which is the main product of that region, and in this and in the

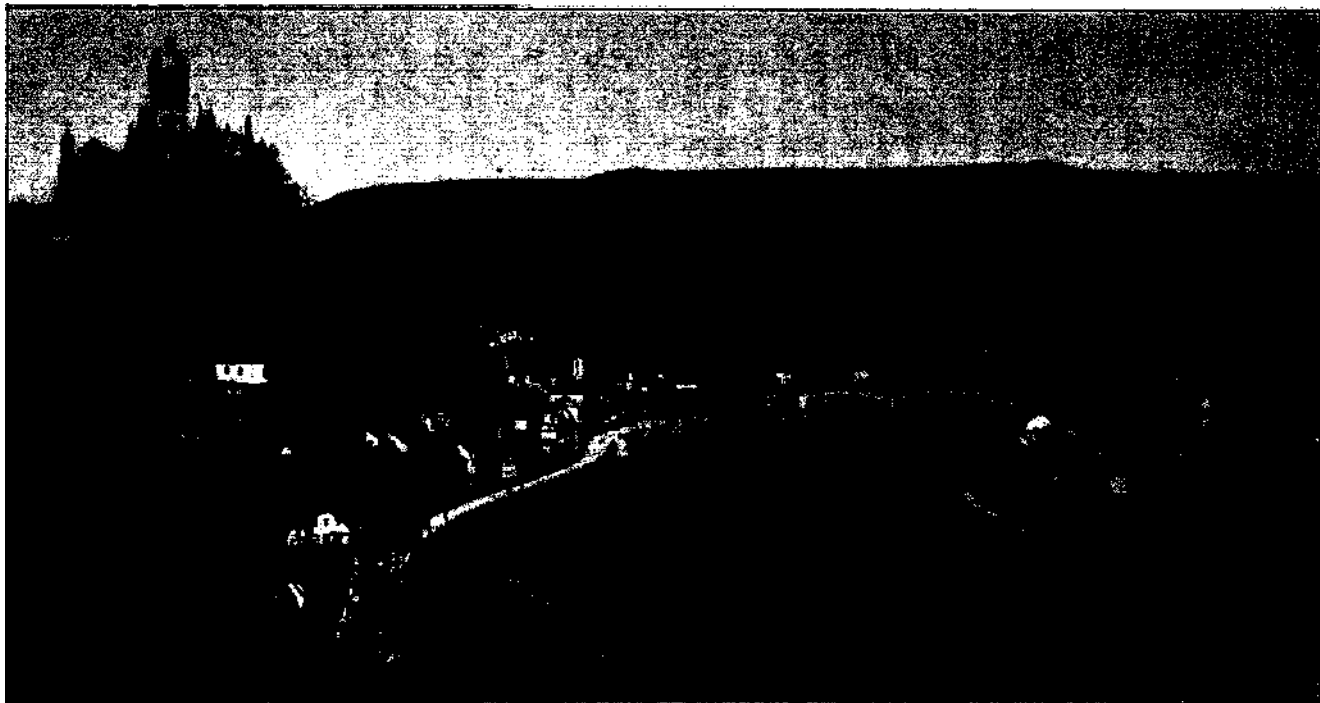


FIG. 45.—VIEW ON THE MOSEL.

German State Railway.

Note.—The flat top of the Rhine plateau is clearly shown ; on the outer side of the incised meander of the Mosel there is practically no lowland, and the road has had to be built up at the river's edge, but on the inner side a small flood-plain has been formed. The castle of Oochem crowns the height remaining between two side valleys; where the larger one (beyond the castle) enters the main valley the town of Cochem has grown up, and the Mosel has been bridged. The view is taken approximately from the south, and the warm south-facing slopes appear light where they have been cleared for vineyards; the darker patches are the woods still remaining on the upper levels, and even on the lower north-facing slopes, as shown on the extreme right. Field cultivation appears only on the small flood-plain area.

other larger valleys **are a** number of small towns depending upon the local trade which uses both the rivers and the roads along their banks.

The Rhine valley is of the greatest importance as a route for commerce, for with this exception the plateau bars the way between north and south. River steamers, railways and motor-cars carry a great deal of traffic through the valley, but there is no large river port in the region ; Coblenz, in a widening of the valley and at the confluence of the Moselle and Rhine, is an ancient town with a famous cathedral, but it has not grown into a great modern commercial city.

The Rhine Rift-valley.—An almost complete contrast to the Rhine Plateau is shown in this down-faulted trough, for it has a drier and sunnier climate, wide areas of fertile land and large cities on or near the river banks. Within the valley itself, differences are mainly due to the various strata which have been relatively recently deposited in the great hollow or on its margins, and we may note four types of constituent areas, working back in our description from those most recently formed to those of earlier origin.

The Flood-plain of the Rhine.—This is shown in the map in Fig. 46 and the section in Fig. 47. It is situated immediately by the river, and would still be subject to inundation were it not for the embanking which, together with the straightening of the stream, has been carried out during the past century.

(i) Above Basel (Bale) the river is too rapid for navigation (though improvements are projected), and has cut a relatively deep and narrow valley. Basel is at the head of navigation on the Rhine and has some trade on that account, but its greatest importance is due to its position at a gap between the upland areas where routes from the north lead towards passes across the Alps. Because of its nodal position it has become one of the main entries to Switzerland, and with a population of about 200,000 people it is the second city of that country.

(ii) Below Basel the river enters the broad valley, and as far as the neighbourhood of Karlsruhe the stream deposits more material than it removes. Enormous amounts of gravels and sands are brought down from the Alps, particularly during great summer floods, and near the stream the water-level is always near the surface, which is therefore frequently wet; even after improvements there remain extensive "moors" and alder-

woods, and the chief use of the flood-plain is for pasture. Strasbourg, a few miles up the 111 tributary, is a centre of inland waterways, for most of the lower Rhine traffic stops here, and between the 111 and the Rhine the Rh6ne-Rhine Canal goes up the valley to cross the watershed west of Basel to southern France ; another waterway, the Marne-Rhine Canal, leaves the 111 at Strasbourg to cross the West Rhine Scarp-lands into northern France.

(iii) North of Karlsruhe the Rhine meanders through a flood-plain which is drier and more capable of utilization than farther up-stream. Moreover, the more regular regime and the greater depth of the river allow navigation of larger boats, traffic is greater and there are busier river-ports. The greatest of these is Mannheim, at the head of navigation for large barges, and here and at Ludwigshaven, its twin-port across the river, are considerable industries; together these cities have a population of nearly 400,000 people.

Where the Rhine turns under the edge of the Taunus, it receives its tributary the Main, and at the junction is Mainz, another river-port and industrial centre.

The Rhine Terrace-lands.—On either side of the flood-plain rise the terrace-lands, formed of older deposits of sands and gravels now situated above 20 feet above the river. They are dry and generally infertile, and in parts there are still great pine-woods. At some points, however, cities have grown up: Mulhouse, in the extreme south where the 111 and the Rh6ne-Rhine Canal enter this region, has important textile industries, and so has Colmar, close to the 111 farther down its course ; between the two towns mines are driven through the surface to reach potash and other salts in the deeper strata of the valley, and the chemicals obtained from these salts aid chemical and dye works connected with the textile industries of the towns.

On the right-bank terrace is Karlsruhe, where a mediaeval castle, guarding routes along and across the valley, aided the growth of a town which has now become a modern commercial and industrial city.

The Foothills and Marginal Plateaus.—Behind these past and present river deposits rise areas formed of sedimentary rock of Tertiary or even older date. The faulting which produced the rift was complicated, and there are large areas which have been let down half-way, as it were, and lie between the lowest parts

EUROPE: THE REGIONS

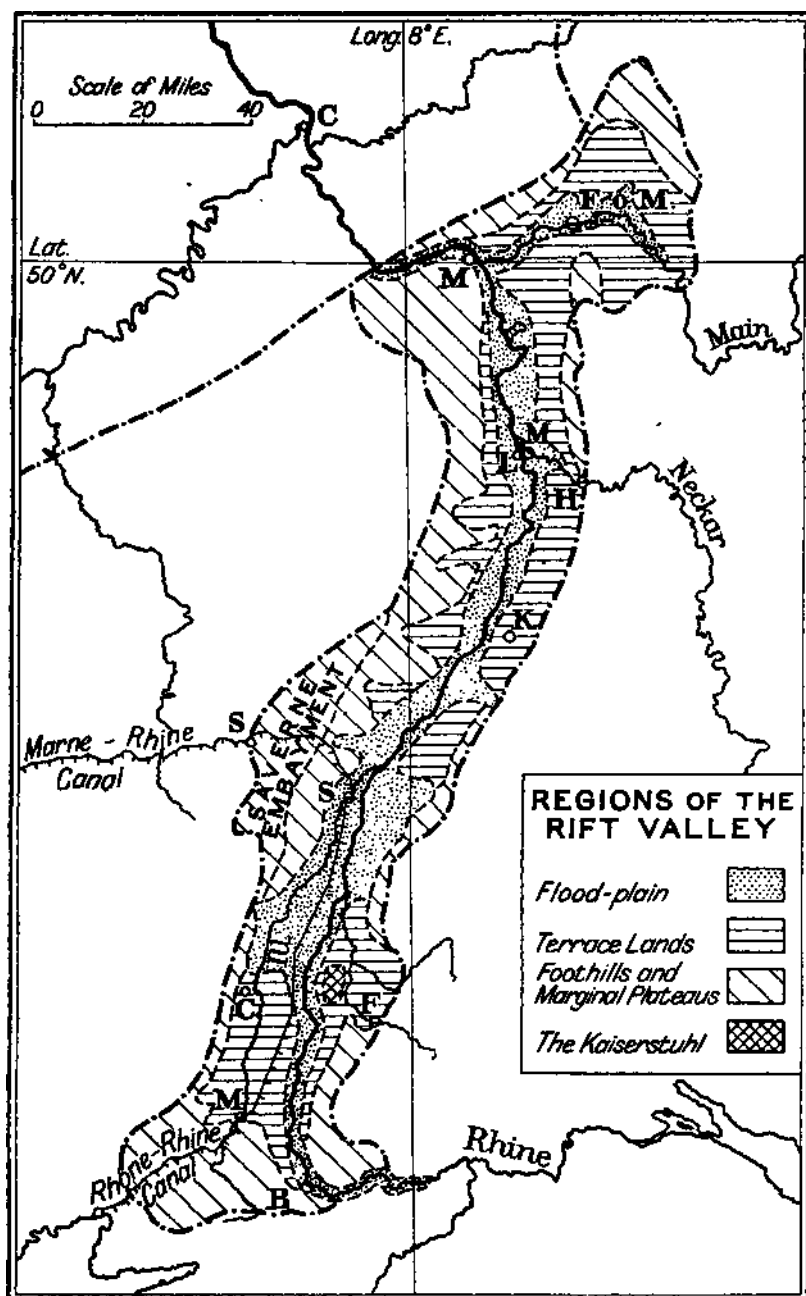


FIG. 46.—REGIONS OF THE RHINE RIFT-VALLEY.

of the valley and the scarp-lands beyond it. Such an area is the Saverne embayment, west of Strasbourg; it is named after a small town in a side valley through which passes the Marne-Rhine Canal, as well as railway and road.

The Rift-valley in general has a relatively low rainfall and much sunshine, and because of its southerly latitude as well as its low and sheltered position it is the warmest part of central Europe; its summers may indeed be called hot. Moreover, almost all the foothills and marginal plateau areas were covered with a mantle of loess in the post-glacial period.

Consequently these marginal areas of the Rift-valley are exceptionally fertile. They yield wheat and maize; fruits, including peaches, apricots and even almonds; industrial crops of chicory, beet and tobacco; in addition, there are vineyards

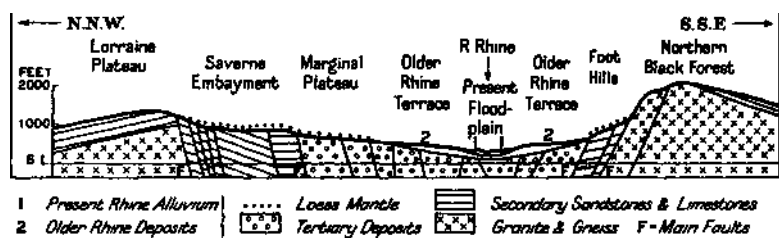


FIG. 47.—SECTION THROUGH THE RHINE RIFT-VALLEY.

which make this the most important wine-producing region of central Europe.

Hence there is a considerable population even in the rural districts, and there are also a number of important cities, particularly where routes enter the valley, e.g. Freiburg and Heidelberg; Frankfurt-on-Main is at an important nodal position at the north-eastern corner of the Rift-valley where traffic from north to south crosses the Main; it is the chief commercial, financial and industrial centre in the south-west part of Germany.

The Kaiserstuhl.—Overlooking the Rhine near Freiburg stands a small, fairly flat-topped plateau rising about 1,000 feet; it is the remains of a great volcanic mass of Tertiary date, called the Kaiserstuhl—the Emperor's Chair. The lava has weathered to fertile soil, and even the steep slopes are terraced for vines.

Thus the Rhine Rift-valley, as shown in Fig. 21, is a lowland sub-region within the Central Uplands.

East Rhine Scarp-lands.—It appears that as a result of the Alpine thrust towards the north-west the whole area now comprising the Rhine Rift-valley and its bordering East and West Scarp-lands was bent up into a dome-like form, the highest part being over the present site of the Rift, and the strata dipping down on either side.

The central strip of the dome foundered and formed the great valley, but the bordering uplands remained ; their tilted strata on either side are therefore of similar structure and dip away from the Rift in each case. The section in Fig. 48 shows this arrangement, and the broken lines suggest how the layers once continued to join over the central area. As the dome-like uplift was highest over the southern part of the Rift-valley, the bordering scarp-lands are here highest, and here all the sedimentary strata have been worn away, leaving granites and gneiss to form the uplands of the Black Forest and the Vosges Mountains. Farther to the east and west respectively the sandstones and limestones remain, but have been worn into scarp-lands whose steeper sides look inward while the more gentle slopes dip outwards.

The two wings of this formation differ, however, in several respects, and we will first describe the East Rhine Scarp-lands.

The Black Forest—In addition to the main eastward tilt of the strata of the scarp-lands, there has been a downward warping north of the Black Forest, and consequently the granites and gneiss of the highest part of that area dip down beneath a cover of Bunter sandstone which forms the surface of the lower and northern part of the Black Forest.

The granitic masses in the south have weathered into rounded heights, such as the Feldberg, which reaches nearly five thousand feet. The rainfall is, of course, considerable, and as the tree-line is at about 4,000 feet, the highest parts tend to be moors, heaths or rough grazing-grounds ; cattle are sent up to them when the snow melts in May and remain till about October, and the chief product from these summer pastures is cheese.

Lower than these highest parts in the south-west, and covering much of the sandstone area of the rest of the region, are great forests of spruce and fir, to the distant appearance of which the name Black Forest is due. Although in the valleys there

is some cultivation of oats, rye and potatoes, and there has been some plantation of cherry and edible chestnut trees, the main resource of the Black Forest is the timber, either exported as such or used as the material for the carved products of domestic industry or as fuel for glass-making. In summer many tourists visit the region, but on the whole it is very scantily populated.

Odenwald and Spessart—North of the Black Forest, the Bunter sandstone dips down below the limestones and marls which form the surface of the scarp-lands east of Karlsruhe, but it rises again still farther north and north-east; here, because of its relatively greater resistance and granitic outcrops, it forms the uplands of the Odenwald and Spessart. These are rather like the Black Forest on a small scale, but they do not rise above the tree-line, the forest-cover consists mainly of oak and beech and there are wider areas of cultivation, although most of the

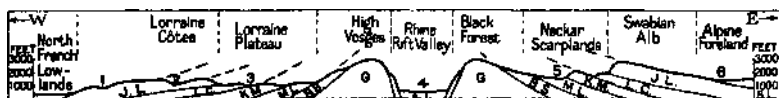


FIG. 48.—SECTION THROUGH RHINE SCARP-LANDS.

Note.—The section is drawn from west to east, south of the latitude of Strasbourg, to Tülm on the Danube. The figures 1, 2, 3, 4, 5 and 6, indicate the valleys of the Marne, Meuse, Mosel, Rhine, Neckar and Danube. The strata are indicated by the following initials: A.T. = Alluvium and Tertiary deposits in the Rhine valley; J.L. = Jurassic Limestone with interbedded clays; L.O. = Lias Olays with some limestones, etc.; K.M. = Keuper Marls and Sands; M.L. = Muschelkalk Limestone; B.S. = Bunter Sandstones; G. = Granite, Gneiss, etc., of the Vosges and Black Forest.

country is mainly dependent upon forestry. They are essentially one region, though separated by the valley of the Main, which cuts right across the upland, while the Neckar similarly cuts through the southern part of the Odenwald,

The Neckar-Main Scarp-lands.—The upper courses of these rivers drain country which they have etched out of the layers of Muschelkalk limestone, Keuper sandstones and marls, and Lias clays, marls and weak limestones. In general, the marls and limestones have been worn down to plateaus at an elevation of about 1,000 feet, above which the more resistant sandstones stand with scarps rising another 500 or 700 feet. The climate varies according to altitude, and the lower lands grow wheat and fruit, even the vine in the valleys; in the inner part of the Main basin the best hops in the world are claimed to grow. The higher sandstone scarp-lands, however, are less fertile; they bear extensive woodlands with both deciduous and coniferous trees.

The Swabian and Franconian Alb.—The easternmost part of the scarp-lands is formed by the massive strata of resistant Jurassic limestone which overlook the Neckar-Main area from heights reaching over 8,000 feet above sea-level in the western or Swabian part and rather less in the eastern or Franconian part. The word "Alb" has the same meaning as "Alp," i.e. summer pasture, and the higher parts of this region, bare and bleak, still deserve the name, though where the region is lower towards the Danube farming is more remunerative. Yet as a whole this region is relatively unproductive, and the population is scanty.

In the north, the Franconian Alb is faulted down eastward, and between it and the Bohemian Massif is an extension of the Main region.

Routes and Cities.—The lower parts of the Neckar-Main Scarp-lands have a considerable population dependent upon agriculture, and there are several large cities on routes which lead through the region. One such line of communication cuts across the south-west portion from Karlsruhe in the Rift-valley, through the Kraichgau ("Kra." in Fig. 43), the hollow between the Black Forest and Odenwald, crosses the Neckar by Stuttgart and continues towards Ulm, the head of navigation on the Danube; Stuttgart is now a city of over 400,000 inhabitants.

The other important route is in the east of the region: it comes from northern Germany by the head-streams of the Weser to the upper course of the Main, which it crosses at Bamberg. Then it proceeds southwards underneath the heights of the Franconian Alb as far as Nurnberg (Nuremberg), and thence three routes diverge. One goes south-east by a small valley through the escarpment to the Danube above Regensburg, and by this route the small "Ludwig's Canal" joined the Main system to the Danubian system of waterways; its course is now followed by the new and important Rhine-Main-Danube Canal, which allows through traffic by water across the whole of Germany from the north-west to the south-east.

Two other routes lead more directly southward from Nuremberg through valleys of the Alb, to cross the Danube to Munich and Augsburg respectively; thence they enter the Alpine region, make use of the Brenner Pass, and so reach Venice and the Mediterranean. From the time when traffic used these routes

to bring spices, silks and precious stones and metals from the East, the cities on these roads have been famous ; in Nuremberg is found some of the finest architecture of the Middle Ages, together with modern business houses and factories, for it is now an industrial centre with 400,000 people.

The West Rhine Scarp-lands.—This sub-region differs from its eastern counterpart in two important respects. In the first place, it is farther from the Alps, and consequently the Jurassic limestone strata have not been uplifted to any great height; indeed, they dip westward into the great structural basin centred upon Paris.

In the second place, the build is complicated where the region impinges upon the southern tip of the Rhine Plateau ; here, overlooked by the Hunsrück, is an area which makes a transition between the plateau and the scarp-lands. Like the plateau, it is formed by a mass of ancient and relatively resistant rock, but it has not been uplifted to the same extent, and its dissection has resulted in a hilly rather than a high plateau type of country ; it may be called the *Palatinate Hill-land and the Saar Basin*. This region is economically important because in its south-western part, the Saar Basin, are preserved Coal Measures which have given rise to the Saar coalfield. With the aid of this coal, iron ores from the Lorraine deposits farther west are worked and an iron and steel industry has developed.

The remaining parts of the West Rhine Scarp-lands show a broad resemblance to those east of the Rift-valley.

The Vosges Mountains are similar to the Black Forest, particularly in the higher portions, but the east-facing slopes, in Alsace, are relatively dry and sunny and have more cultivation ; also in the lower parts of the valleys, both on this eastern Alsatian side and also on the western, or Lorraine side, are villages and small towns where a small, old-established woollen and linen industry has persisted and led to a more important cotton industry, aided by the water-power of the rapid streams.

North of the mountainous *High Vosges* is the hollow of the *Low Vosges*, still partly forested, while farther north and north-east rises the *Hardt Upland* corresponding to the Odenwald, though without granitic outcrops.

The *Lorraine Plateau* is situated west of the Vosges, the Hardt and the Saar Basin. Here are the same rocks as in the Neckar-Main Scarp-lands, with Muschelkalk giving good soils for

cereal growing, Keuper marls having rich pastures and Lias clays more difficult to work.

These strata in France, however, are at a generally lower elevation than those in Germany, and have not been worn into such marked relief, though the Lias clays have been cut into a rather deep valley belt by the Moselle and its tributaries, the rivers which drain nearly all the Lorraine Plateau.

This valley belt, cut into the Lias clay by the Moselle, lies under the scarp of the Jurassic limestone region which is situated immediately to the west (see Fig. 44), and at the junction of the Lias and Jurassic strata are rocks in which occur iron ore known as minette. The minette ore is mined around the town of Nancy, in and near the Moselle valley, and iron and steel works have grown up in this neighbourhood.

Farther north, on the edge of the Moselle valley, is the fortress of Metz, important because Lorraine has for long been debatable ground between France and Germany.

The Jurassic limestone region which is situated to the west is perhaps most conveniently termed the *Cotes de Lorraine*, for in the east where it is highest the edges of its scarp overlooking the Moselle are known as the *Cotes de Moselle*, and farther west it is again deeply cut by the Meuse, and the resultant hill-slopes are called the *Cotes de Meuse*; overlooking this Meuse valley is the fortress of Verdun. In the south part of the limestone belt the drainage is not to the Rhine, but to the Seine, whose tributaries, especially the Marne, have also cut deep valleys.

The rainfall is fairly heavy on the higher parts of the limestone plateau, which, like the Ardenne, is on the side of the Central Uplands facing the Atlantic winds. The highest areas are much wooded, while the rest of the plateau is rather poor agricultural-country.

The whole region is not an unbroken plateau, for between the upper and lower limestones are clays which outcrop in a belt running longitudinally; this clay-belt has been worn to a relative hollow, and part of it, known as the Woevre (Woe. in Fig. 43), is naturally marshy and even yet has small lakes.

The minette iron ore which is situated at the base of the Jurassic strata is reached in two districts by mining through the rocks which form the edge of the escarpment; one is in the "Briey basin," north-west of Metz, whence the ore is sent

in part to Germany for working, and the other is in the " Longwy basin " at the northern part of the scarp. Here the Jurassic escarpment faces north and almost coincides with the boundary between France on the one side and Luxembourg and Belgium on the other. The iron ore is utilized in all three countries (see Fig. 79 in Chapter XIX); it is of most value to France and Luxembourg and forms an important part of the basis of the economic life of the latter small State.

The western margin of the limestone belt rises fairly definitely from the clays of the North French Lowland which succeeds it to the west, but in one part there is, as it were, a bastion of uplands projecting from the main area. This is the Argonne Forest region, where an admixture of sand with the clay has enabled the stratum to resist erosion, and wooded heights of about 1,000 feet mark the sharpest contrast between the Central Uplands and the North French Lowland.

South of the Marne the limestone belt rises to an area whose escarpment forms the high Plateau of Langres ; this links the Central Uplands of Europe to the Central Plateau of France.

The Weser-Saale Hill Country.—Most of this area is drained by the upper Weser and its tributaries, and much of the rest by the Saale tributary of the Elbe ; for this reason, and because it is very uneven in its relief, a convenient name is the Weser-Saale Hill Country.

The Harz.—One of the most striking features as seen on a relief map is the upstanding mass of the Harz Mountains. This is a typical horst, markedly fault-edged on the north-west, south-west and north-east sides, though its surface descends more gradually towards the south-east. The " Upper Harz " in the north-west reaches over 3,500 feet and is almost completely covered with dark masses of spruce forest, but the " Lower Harz " in the south-east has deciduous woods and also many clearings for agriculture and small settlements. A little mining of copper is almost the only survival of past varied and important mineral industries.

In the *Harz Foreland*, to the north-east and south-east of the massif, potash salts are obtained, which aid chemical works such as those at Stassfurt situated in the neighbouring lowlands near the Elbe ; also, just within the upland region south of Brunswick, there are deposits of high-grade iron ore which have recently been utilized.

The Thuringian Forest.—Very similar to the Harz is the Thuringian Forest; here the main faults which bound it run in a north-west to south-east direction and give it a long and relatively narrow shape with a fairly flat top, reaching over **3,000** feet.

The Weser Hills and Teutoburger Wald.—Almost the same general direction is shown by the two lines of hill country which project north-westward far into the North Sea Lowlands. They are formed of sedimentary rocks of Secondary Age, folded and faulted, but only to a moderate elevation, and the "Wald" or "Forest" has mostly given place to farming.

The Rhon and Vogelsberg.—In the south of the Weser Hill Country rise two great volcanic masses, the Rhon and the Vogelsberg; since they reach elevations of about 3,000 feet, their higher parts are moorland or forest. Other wooded volcanic heights lie on either side of the Fulda tributary of the Weser.

The Fulda Valley offers a useful means of communication from the Rhine Rift-valley to the North German Plain, and this relatively low and fertile country is rather like that of the valleys of the Main and Neckar.

The Thuringian Basin.—Farther east, between the Harz and the Thuringian Forest, is an important area, drained by the Saale. It is formed of the same strata as the Rhine Scarp-lands, bent downward into a syncline forming an oval-shaped basin between the surrounding heights. The outcropping strata have been etched out by the tributaries of the Saale to form a series of low scarps, and the basin as a whole resembles the Neckar-Main Scarp-lands on a smaller scale; it is a well-developed region of productive agriculture.

The Bohemian Massif.—The area drained mainly by the upper Elbe river system may be thought of as largely formed of ancient rock, including granite, gneiss and schists, faulted in two main directions: south-east to north-west, and south-west to north-east (see Fig. 50). Along the faults, blocks have been raised or lowered to produce four main regions:

(i) A central area, sometimes known as the "Bohemian Diamond," of moderate elevation on its south-east side, but lowered towards the north; here it is bounded by the uplifted edges of (ii) the Sudetes Uplands on the north-east, and (iii) the Saxon Uplands on the north-west, while another faulted and

raised area, (iv) the Bohemian and Bavarian Forest Uplands, is the boundary on the south-west.¹

The Bohemian Diamond.—The southern part of this central region is a plateau of resistant rock ; undulating country rises to rounded heights, where it forms the water-parting (shown by a dotted line on the regional map) between the Elbe (known in Czechoslovakia as the Labe), which drains Bohemia, and the Morava, which flows southward to the Danube and drains Moravia.

Most of this Bohemian-Moravian Plateau area is drained by the Vltava tributary of the Labe ; it has generally rather poor soils and its agriculture is not very productive. The main development is in the neighbourhood of the River Berounka, which enters the Vltava just above Prague (Praha), the capital of Czechoslovakia. Here the folding of the carboniferous strata has preserved Coal Measures which are mined in several places from near Pilsen (Plzen) to near Prague, and iron and graphite are also obtained in the neighbourhood. Aided by these mineral resources, industries have grown up : at Pilsen iron and steel goods, glass and pottery are produced, and beer is brewed, and at Prague the range of productions includes these commodities, besides chemicals and various textiles.

Prague is also an important trading and financial city ; situated at the head of navigation on the Elbe-Vltava river system, it was the chief market and the seat of Government of the old Kingdom of Bohemia, and it has become the capital of the modern State of Czechoslovakia, and now has nearly a million inhabitants.

Although Prague is almost in the centre of Bohemia, it is (like many cities) at the meeting of two types of country, for here the Vltava descends from the plateau to the North Bohemian Trough. In this northern corner of the Diamond, the ancient rocks dip down and are covered by sedimentary or alluvial deposits, save where there have been out-pourings of volcanic material under the edges of the great faults which separate the Trough from the Saxon and Sudetes Uplands.

Consequently, apart from such volcanic heights, the North

¹ In Germany, the term " Sudetenlander," i.e. Sudetes-lands, has been applied to a much wider area than the Sudetes Uplands ; indeed, the whole of Bohemia, Moravia and Silesia has been included in the term, and the German-speaking people who now live in Bohemia and Moravia are still commonly referred to as Sudetendeutsch, i.e. Sudeten Germans.

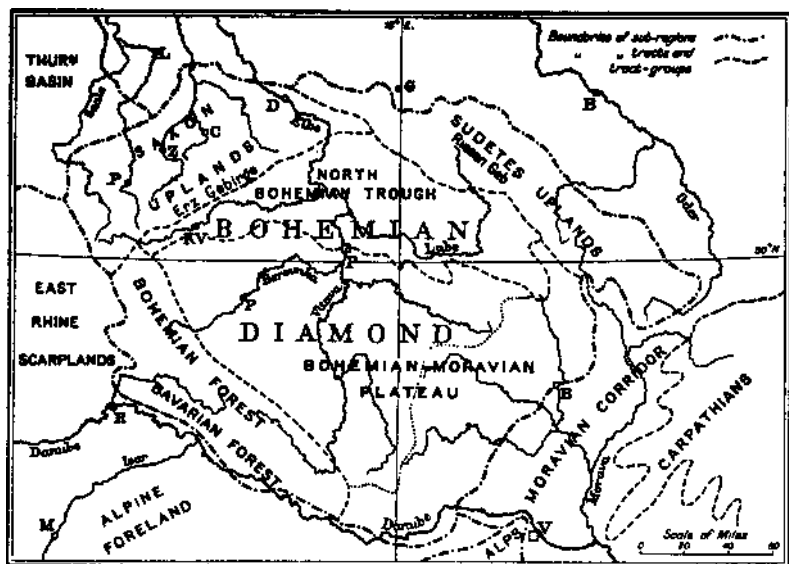


FIG. 49.—REGIONS OF THE BOHEMIAN MASSIF.

Bohemian Trough is lower and warmer than the Bohemian Plateau, its rocks have weathered to fertile soils, and the valleys of the Labe and Eger (or Ohre), which drain it on east and west respectively, are fertile and well populated; beet production and sugar refining are considerable in the Labe area, and fruit and vine growing noteworthy in the Eger valley.

The faulting of the north-western edge has resulted in mineral springs around which have grown up health resorts, such as Karlsbad. Deposits of brown coal or lignite are worked in the Eger valley, and these have aided the carrying on of varied forms of industry, while at the base of the Sudetes Uplands there is cotton manufacturing. Hence there are a number of towns, and because of its agriculture, mining, industries and trade, the North Bohemian Trough is a densely populated region.

The Bohemian and Bavarian Forest Uplands.—The mass of gneiss, granite and schist which forms the south-western part of the Massif has been dislocated along faults, running generally from south-east to north-west. In its south-eastern part, however, it is warped rather than broken, and rises more gradually from the Bohemian Plateau, forming rounded heights of about 4,500 feet above sea-level. The higher parts are almost completely clothed with firs and other coniferous trees, but

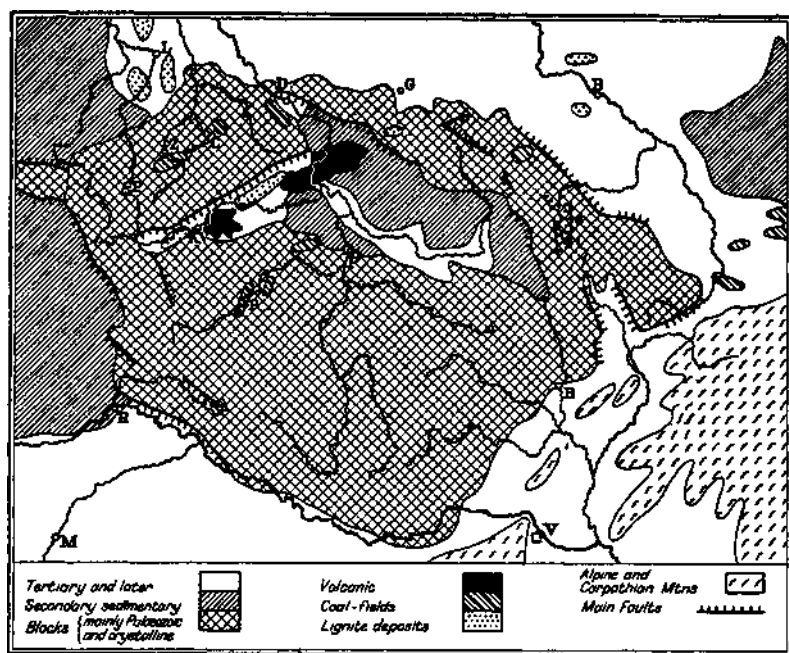


FIG. 50.—STRUCTURE OF THE BOHEMIAN MASSIF.

there are great moors and peat bogs in the broad hollows. A rift-valley separates the smaller Bavarian Forest from the greater Bohemian Forest, and there is thus a double, and almost uninhabited, barrier to communication between the Alpine Foreland and the Bohemian Diamond. In the north-west, the Bohemian Forest is less high, contains small areas of sedimentary rock, which offer more opportunity of settlement, and is more easily crossed.

The Sudetes Uplands.—These have broadly similar structure, relief and vegetation, but have been still more dislocated; consequently, in addition to high areas of crystalline rock, such as the Riesen Gebirge (Giant Mountains) which rise above the tree-line to over 5,000 feet, there are a number of rift-valleys and basins of lower elevation in which sedimentary strata have been preserved. These are farming areas, and also there are two districts which have fuel deposits: one is at the northern edge, south-west of Gorlitz, where lignite is found and utilized to produce power transmitted to the manufacturing districts of Saxony and to the northern plains; the other is the small



FIG. 51.—VIEW IN PRAGUE.

[Czechoslovak Legation,

Note.—The central building is the " Powder Tower," once part of the fortifications enclosing the city; with the growth of Prague, the tower has been surrounded by the modern buildings which form such a striking contrast.

Lower Silesian coalfield south-west of Breslau. In earlier times mineral ores were obtained in the Sudetes Uplands, and there are still small manufacturing districts in which textiles are now the chief products.

At its south-eastern end this upland region forms the most easterly bastion of the Central Uplands ; beyond this the ancient rocks dip below younger deposits in the Moravian corridor.

The Saxon Uplands.—At its north-western end the block of the Sudetes Uplands is separated from that of the Saxon Uplands by an area in which faulting has let down and preserved a mass of sandstone which projects north-westward from the North Bohemian Trough towards Dresden. This sandstone is easily eroded and has been cut into a series of cañon-like valleys by the Elbe and its tributaries. Communication between the Bohemian lands and Germany is carried on by the Elbe, and at the northern end of the gorge of the river has grown up Dresden, a great city of nearly three-quarters of a million people. It has also advantages in developing industries because of the mineral resources of the adjoining Saxon Uplands.

From the northern plain this massif rises gradually southward to the faulted edge which is called the Erz Gebirge (Ore Mountains) because of the occurrence of ores of silver, lead, copper and other minerals (refer back to the section in Fig. 4). These were once mined and led to a relatively close settlement of what was then a forested upland. Now the ores are in large part exhausted (though in a valley of the southern slope a recent development has been the working of radium-producing ores) and the forests which supplied timber for raw material and fuel have been destroyed. Other resources, however, have been utilized : the streams were harnessed first for direct power and later for obtaining electrical energy, and Coal Measures were found in basins extending along a belt of " Variscan " graining some distance up the slope ; consequently in the neighbourhood of this belt several large towns arose, including Plauen, Zwickau and Chemnitz. Little coal now remains in this Saxony coalfield, and the greater part of the electric power on which the industries mainly depend is derived from coal, lignite and water-power outside the area. Clearly, geographical inertia has played an important rôle here and enabled the early metal, wood and textile working to continue, and also transferred inertia has greatly widened the range of production. Moreover, beside

the large-scale manufacturing of the towns, smaller-scale industry has survived in villages and even in the houses of the workers. Consequently, except on the highest parts, the Saxon Uplands region is one of the most densely populated areas of Germany, and indeed of all Europe.

The Jura.—The southern end of the Rhine rift-valley is almost closed by the Jura Upland ; between this and the Black Forest is only the narrow valley of the Rhine above Basel, but between it and the Vosges Mountains is the wider Burgundian Gate, or Gap of Belfort, as it is called from the fortress-town which guards this entry between the Rhine-lands and the Rh6ne-Sa6ne basin.

It is from the Jura Upland that geologists gave to strata appearing here the name of "Jurassic," and geologists frequently illustrate their terms "anticline" and "syncline" from the marked foldings which the limestones have here experienced on

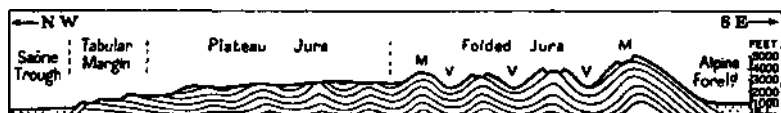


FIG. 52.—DIAGRAMMATIC SECTION THROUGH THE JURA UPLANDS.

the side nearer the Alps, and right across the region in the south (see Figs. 52 and 53). In this region of the "Folded Jura" the structural anticlines correspond with the mountain ridges and the synclines with the longitudinal valleys between them. In Fig. 52 a typical ridge, or "mont," is indicated by M, and a typical longitudinal valley or "val," by V.

The central part of the uplands, however, is of plateau form and is known as the "Plateau Jura." Here the foldings are less marked, and in the past the higher parts of the anticlines were worn down in a process of peneplanation. In the extreme north and north-west are the "Tabular Margins," where the strata have remained little disturbed except when they break down into the valleys of the Rhine and the Sa6ne. The map in Fig. 53 therefore shows three distinct constituent areas of the Jura sub-region.

The Folded Jura.—Considerable parts of the mountain ranges are over 8,000 feet above sea-level, the highest reaching more than 5,000 feet. With heavy precipitation, much of the region

is covered with forests of spruce and silver fir, though above 4,000 feet there are only summer pastures. Forestry and the keeping of cattle are therefore the most widely spread occupations, and Gruyere cheese is a well-known product. In the deep, longitudinal valleys are farming settlements, and for centuries domestic industries have been carried on during the winter. A development of these is the making of watches and clocks; the manufacture is now aided by electricity obtained from the water-power of the streams and is in part organized in large factories; consequently some of the villages have grown into towns, the largest of which is la Chaux-de-Fonds.

Beside these long and fairly wide valleys there are others, the "cluses," which have been worn transversely across the ridges. The cluses are typical narrow limestone cuttings, sometimes with almost vertical sides, and are important as giving a means by which communications are carried on across the great barrier of the Jura Mountains.

The Plateau Jura.—With a general elevation of 2,000-3,000 feet and a dry and infertile soil, this region resembles the Franconian and Swabian Alb; it is mainly a rather bleak pasture-land. In parts, however, glacial deposits from the Alpine ice-sheet give a welcome admixture to the limestone, and woods and the cultivation of barley and oats affords variety to an otherwise monotonous landscape and some additional resources to a scantily populated country.

The Tabular Margins.—This lower area is much more productive and relatively well populated. Indeed, the central part of the north-western margin is such a vine-growing district that it is known as the "Vignoble," while the northern area bordering on the Burgundian Gate and the Rhine valley has industrial development, especially of watch and clock making and of silk manufactures. Besançon, near the exit of the Doubs from this region, is the chief centre of the French horological industry.

The Alpine Foreland.—The Alpine Foreland extends as a unity for about 500 miles in front of the whole northern margin of the Alps, most of it at an elevation of between 1,000 and 2,500 feet above sea-level. Here, between the upraised limestone strata on the north-west, the block of the Bohemian Massif on the north-east and the Alps on the south is a relative hollow,

filled in to a great depth by Tertiary deposits, the "Mollasse," largely sandstones with marls and shales, formed of material worn away from the Alpine strata.

The surface deposits too are mainly of Alpine origin, but of much more recent date, for during the earlier part of the Ice Age, all except the extreme northern angle of the Foreland was covered by the ice and its deposits; the last advance of the ice-sheet, however, with its greater influence on present-day geography, affected only a relatively narrow area nearer to the Alpine margin (see the map in Fig. 53). In post-glacial times the Tertiary sediments of the unglaciated northern angle were largely covered with fertile loess.

The relatively high altitude of the Alpine Foreland is an unfavourable factor, and only the south-western half can be compared with the warmer parts of central Europe. At Geneva, temperatures are very similar to those in the Rhine rift-valley, but at Munich they are almost the same as those of the extreme north-east of Germany (see the table on p. 26). Rainfall is everywhere relatively heavy, reaching about 60 inches on the Alpine margin.

Taking into account climate, relief and surface conditions, we may observe the following constituent regions of the Alpine Foreland: (i) the warmer, south-western portion, which may be termed the *Rhine-Rhone Plateau*, since it is drained by those two rivers; (ii) the *Bavarian Foothills*, the area which was glaciated in the last advance of the ice and now drains to the Danube; (iii) the *Bavarian Plateau*, farther north and earlier glaciated; (iv) the *Northern Danubian Plains* in the angle of that river, and largely loess-covered.

The *Rhine-Rhone Plateau* is in French territory south-west of Lake Geneva, and is German north-east of Lake Constance, but its greater part constitutes the "Swiss Midland," as the Swiss geographers call this most populated and productive section of their country. Most of the area shows the characteristic morainic scenery with low hills, and its valleys have been fairly deeply cut by post-glacial streams. The hollows once occupied by the terminal tongues of glaciers which emerged from the valleys of the Rhine and Rhone are now filled with the waters of Lakes Constance and Geneva. In the long, narrow trough under the edge of the Jura an earlier glacial extension became filled partly by lakes, e.g. Lake Neuchatel, and partly by the

marshes of the River Aar, now largely reclaimed for farming. The variety in the land-forms and in the soil conditions gives rise to an alternation of fields, meadows and woods, all carefully utilized and supporting a considerable population ; the irrigated meadows give predominance to pastoral work, and on this Foreland Plateau (not in the Alpine valleys) is the main production of the Swiss dairying industry. In favourable situations, e.g. on the south-facing shores of Lakes Geneva and Neuchatel and in the river valleys, wheat and fruit, including the vine, are cultivated.

Moreover, commerce and a considerable amount of industrial work are carried on at nodal points where two sets of routes intersect. In one set are the transverse lines of communication which skirt or cross the Jura to reach the passes through the Alps ; across these run routes along the plateau from southern France to the Rhine and Danubian countries. Geneva is situated at an obvious " gateway " into Switzerland, and in this favourable position it has become the centre of the Swiss manufacture and trade in watches and clocks ; moreover, it has international importance as the seat of the League of Nations, with its many activities in which representatives of most of the nations of the world co-operate. Bern (Berne) in the centre of the Swiss Midland is conveniently placed as the capital; it is situated by the River Aar and on the direct railway route northward from the Simplon Pass. Zurich is at the end of Lake Zurich, which half-blocks the plateau, and through this city passes the route from the St. Gotthard Pass to the Rhine rift-valley; it is regarded as the " intellectual capital " of Switzerland, and has a technical college specially famous for its electrical engineering, for the Swiss have done much to advance science in connexion with the development of the water-power of their country. Both in Zurich and in the smaller towns and villages in the district, water-power is greatly used to carry on the manufacture of silk and other fabrics, chocolate and other foods-tuffs, as well as many forms of metal goods, including machinery.

The Bavarian Foothills.—The irregular relief of this region is due to its covering by the last extension of the Alpine ice-cap,

lakes in the sites of past glaciers, though moors and peat-bogs are common. There are rather poor growths of pine over considerable expanses of the region, the fairly heavy rainfall aids pastoral work rather than cultivation, and on the scanty resources only a small population can obtain a living. At its eastern extremity the region extends into Austria ; here Salzburg, the " salt burgh," situated where the Salzach leaves the Alps, is famous as the birthplace of Mozart, and its concerts attract visitors from many countries.

The Bavarian Plateau.—Not much better favoured than the foothills region is this plateau, which though mainly in the province of Bavaria extends into Wurttemberg on the west and Austria on the east. Here the older morainic material is largely covered by the out-wash gravels and sands from the last ice-sheet. The surface has been cut by glacial and post-glacial streams into a series of terraces, and in the valleys the Alpine-fed rivers bring summer floods and prevent the utilization of the land. On the higher parts there are wide beech forests, and others of pines, spruce and firs. Moors are now being reclaimed for pasture or crops for cattle, but there is little cereal cultivation, mainly of barley for brewing or of rye. Most of the settlements are small and widely scattered, except for two great cities on important routes referred to earlier in this chapter. Augsburg was a Roman settlement on the Lech ; it became great by the trade with Italy, and has still fine buildings dating from that time. Munich is situated where the route crossed the Isar between marsh to the north and forest to the south, and intersected an old " salt road " from Salzburg to Augsburg. Munich has been called the capital of south Germany, for in past centuries it was the seat of the rulers of Bavaria and is still the possessor of museums, picture galleries, opera houses and a great university. In recent times it has developed into the chief commercial city of this part of Europe, and with imported coal and with water-power from the Alps and the Isar numerous industries have grown up, brewing being particularly noted ; it has a population of about three-quarters of a million.

The Northern Danubian Plains.—Here on the almost horizontal, loess-covered sediments of sands and marls, good soils have developed, and the region is favoured by the warmer climate, due to its lower altitude. Cereals, particularly wheat, are an important production, and hops are largely grown ; everywhere

there is cattle-rearing, and the farming supports a moderately dense population.

It may be pointed out that the River Danube, which runs near the northern margin of this region, established its course before the present surface of the country had been developed, and consequently in some parts the river flows through the sediments of this plains region and has a wide and often marshy valley, while in other parts the river is in the adjoining regions of more resistant rocks and has cut a valley which is always narrower and is sometimes almost a gorge ; here, as so often, a river flows athwart the natural regions of the present stage of the earth's evolution.

QUESTIONS

1. Contrast, in as much detail as possible, the upland areas with the river valleys of the Rhine Plateau.

2. " The Rift-Valley of the Rhine is a geographical unit area." How can this statement be reconciled with the differing characteristics of the country comprised within this valley ?

3. Write an essay on the Rhine as an artery of economic life.

4. Describe the country traversed by the Marne-Rhine canal, and assess the value of this canal.

5. Estimate the economic importance of the areas comprising the " Bohemian Diamond " within the Bohemian Forest, Saxon and Sudetes Uplands.

6. Account for the fact that Saxony is one of the most densely populated areas of Europe.

7. Make a regional study of the Jura Uplands.

8. Write comparative notes on the situation and development of any three cities in Southern Germany.

9. Describe and account for the economic development of the Swiss portion of the Alpine Foreland.

CHAPTER XI

THE ALPINE LANDS

General Characteristics.—With a length of some 700 miles, the great curve of the Alpine region extends from the Mediterranean Sea across the southern part of all central Europe, and it adjoins regions which are of different physical character and inhabited by people of varying types. Hence its valleys have been penetrated and occupied by men of several nationalities, and the Alpine Lands are now shared by several States : France, Switzerland, Germany, Italy and Yugoslavia.

Structure.—As was explained in Chapter I, the Alps constitute the highest and most extensive system of folded mountains of Europe. Here the strata were thrust north-westward and northward against the massifs of the Central Plateau of France and the uplands of central Europe until nappes were piled on one another to a height of miles above the present mountains ; strata which had their roots in the southern part of the Alpine region were even pushed across to the northern side (refer back to Fig. 5).

The lower rocks were metamorphosed into crystalline form, and where the upheavals were greatest, that is, along the middle part of the great curve, the overlying sedimentary strata were worn away. Consequently the rocks of the central zone of the " High Alps " (compare Figs. 5 and 53) are mainly of crystalline structure, while the lower margins, or " Pre-Alps," are formed largely either of limestone of Secondary Age, or of the Tertiary sands, marls and clays known as Flysch. The southern zone of sedimentary rocks is missing, however, in part of the western Alps where the crystalline rocks descend steeply to the western side of the North Italian Plain.

In the central zone, besides the metamorphosed and crystalline nappes are areas of older rocks, including masses which are like those of central Europe and show the earlier Hercynian folding. Also in the disturbances in the Alpine region igneous rocks such as porphyry were produced, though recent volcanic outpourings have no important part in the build of this region. These

contrasted elements in the structure considerably influence the present-day geography.

Relief.—In the Alps, however, altitudes are so great that differences of relief are even more important than those of the rock material, and perhaps the best way to appreciate the form of the relief is to study the pattern of the river valleys. Near the outer, i.e. the western and northern, margin of the great curve of the region is a series of almost continuous longitudinal valleys, which accompany the junction between the High Alps and the Pre-Alps along much of its extent (see Fig. 53). This line is well marked in the case of the valley of the River Isère, above Grenoble, and of its tributary the Drac, which meets it at that town ; to the north-east, after a break, it is again clearly seen in the back-to-back valleys of the upper Rhone and the Vorder Rhine ; after another break it is continued by the longitudinal section of the Inn above and below Innsbruck, and by the longitudinal courses of the Salzach and the Enns. Most of these rivers have their origin in the High Alps, and all of them turn from a longitudinal course outward and cut the North-western and North-eastern Pre-Alps into sections which have their own local names. Some of the valleys, too, have such marked individuality and importance that they have long been regarded as regional units and given special names ; e.g. the longitudinal part of the Isère valley is known as the Gresivaudan, and that of the Salzach as the Pinzgau.

Near the inner margin of the Alps which overlooks the North Italian Plain, marked longitudinal valleys are found only in the eastern part. Here are two series, each of less extent than those of the outer margin. One set forms the northern part of the Italian lake region, where, in the Val Tellina, the River Adda flows westward to join Lake Como, whilst farther east are the shorter longitudinal valleys of the Brenta and Piave. The other set lies farther north-east and is within the Eastern High Alps ; it is formed of the Val Pusteria, which is drained both westward by the Isarco to the Adige river system, and eastward by the Drava ; where the Drava leaves the High Alps to cross the Eastern Marginal Pre-Alps, it flows through a broad and deep depression known as the Klagenfurt basin.

While all these series of longitudinal valleys aid movement between different parts of the Alpine region, several transverse valleys are of great importance as permitting communication

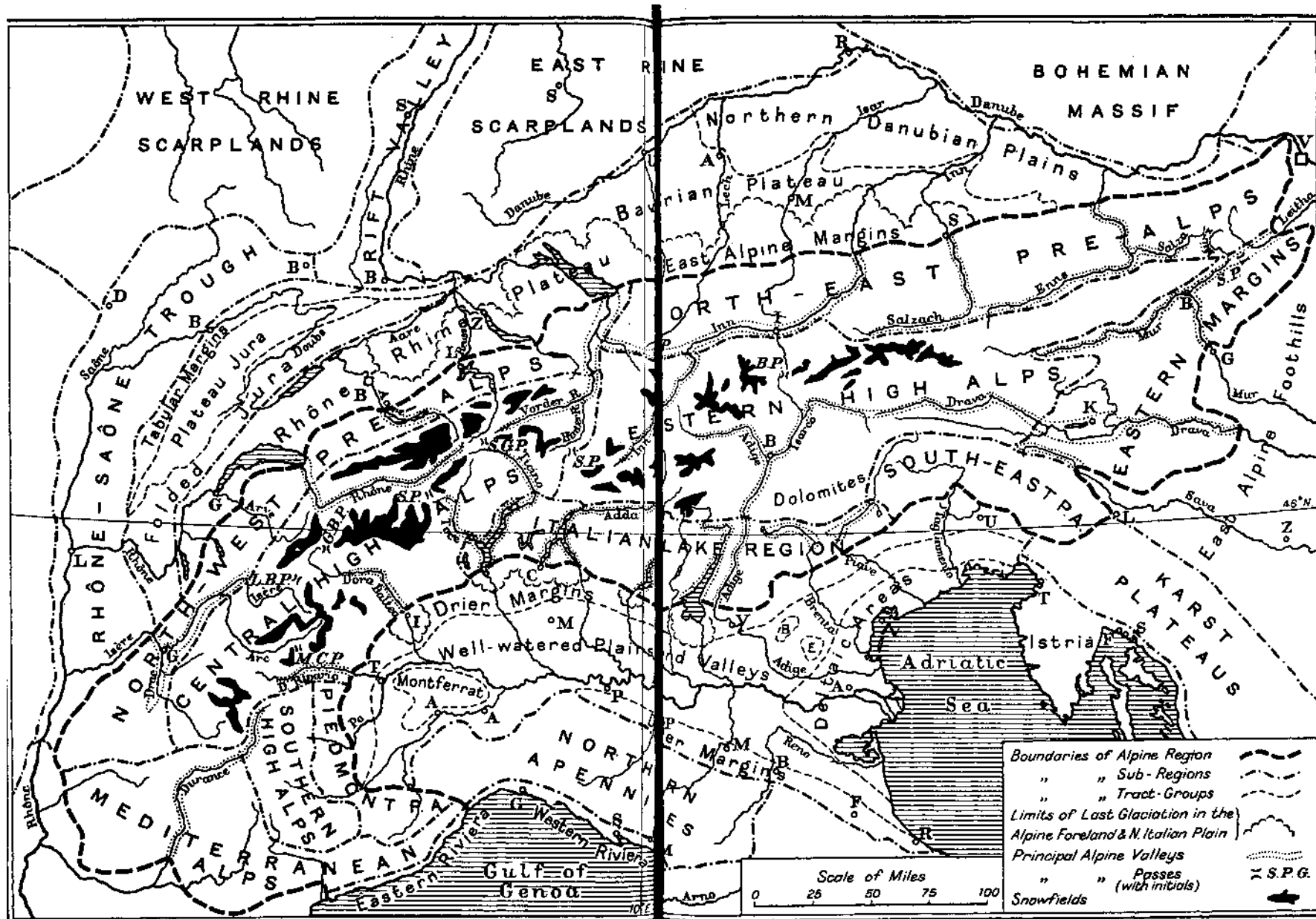


FIG. 53.—REGIONS OF THE ALPES AND NEIGHBOURING LANDS.

Note.—To avoid ambiguity the term "Bavarian Foothills" is used in the text instead of "East Alpine Margins," as printed above south of the Bavarian Plateau.

across the mountain barrier. In the west, from the Italian plain near Turin, the valley of the Dora Riparia leads to the Mont Cenis Pass, and thence to the Arc tributary of the Isère, while the valley of the Dora Baltea leads by the Little St. Bernard Pass to the Upper Isere and by the Great St. Bernard Pass to the Rh6ne. From Lake Maggiore there is access by the Toce valley to the Simplon Pass, and thence to the Rh6ne, and by the Ticino valley to the St. Gotthard Pass, and thence to the Reuss. From Lake Como a northward route leads over the Splugen Pass to the Hinter Rhine. In the Eastern Alps beyond the Splugen, the most marked transverse route is up the Adige valley as far as Bolzano, thence continuing northward up the Isarco tributary to the Brenner Pass, and across this to a tributary of the Inn, which meets the main river at Innsbruck.

In the broad mass of the Eastern Alps there are also several large oblique valley-lines, with a general south-west to north-east direction—for example, the upper Inn flows through the Engadine valley. In the Eastern Margins part of the Pre-Alps the upper Mur flows from south-west to north-east till it turns at Bruck, while beyond this town the same line is followed, though in the reverse direction, by its tributary the Murz; beyond the Murz the line continues across the Semmering Pass to the Leitha tributary of the Danube.

The reasons for the courses of the Alpine valleys can be explained only in part by the present differences of the rock composition; especially in the High Alps their origin may lie too far back in the geological history for its discovery. The form of the valleys, however, and much of their human significance are due to relatively recent glaciation, of which some account will be given later.

Climate and Vegetation.—It is evident that the deeply cut valleys must have climatic conditions very different from those of the intervening highland masses, and these again differ from one another because of their relative elevations; the greater part of the marginal Pre-Alps, for example, is clothed with forests or pastures, while in the central High Alps wide areas rise above the tree line and even to the levels of perpetual snow.

There is, indeed, in the Alpine region a zonal arrangement of climates. The culminating heights which rise above about 10,000 feet form the *snow zone*, and bear no vegetation. The mountain slopes which are below this level, but above 5,000 or

6,000 feet, are in the *alp zone*, snow covered for more than half the year, and with such a short period when vegetable growth is possible that trees cannot exist; low herbaceous plants grow in great abundance, however, flowering brightly in the earlier part of the summer and constituting the valuable alpine pastures.

Below this level the higher valleys and the upper slopes of the lower ones are in the *forest zone*, which extends downwards to about 2,500 or 3,000 feet; in the higher parts of the forest zone only conifers are found, the spruce and larch being common, but at the lower levels there are mixed growths of coniferous and deciduous trees, the beech often giving a lighter colour to the woods in the west, and the oak being more plentiful in the east. Deforestation has, however, taken place over considerable areas, and the trees have given place to pastures.

The lowest valleys which have been cut below about 2,500 feet are in the *cultivation zone*; here fruit trees have been planted and cereals and vegetables are grown. At these lower levels account must be taken of another factor than altitude, for the Alpine Lands have such a wide extent that the different parts adjoin regions with markedly different climates; hence from these contrasting regions, winds of different character penetrate into the valleys and modify their climatic conditions.

With these differences of climate and vegetation necessarily correspond differences in the ways of life of the inhabitants.

Regional Divisions.—Thus, determining the general character of the various parts of the Alpine region are five main factors: the altitude; the composition of the rocks; the situation; the climate; and the utilization by man of the natural resources. Taking all these into account, the constituent sub-regions have been demarcated as shown in Fig. 53, and will now be briefly described in turn.

The High Alps.—By contrast with the marginal Pre-Alps, all this medial belt is "high," but the culminating area is the Central Alpine sub-region between the Splügen Pass marking off the Eastern High Alps and the valley of the Dora Riparia beyond which are the Southern High Alps.

The Central High Alps.—The two factors of great elevation and generally crystalline structure determine much of the character of this region, yet here, as throughout the Alpine Lands, it is the valleys, often floored with recent deposits, that count for most in the human geography* The forms and the

resources of these valleys, and also the scenery of the mountains, owe much to the glaciation of the Ice Age. Deep corries, or cirques, with steep walls, were worn out of the uppermost parts of the pre-existing valleys, and by the development of these cirques mountain masses were cut back into irregular sharp-edged



[French Railways—National Tourist Office.]

FIG. 54.—VIEW OF THE MER DE GLACE.

Sote.—The Mer de Glace is the name given to the lowest part of the glacier which descends north-eastward from the extensive massif of Mt. Blanc ; in this part the tongue of ice occupies a valley to a width of half a mile, and a length of four miles. Above the part shown in the picture the icefield is much wider, and covers the slopes of the massif which rises to the peak of Mt. Blanc, about six miles to the right of the view here shown.

ridges, and the ridges were reduced to jagged pyramids, " horns " or even " needles." The valleys were scoured into troughs of U-shaped section, and in parts were deepened to basins separated by rock-bars or by morainic deposits ; main valleys were worn more deeply than were the side valleys, which were left " hanging " after the ice had disappeared and the form of the valley bottoms had become visible. Much of the magnificent

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EUROPE

BY

J. F. UNSTEAD, M.A., D.Sc.

**FORMERLY PROFESSOR OF GEOGRAPHY IN THE
(UNIVERSITY OF LONDON)**

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PREFACE

THIS study of the lands and peoples of Europe is written primarily for the use of students taking " Intermediate " or " General " courses towards a University degree, " Higher School " examinations, or courses in Training Colleges.

It aims at providing a twofold training : in the first place it not only presents facts but points out their significance and how they may be correlated ; in the second place, it shows the interaction between the facts of geography and those human affairs, economic and political, which are the concern of all.

From both points of view a study of Europe is important. To the geographer, this continent offers a great variety of conditions within an area small enough to be studied in some detail and with some approach to actuality. To every man, the economic and political affairs of Europe influence his own life whether he lives within the borders of the continent or beyond the seas.

Yet a study of Europe involves considerable difficulties, for it is scarcely too much to say that it confronts one with a mosaic of geographical units, a jig-saw puzzle of nationalities and a kaleidoscopic picture of States ; one has to work out a method of recognizing order and causation in this complexity, for the three factors cited above overlap and conflict in a most confusing manner. In many cases, the natural unit of the geographer, e.g. the Rhine Rift Valley, the Alpine Highland or the Lower Hungarian Plain, is inhabited by people of more than one nationality and divided among two or more States ; again, the fact that the limits of the nationalities by no means correspond with those of the political divisions is the origin of some of the most serious problems of Europe.

Because the various States bear so little relationship to geographical regions, and also are liable to sudden and catastrophic changes, it seems to the writer impracticable to arrange a study of Europe according to the political divisions ; hence this book has three parts.

Part I makes a general survey of the continent as a whole—its relief and structure, its climates, soils and vegetation, the

types of land-utilization and production and, by combining these factors, the major geographical regions; at this stage, also, a general survey of the peoples and States of Europe is given. The broad pattern of the distribution of the physical and human elements is thus brought out.

Part II presents a more detailed study on the basis of the natural or geographical regions which comprise the continent : the major and minor regions and, except in eastern Europe, the sub-regions. These are treated as units, and in each the interrelations of the physical and human factors are considered. This is the longest section of the book, and in it the economic conditions are given special attention.

In Part III each of the States is dealt with in turn. Their physical and economic foundations are reviewed, the peoples who form their populations are considered, and an examination is made of the boundary changes of recent years and of those international problems which are either influenced by geographical factors or have geographical effects. In this section, facts are stated without prejudice, causes and consequences are pointed out, but judgments are deliberately withheld as unsuitable to a geographical text-book.

The relative space allotted to the various parts of the continent has been determined partly according to their importance as the homes and work-places of large populations or of characteristic groups of people, and partly according to the nearness to Britain.

A large number of maps have been specially drawn to illustrate the text. These deal with all aspects of the geography, but the available space has been used to supplement, not to duplicate, the maps to be found in atlases; it is assumed that an atlas will be constantly used with this book.

Questions have been added, in many cases designed to require a reconsideration of the facts and ideas already given and to promote individual thought.

The writer cordially thanks Mr. L. Brooks, M.A., Mr. G. J. Cons, M.A., Professor C. B. Fawcett, Dr. H. A. Matthews and Dr. S. W. Wooldridge, who have each read the draft of parts of the book and have given advice which has been gratefully accepted.

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NOTE

IN March, 1939, while this book was being printed, the State of Czecho-Slovakia was dismembered ; Germany established one Protectorate over Bohemia and Moravia and another over Slovakia, while Hungary annexed Ruthenia (Carpatho-Ukraine). The political boundaries on the end-paper maps have been altered to conform with these changes, and on pages 344 and 345 the geographical consequences are described in such a way as to bring Part III of the book up to date. The statements made in Chapter XIX regarding the States of Germany and Hungary must therefore be modified by the facts given on pages 344 and 345.

The account in Chapter XIX of the conditions of Czecho-slovakia, as it was just before March, 1939, explains the fundamental political and economic factors in the problems and relationships of the three States ; many of these factors, though modified in certain respects, still remain and are still important in the human geography of Central Europe. Similarly, the map of the earlier boundary changes in Czecho-Slovakia (Fig. 80) is still useful in showing important features of the areas which have now passed into the possession of Germany and Hungary.

In April, 1939, following disagreement between the governments of Italy and Albania, Italian troops overran Albania. The King fled, a group of Albanians offered the Crown to the King of Italy, and the two States were thus united.

April, 1939.

PART I

EUROPE AS A WHOLE

CHAPTER I

RELIEF AND STRUCTURE

Introduction.—If we want to understand the nature of any region and the manner of life of its people, and we trace back to the reasons for the facts, we find that the most fundamental consideration is the position of the region in the world—its situation on the globe.

That position has, in the past, determined the way in which the region has shared in the great earth movements which have, for example, raised some areas to broad highlands, subjected some to foldings producing mountain systems, or lowered others, in some cases even below sea-level; in other words, the position has determined the broad features of the relief and structure of the region.

The main characteristics of the climate are similarly due to its position on the globe, which exposes the area to the influence of the sun and to that of one or more great wind-systems, while the relief also influences the climatic conditions.

Climate and relief together are directly or indirectly the chief factors conditioning the type of vegetation which can live in the region, and this in turn has a great influence on the agricultural and pastoral work by which many of the people get their living.

Of course, the environment of a people does not *determine* their work, nor their particular manner of life, for different peoples are at different stages of development and have different traditions and habits. Yet the position of a region in relation to other regions, either near at hand or far away, has been one of the main factors in aiding the immigration of peoples and ideas, and so affecting the character of the population and their mode of life. Moreover, the incentives and opportunities which their environment may offer influence their further development.

The position of regions may therefore be regarded from several points of view, and in each of the earlier chapters of this book, which deal with the general characteristics of Europe and its peoples, we shall examine the position of the continent from the particular aspect with which we are concerned. Accordingly, we will now consider how the varied relief and structure of the continent are related to the situation of its constituent regions.

A relief map of Europe shows at once a marked contrast between the relatively level and unbroken east, and the remaining part of the continent which is diversified by many uplands and lowlands and, moreover, is divided by invasions of the Atlantic waters and by inland seas. This fundamental distinction as to relief and outline affects practically all aspects of the physical and human geography of the two contrasted regions, known sometimes as "Trunk Europe" (because it forms part of the great trunk of the Euro-Asiatic land-mass) and "Peninsular Europe" respectively. The cause of the contrast lies in the fact that whereas eastern Europe is situated in a part of the globe which has been relatively stable through much of its geological history, the rest of the continent has been involved in repeated disturbances and dislocations of the crust of the earth.

In Peninsular Europe, on the north-west margin of the continent, one group of highlands stands out clearly and will be first considered.

The North-western Highlands.—The Highlands of Scotland-and-the north of Ireland resemble in many ways, though on a smaller scale, the Highlands of Scandinavia because they have shared the same geological history."

Some of the rocks comprising these regions were formed before the Palaeozoic Era, i.e. before any life appeared upon the earth ; even at that time the surface was contorted, and these earliest rocks were folded into great mountain ranges, but of these denudation has by now removed all but the deepest roots.¹

During the Palaeozoic Era other rocks were formed, and in the Devonian Period there occurred a series of dislocations of the earth's crust which were called the " Caledonian " earth-movements because their effects were studied in the structure of Scotland. At this period the rocks were subjected to great

¹ A time-sequence of the geological periods and the great earth-movements is given in Appendix I.

foldings in a general south-west to north-east direction. As a result the Caledonian mountain system arose, which extended over all the region now forming the north-western margins of Europe (see Fig. 1), including Spitsbergen far to the north of Scandinavia. In the course of these disturbances much of the rock was metamorphosed into crystalline forms, including schists and gneisses, while there are also large areas of granite, gabbro and other resistant igneous rocks.

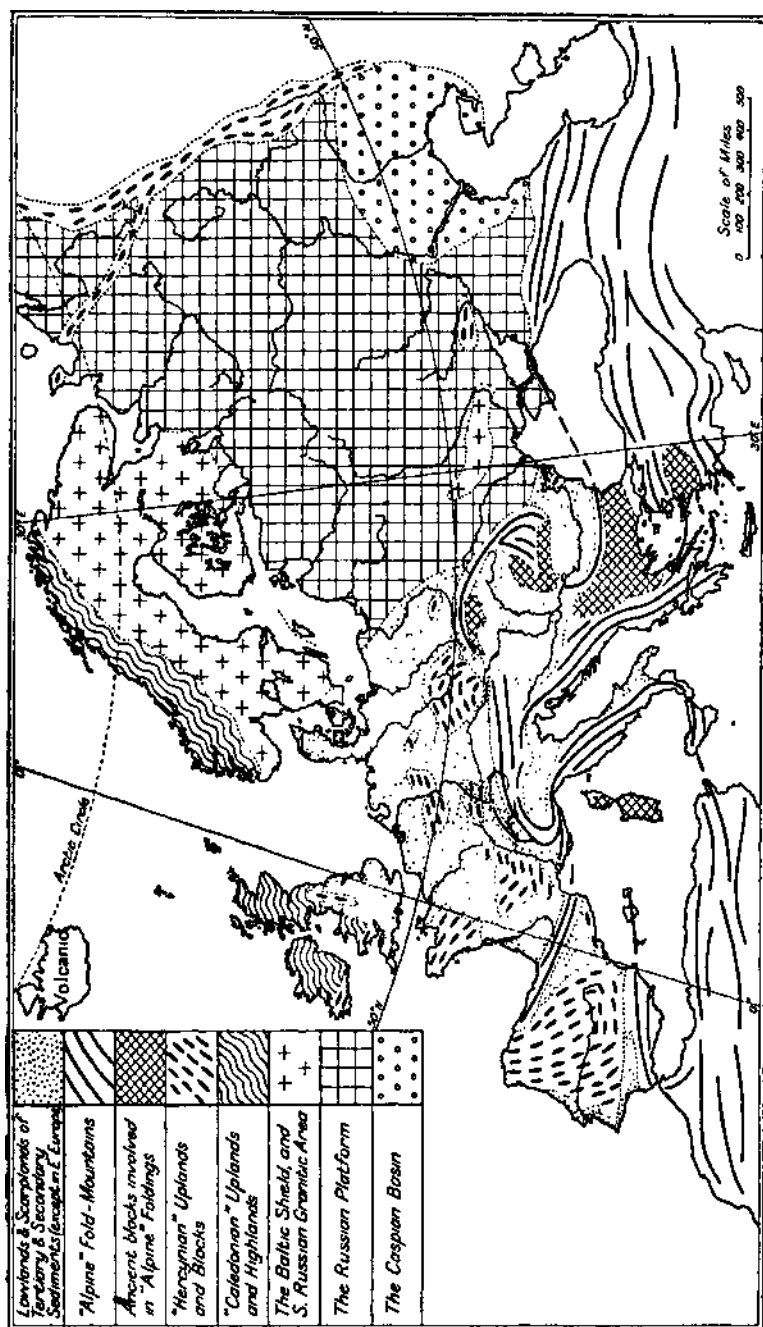
From this period onward through the Secondary Era the great mountain system was worn down to the condition of a peneplain, and only its stumps remained. Then, in the "Alpine" earth-movements of the Tertiary Era, the region again suffered disturbance, this time by faulting and the uplift of some of the resultant dislocated blocks and the subsidence of others. At this time, too, that part of the earth's surface now under the Atlantic waters was detached from the continental platform from which the lands of Europe rise, and the present shape of this margin of Europe was determined.

On the continental side, the blocks were raised probably in more than one stage, so that a low terrace-like step was formed between the sea and the great plateaus which in the Dovre Fjeld now reach over 7,500 feet and in the Jotun Fjeld over 8,000 feet (see Fig. 2). Moreover, the area was dislocated by faults running in several directions, and along these cracks there occurred both subsidences and also lines of weakness along which rivers eroded deep valleys in the plateaus.

Through such cracks and vents in the earth's crust, the pressures associated with the Alpine disturbances forced volcanic material in a number of places, and the Faroe Islands and Iceland in the far north-west are almost entirely formed of these volcanic accumulations.

In the Ice Age, snow accumulated on the high plateaus and ice was formed which worked its way down the valleys, deepening them and changing their section from V-shape to U-shape. In many other ways, too, glaciation played a part in producing the present relief; and its general importance is so great that we may at this point consider it further, although its influence extended far beyond the limits of the North-west Highlands.

At one stage the climate was so cold and precipitation was so great that the great ice-sheet from the Scandinavian Highlands and the smaller ones from the British Highlands extended south-



ward as far as the broken line marked as the maximum extension of the ice on the map showing the distribution of glaciation (Fig. 3). After this period, the climate became warmer, the southern part of the ice-sheet gradually melted and its edge lay progressively farther north ; this continued until the climatic improvement ceased and the margin of the sheet remained in the same position. Here lines of terminal moraine, composed of boulders, gravels, sands and clays, marked the end of this stage in the retreat of the ice. In the area between the outer margin of the earlier ice-sheet and the terminal moraines, there was now visible a layer of boulder-clay, the ground moraine formed below the ice in its wider extension. Also, melted ice-water washed away clayey and sandy material from the later terminal moraines, and much of this was deposited upon parts of the ground moraine ; occasionally such sheets of gravel and sand covered considerable areas. At later periods, with other climatic changes, the ice-edge withdrew farther, and the various stages in the retreat of the ice are therefore marked by alternations of lines of very irregular and often hilly terminal moraines, and flatter stretches of clayey or sandy character. Since the farthest southward advance of ice occurred, there has elapsed sufficient time for streams and weathering to reduce considerably, and to smooth out to some extent, the glacial deposits, but some of the later series remain so little affected that they dominate the landscape and largely control the way in which man uses the land.

An important effect of the ice was to obstruct or alter the courses of the streams, and in many parts this is now shown by rapids in the rivers and by the presence of lakes or swamps. Immature river-development and poor drainage are frequent characteristics of glaciated regions.

In general, the areas from which the ice worked its way outward are those in which its scouring action predominated, while the marginal areas of glaciation are those of deposition. Hence, over parts of the North-western Highlands region the soil was completely worn away and bare rock is the witness of the action of the ice, while in other parts are the coarse gravels and sands of the later terminal moraines. Taken as a whole, in the northern regions glaciation has made surface conditions more difficult for man's occupation and use ; on the other hand, some of the glaciated regions of central and western Europe have

benefited by the finely ground and fertile material brought from the north.

Another very important element in the evolution of the North-western Highlands was a succession of changes in the relative level of land and sea which have occurred several times since the Alpine dislocations, and are still in progress. These changes

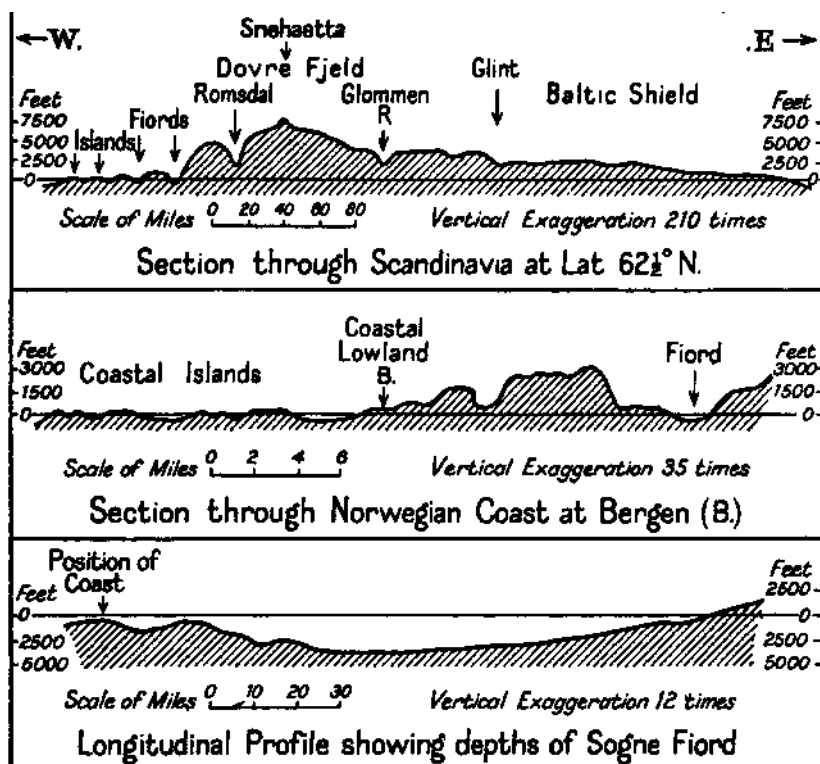


FIG. 2.—SECTIONS SHOWING RELIEF OF SCANDINAVIA.

may be due either to alterations in the level of the sea or to the slow risings, sinkings or tiltings of the land masses; in this part of the world the broad result has been a general sinking of the continental margin as compared with the Atlantic waters, and consequently the shores have been partially "drowned." The low terrace off the Norwegian coast has been reduced either to several small archipelagoes or to narrow patches of lowland extending beyond the highlands (see middle section in Fig. 2).

Also, the lower parts of the valleys, whether due to faulting, to stream erosion, to scraping and deepening by ice, or to a combination of these processes, have been invaded by sea-water and have become the wonderful fiords, with great side-branches leading inland, in some cases for scores of miles. Usually the fiords have steep or even vertical sides, rising to many hundreds of feet, while below the quiet waters are corresponding depths (see bottom section in Fig. 2). Apart from the narrow patches of coastal lowland the only habitable areas are either at the heads of the fiords or at the sides where old terraces interrupt the mountain slopes ; they give landing-places when they are at the water-level, and fields and pastures when they are a little above it.

The influence of this history and its resultant land-forms on human occupation will be considered in detail later. Yet it may be at once observed that it is in the main unfavourable, although the indented coast affords harbours for seafaring. Less obvious is the fact that the enormous amount of denudation has brought the surface of the earth down to the level of the minerals, originally formed in the depths, and now able to be reached by man ; iron and copper ores are therefore among the rather scanty resources of the Scandinavian Peninsula (see Fig. 6).

Another very important result of the geological history is the modification of climatic conditions by the upraised continental margin bordering the ocean. The precipitation of rain or snow is concentrated, as it were, along the coast and on the neighbouring mountains, while in the lee of the great barrier the Baltic lands are relatively dry. Similarly, the moderating influence of the oceanic winds is mainly limited to the Atlantic margins ; behind the highlands continental conditions at once begin, and from Sweden right across north-eastern Europe and far into northern Asia extend regions where the long, severe winters allow the growth only of the tundra or coniferous forest vegetation.

. **The Baltic Shield.**—The Scandinavian Highlands descend, often by a marked drop, known as the Glipt (see Fig. 2), to a great region which dips gently eastward under the Gulf of Bothnia and rises again in Finland, thence sinking in northern Russia till its border is largely covered by the waters of the Arctic Sea, the White Sea and Lakes Onega and Ladoga. Because this

region is slightly concave towards its centre under the northern arm of the Baltic Sea, and thereby resembles an inverted shield, it has been termed the Baltic Shield. It is one of the most ancient land surfaces on the globe, for it is composed of highly resistant granites, gneiss and crystalline schists which, although folded in the dim geological past, before life appeared upon the earth, have remained almost undisturbed during and since the Palaeozoic Era. Faultings have let down parts where relatively small areas of Palaeozoic sedimentary rocks have been preserved,

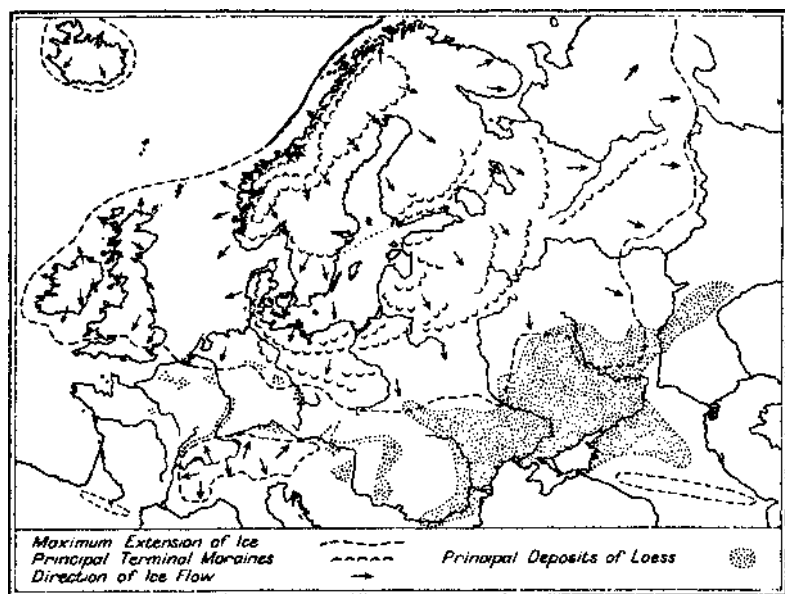


FIG. 3.—DISTRIBUTION OF GLACIATION AND LOESS.

and where the surface is rather lower than the rest, as, for example, in the "Lake Belt" of southern Sweden, in which are situated Lakes Vaner, Vatter and Malar.

For the most part the bed-rock forms undulating country in which the characteristic land-forms are due to glaciation. Near the southern margin there are long lines of hilly terminal moraines, behind which the glacial deposits are still so abundant and so recent that rivers have not been able to develop mature drainage systems. Their courses are irregular, and lakes are numerous. In central Finland, indeed, lakes and marshes cover much of the country and the roads make use of long,

narrow, winding ridges which stand above the waters; these are asar, or eskers, trains of gravel and sand deposited beneath or on the margins of the ice-sheet.

Yet over large areas the naked rock is exposed, for much of the soil was scraped away by the ice and transported to the surrounding regions ; nor was this loss remedied in the lower areas near the Baltic Sea and the Gulf of Bothnia by the deposit of sandy or clayey material when, for a time, the waters spread farther over the land.

Although the ancient rocks contain certain minerals, the Baltic Shield has proved a generally inhospitable region to man, even apart from its climatic conditions.

3. The Hercynian Uplands.—As the mountains of the north of the British Isles are akin to the Scandinavian Highlands, so the uplands of the south of Ireland and of the south-west of England and Wales are akin to a number of others scattered widely over the continent. They are known as the Hercynian Uplands because they represent fragments of mountain systems folded in the Hercynian earth-movements which occurred at the close of the Carboniferous Period. These mountains were continuous over great areas, though their traces are now found only in scattered fragments, and their folds ran in various directions. In the south-west of Britain and the adjoining region of Brittany, the general direction was about west to east with a trend to the south-east towards the centre of France, as is shown by the direction of the lines in these areas in Fig. 1 ; folds running in this direction are referred to as Armorican, from the ancient name of part of Brittany. In central Europe, however, the common direction is from south-west to north-east, termed Variscan, from the name of a tribe long ago living in the neighbourhood of the Fichtel Gebirge.¹ The Variscan direction is seen in the structure of the Rhine Plateau, which is cut across by the Rhine in its course between Bingen and Bonn, and also in the Harz Mountains, the Vosges and the Black Forest Mountains. In the Central Plateau of France both directions are seen, and still others appear in other regions, notably in the central tableland, or " Meseta " of Spain, in the " Diamond " formed

¹ Both the term " Armorican " and that of " Variscan " are sometimes used to denote all these foldings and all the regions of this type, but it seems best to restrict them as is here done, and to employ the term " Hercynian " in the general sense. " Hercynian " is derived from the old name of the Harz Mountains, one of the regions of this type.

by Bohemia and its margins, and in the Lysa Gora -Uplands of Poland. Even in eastern Europe are two similar Hercynian areas, viz. the Donetz Plateau in the south, and the Ural Mountains, with their offshoot, the Timan Uplands, on the borders of Asia.

The various mountains formed by the Hercynian movements have had a history somewhat like that of the older Caledonian mountains ; they were worn down to peneplains, so that the directions of the folds showed only in the strips of the various strata outcropping along the surface, like the graining of the wood in a sawn tree trunk. The Hercynian peneplains later suffered changes : over some areas they were depressed and upon them were laid down sedimentary rocks during the Secondary and early Tertiary Eras, and in the succeeding Alpine earth-movements they were considerably fractured, tilted, upraised or depressed.

Consequently much of what continuity they had previously shown has disappeared, only those parts which stand up above the surrounding lowlands being clearly recognizable as Hercynian Uplands of the usual type. These, which are shown as such on the map of structural regions in Fig. 1, were uplifted to plateau-like form, with more or less level surfaces, but denudation has since removed most of the overlying sedimentary rocks of Secondary and Tertiary date, and has exposed the older rocks of the peneplains with their graining ; even in this older rock the less resistant strips have been etched out so that the more resistant stand up above the general level as ridges running in the direction of the original mountain-folds.

Where an uplifted mass is bounded by clearly marked, and more or less parallel, faulted edges, it is known as a " horst," and such structures are common in the Hercynian Uplands. The converse of a raised horst is a rift-valley, which has subsided between two parallel series of faults. One very important rift-valley is that in which the Rhine flows between Basel and Mainz ; the parallel faults which bound it are shown in the map in Fig 46, and the section in Fig. 47.

In many cases, uplands due to dislocation rise steeply on one side where they are bounded by marked faults, and descend more gently in other directions ; structures of this kind are commonly known as " massifs " and are exemplified by the " Massif Central " or " Central Plateau " of France, which is fault-edged where it overlooks the Rh6ne Valley.

The dislocations which broke up the Hercynian areas allowed igneous material to be forced up along faults and through volcanic vents, and in several parts, notably in the Central Plateau of France, great sheets of lava and the remains of volcanic cones bear striking witness to this part of the history.

In the rocks of the Carboniferous Period which enter into the structure of the Hercynian regions, there were formed widely extending coal-measures containing seams of valuable coal, and these coal-measures were involved in the Hercynian foldings. Where they formed parts of the upfolds which were first denuded, the coal-measures have been worn away, but where they formed parts of downfolds or basins they have, to a certain

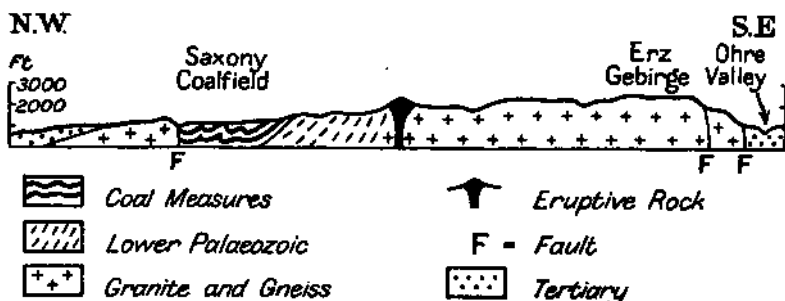


FIG. 4.—SECTION THROUGH THE SAXON UPLANDS, ERZ GEBIRGE AND EGER (OHRE) VALLEY.

extent at least, been preserved. Consequently there are important coal-fields associated with some of the Hercynian Uplands, and these, together with other mineral resources found in their exposed rocks, are the basis of mining and manufacturing industries which have attracted people to the mineral-bearing areas.

The structure of the Hercynian Uplands is illustrated in Fig. 4 by the section through the Erz Gebirge and Saxon Uplands; this area exhibits most of the elements described above.

Yet in general the Hercynian Uplands are not well populated, for they are not productive agricultural regions, since, as they stand above the surrounding lowlands, they have a relatively cool and moist climate, and also they do not usually bear fertile soils. Hence they naturally tend to be heath or moor lands or to be clothed with forests.

4. Central and Western Lowlands and Scarp-lands.—After the Hercynian earth-movements and the later wearing down of the resultant mountain systems, most of Europe, except the north, was submerged under the waters of seas or lakes. This submergence was, however, not uniform over the whole of the southern part of the present continent; some parts were beneath relatively deep seas in which was deposited the ooze from which limestones were formed, while other parts were covered by shallow seas or lakes in which clay-forming muds were laid down, while elsewhere sand was dropped which was changed to more resistant sandstones or remained in an unconsolidated form. Moreover, alterations in the depths of the various parts brought differing conditions first to one region and then to another, and thus at a given place there might occur first the formation of sandstones, then of limestones, and later perhaps of sands or clays.

Thus over wide areas of central and southern Europe there was a succession of deposits of varying composition during considerable parts of the Secondary and Tertiary Eras, and consequently thick strata of sedimentary rock covered platforms of more ancient formation.

Where, in the Alpine earth-movements, the platforms and their coverings of Secondary and Tertiary sediments were broken and upraised, the Hercynian Upland regions were formed as has been described above, but in the less-disturbed areas the strata remained at a lower elevation and the sedimentary cover was less exposed to denudation. In central and western Europe this was the case between and around the blocks of the Hercynian Uplands, where basins were formed such as those of south-eastern England and northern and south-western France, or where there were broader depressions, such as that on the southern shores of the North Sea and the Baltic Sea; in these regions the older rocks are still covered by a succession of sedimentary strata lying above one another in more or less saucer-like form or in an almost horizontal position, as is shown in the section through northern France in Fig. 38. v*

In other parts the rocks have a pronounced tilt, as in England west of the London Basin, in France west of the Vosges Mountains and in Germany east of the Black Forest Mountains; in such cases the less-resistant strata have been worn away, leaving the more resistant as long, tilted slabs, and giving to the

whole region a scarp-land character. This structure is shown in the section in Fig. 48.

Moreover, in the Ice Age, parts of these lowlands were invaded by ice, especially from the North-western Highlands, as was described above, and in such parts various deposits of clays, sands and gravels were laid down.

Frequently, fertile soils have developed upon the rocks of the lowlands and scarp-lands, and agriculture and pastoral work are carried on in such forms as the generally favourable climatic conditions have allowed.

Exceptional fertility marks the soils which have been derived from a mantle of loess covering the earlier deposits in certain parts of the central and western lowlands, and over a great area in south-eastern Europe (see Fig. 3). This loess resembles that of China in its composition ; it is fine-grained, loose and sufficiently porous to allow a free downward drainage of water after rain, and a slow upward movement by capillary-action in dry weather. Its existence in Europe is due to dry climatic conditions which occurred during and after the Ice Age, when southward-blowing winds raised clouds of dust from the finely ground particles of the moraine areas, and deposited them over the surrounding lowlands until a layer was accumulated, in the west often to a depth of scores of feet, and in the east to much greater depths. In central and western Europe the existence of the loess was specially important during the period of man's early settlement and cultivation of these regions, for loess areas were usually free from forest, easily worked and gave abundant return to the simple forms of agriculture then practised.

Minerals are not characteristic of the later sedimentary rocks, though iron ores were formed in some of the Secondary strata (again see Fig. 6), and lignite deposits are found in some of the Tertiary. Yet where the older rocks of the Hercynian Uplands dip down beneath the edges of the basins, the coalfields may extend beneath the younger strata, and therefore in several cases coal-mining has spread from the Hercynian margins some distance into the neighbouring lowlands.

Because of the subsidence of the basins and hollows, the waters of the Atlantic have invaded the lowest parts, and oceanic inlets or inland seas adjoin these lands and bring opportunities for fishing and trading. Hence the lowlands and scarp-lands of central and western Europe have varied resources, and as a

whole have become the most densely populated parts of the continent.

3. The Regions of " Alpine " Folding.—Great as were the changes brought about by the Alpine earth-movements in northern and central Europe, they were but small compared with those which entirely transformed the southern part of the present continent.

It appears that during a very long period about the middle of the Tertiary Era, the block of the earth's crust which forms northern Africa moved northwards towards the similar block forming the platform of ancient and resistant rock which in central Europe underlay the sedimentary strata of Secondary and early Tertiary date. The northward movement was irresistible: the older rock structures of central Europe were broken and displaced, while the younger, sedimentary strata of the south were contorted in a most complicated fashion.

In a general way it may be said that massive sheets of limestones and other sedimentary rocks were ridged up into folds along lines which formed great curves, as indicated in Fig. 1. These curves appear to sweep round from the south of Spain across the Strait of Gibraltar into the Atlas Mountains of northern Africa, whence they are continued across the central narrows of the Mediterranean Sea into Sicily and through the Apennine backbone of Italy into the Alps; even the Pyrenees and the Cantabrian mountains of northern Spain are linked with this system, which therefore almost completely encircles the area of the western Mediterranean. A small spur from the Alpine system is seen in the Jura Mountains.

On their eastern side the Alpine folds appear to spread out, both to the north-east in the Carpathian system and to the south-east in the Dinaric Alps, thus enclosing the lowlands of the middle Danube. The southern part of the Carpathian system swings round into the Balkan Mountains, so that between these and the southward continuation of the Dinaric Alps is another enclosed area in the neighbourhood of the northern part of the *Mæan* Sea. An eastward continuation of the Balkan Mountains is probably to be seen in the Yaila Mountains of the Crimea and in the Caucasus, while those of the southern part of the Balkan Peninsula are continued in the islands of the southern *Mæan* and curve again into the mountains of Asia Minor. Indeed, the whole system extends east-

ward across Asia on a still greater scale and culminates in the highest ranges of the world.

The term "folded" is, however, inadequate to describe the^T contortions which the strata have suffered (see Fig. 5). They have been squeezed together in most complicated ways, and on the outer side of many of the curves, sheets of rock (called "nappes") measuring hundreds or thousands of square miles in area, have been thrust bodily forward over other strata till

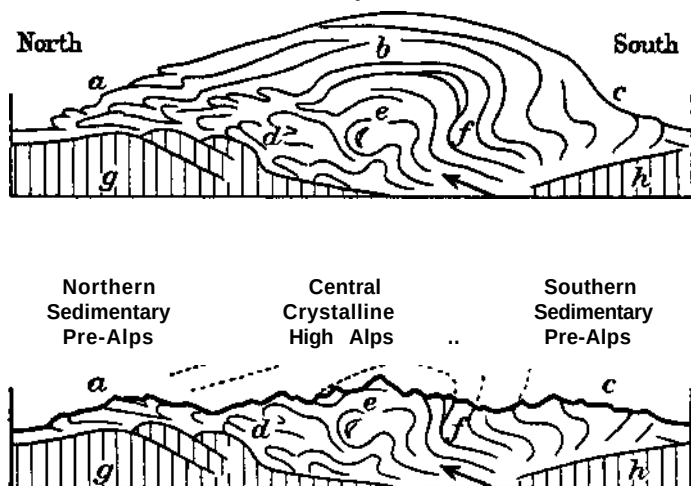


FIG. 5.—DIAGRAMMATIC SECTION THROUGH THE EASTERN ALPS.

(Vertical Scale greatly exaggerated.)

Note.—The upper diagram shows in a simplified form the contortions due to a thrust from the south. The underlying platform, *g* and *A*, is dislocated; the lower sedimentary rocks, *d*, *e* and *f*, are metamorphosed into crystalline nappes; the sedimentary nappes of the upper strata, *a*, *b* and *c*, are thrust northward (except in the extreme south), far from their roots.

The lower diagram shows the present constitution of the Eastern Alps after great denudation. In the central zone the crystalline nappes are exposed, and in the northern zone the sedimentary strata are left widely separated from their counterparts in the south.

they have been parted from their "roots" and now lie in regions far distant from those in which they were formed.

Under the pressures which have brought about such movements, some of the rock was metamorphosed into crystalline form; for example, a large part of the central Alps is composed of crystalline rocks which were thus formed. In some parts, too, molten material was forced up from the depths, and igneous rocks thus add to the complexity. Moreover, volcanoes were formed and are still to be observed, and even now earthquakes show that stability has not yet been attained in this part of the earth's surface.

The Alpine foldings have not only affected sedimentary rocks ; within them have been enclosed masses of older date and more resistant composition. For example, in the central Alps themselves are large areas, including the Mont Blanc massif, consisting of splinters of an Hercynian floor driven up into the folded pile above ; again, in the system of the Carpathians (in the wider sense of the name) is the great and ancient massif of the Transylvanian Alps as well as ancient fragments on the west of Transylvania and in parts of the Tatra Mountains.

Other blocks or massifs occur within the folded mountains of southern Europe, notably that between the Balkan Mountains proper and the western heights of the Balkan Peninsula ; here is the massif of which the Rodopi Mountains form the highest part. Again, within the curved folds of the western Mediterranean, there stand up ancient massifs forming the greater part of the islands of Corsica and Sardinia.

Another very marked, and very important, feature of the region affected by the Alpine foldings is the formation of great basins within the mountain system. These are of varying depth : in the western Mediterranean subsidences have let down the earth's surface over 10,000 feet below sea-level; the Adriatic Sea, however, is relatively shallow, especially in its northern part, and the North Italian Plain is essentially a continuation of this depression now just above the level of the sea. The iEgean Sea occupies another area of subsidence ; it is " half-drowned," and the higher parts of the previously continuous mountain chains form the islands which appear as stepping-stones between the Balkan Peninsula and Asia Minor. The southern part of the Black Sea is another well-marked basin; the north-western edge of the deeper area is the line of shallows showing the earlier connection between the Balkan Mountains and those of the Crimea.

A less-marked basin is that between the Balkan Mountains and the Transylvanian Alps where the relatively recent deposits forming the Walachian Plain stand above sea-level, and thus resemble those of the North Italian Plain.

Broadly similar in origin are the lowlands between the Alps and the great curves of the Carpathian system.

The Alps themselves, and to a less extent other parts of the great fold-mountains, reach such heights that, during the Ice Age, they bore ice-sheets which overrode the highest parts, and

in the case of the western Alps extended into neighbouring regions. The complex results of glaciation in the Alpine Lands and the Alpine Forelands will be described in later chapters.

The effects of the geological history on other conditions than structure and relief are very great; we can here only hint at a few of the results. There is the existence of the Mediterranean and Black Seas which separate Europe from Africa and southern Asia; these seas have physical influences, such as their warming influence upon the winter climate of the neighbouring lands, and influences upon human life, such as the way in which they have enabled civilization to spread all around their habitable coasts.

Corresponding to the variety in the rock structure and the relief of southern Europe is the variety of resources which include mineral deposits, Alpine pastures, mountain forests, broad inland lowlands and hill-sides facing the seas, all capable of human utilization; thus the extraordinary complexity of the geological history has been followed by an extraordinary complexity in the conditions of human life.

6. The Russian Platform.—In eastern Europe the physical development and the human history have been quite different. The ancient rocks of the Baltic Shield dip gently south-eastward, and form the substratum of the great structural region known as the Russian Platform. Apart from its margins, where there are the Hercynian areas of the Ural and Timan Mountains and the Donetz Block, the whole area between the Caledonian Highland system and the fold-mountains of the Crimea and Caucasus has remained almost unaffected by the later disturbances, and the most important movements have been relatively slight alterations in its general elevation as compared with sea-level. Because of these alterations, the area has been covered by the waters of seas of varying extent, and hence the ancient rocks which continue those of the Baltic Shield are covered in the north-west of Russia by deposits of Palaeozoic age, while farther to the south-east these are followed first by Secondary, and then by Tertiary, strata.

But because these deposits have lain almost undisturbed, they have not been subjected to pressures which would have changed their character, and in general even the oldest remain in much the same condition as those of recent formation; stone

which could be used for building or road material is a rarity over large areas of Russia.

The region is not of uniform elevation ; the Valdai Hills are over 1,100 feet above sea-level and form part of the water-parting between the rivers flowing north-west to the Arctic and Baltic Seas and those flowing south-east to the Black and Caspian Seas. The greater part of eastern Europe is less than 600 feet in height, while the land immediately north of the Caspian and the surface of that great inland lake are below the general sea-level of the globe.

Moreover, there have occurred warpings of the underlying platform which, although very slight if measured in degrees of slope, when continued over the great distances of eastern Europe have important consequences. The most marked of these warpings occurs in the south-west, where it brings up to the surface a belt of granite (Fig. 1); through this resistant mass the Dnieper River has been able to cut its southward reach only incompletely, and there are rapids which prevented navigation, but gave water-power now used for industrial purposes.

It must also be observed that all the northern part of the region has been glaciated, with results similar to those found in the plains of the central and western parts of the continent.

Because of its uneventful history, the Russian Platform has in general lacked the formation of mineral ores. Apart from some coal in the Palaeozoic strata near Moscow and iron in the granitic belt, the chief minerals are in the Hercynian areas of the Donetz and the Urals, where industrial development can utilize resources lacking over most of European Russia.

One consequence of the geological history is of the first importance. Undisturbed by the great forces which have led to such a complicated relief in the rest of Europe, the east has remained open, level country in close physical association with the similar lands of western Asia, for the Ural Mountains do not form an effective barrier of any kind. Hence the climates of western Asia are continued across " Trunk Europe " about as far as " Peninsular Europe." Similarly, the belts of natural vegetation, i.e. the tundras, the forests, the steppe-lands and the semi-deserts, extend unbroken from Asia across eastern Europe. Consequently peoples who have adapted their ways of life to each of these types of vegetation have worked their way, either westward or eastward, along almost the whole extent of the

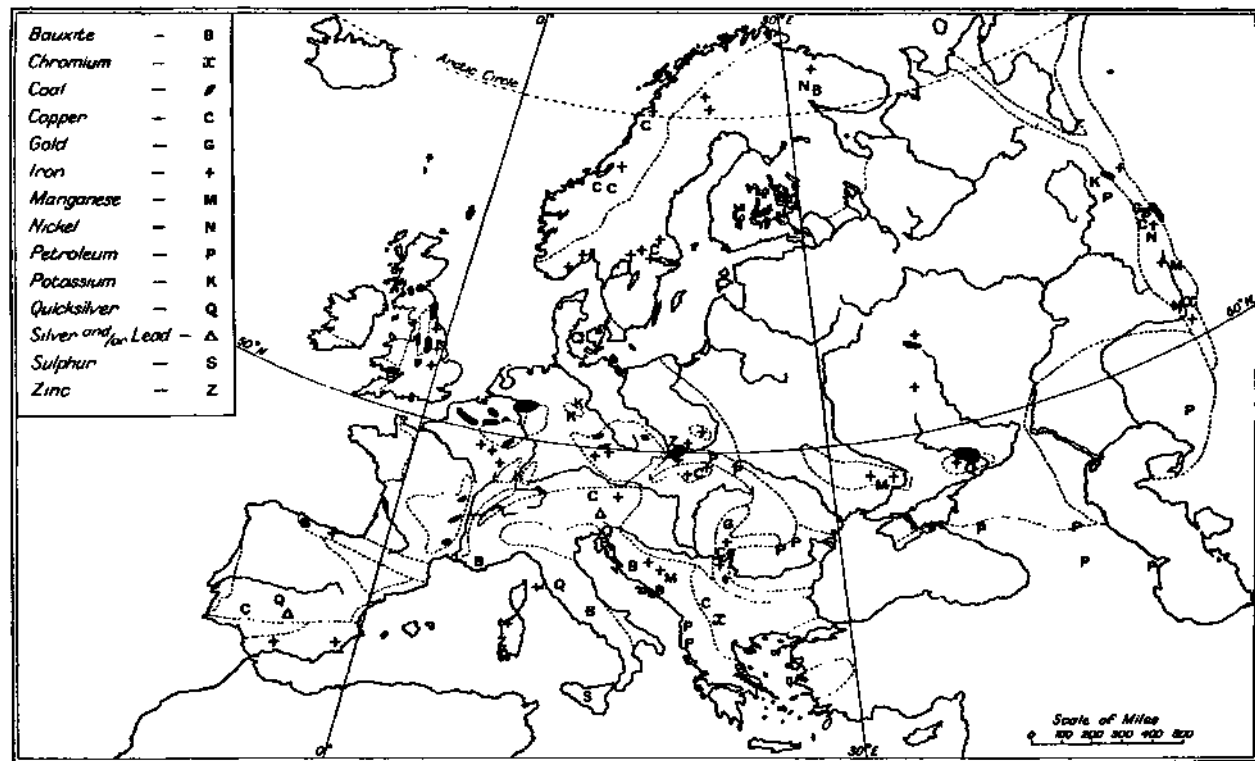


FIG. 6.—PRINCIPAL MINERAL WORKINGS.

Note.—There are also numerous lignite workings, especially in central Europe.

belts, and so kept western Asia and Trunk Europe in very close association from the human point of view.

7. The Caspian Basin.—Here is a region which is certainly more " Asiatic " than " European." It is a part of a great depression which includes the three inland seas : Caspian, Aral and Balkash. To this hollow flow the waters of the surrounding higher lands, and to the Caspian Sea the Volga brings the drainage from a large part of eastern Europe. With the water is brought down the material worn away by the rivers, and the Caspian Basin is covered partly by such recent alluvium and partly by deposits formed when a greater sea than the present one occupied the area.

Moreover, the formation of the Caspian depression, in causing the greatest river of Europe to flow, not towards the Mediterranean, but to the south-east, and to end in a lake without access to the oceans, has tended to hinder close association between eastern Europe and the remaining part of the continent.

QUESTIONS

1. How much knowledge of the Ice Age do you consider necessary in order to understand the present-day geography of the northern half of Europe ? Illustrate by reference to particular areas and their characteristics.

2. Certain parts of Europe may be referred to as being regions of " Alpine folding." Make a sketch-map showing these regions, and consider to what extent they have geographical, and not merely geological similarity.

3. What are the common structural characteristics of the " Hercynian Uplands," and how do these characteristics affect their utilization by man ?

4. Distinguish between four types of coast on account of their structure, and state their location in Europe. Give a description of any two of these types.

5. Define " Trunk " and " Peninsular " Europe respectively, and explain the fundamental causes of the contrasts between these areas.

CHAPTER II

CLIMATE

Wind Systems.—Over much of Europe, oceanic influences play a very great part in determining the climatic conditions, and the belts of wind systems which are developed over the oceans are therefore important. Since these belts lie in certain latitudes, the position of Europe as regards latitude must be first noted. On its southern margin, Europe forms the northern part of the Mediterranean area; Gibraltar is about lat. 36° N. In the north of Europe the Scandinavian peninsula extends well beyond the Arctic Circle; North Cape is about lat. 71° N.

As a consequence of this position, all the continent except the east, i.e. Peninsular Europe as distinct from Trunk Europe, comes under the influence of the great system of winds known as the "westerlies," which appear on wind maps as blowing from a more or less westerly direction, that is, from the neighbouring Atlantic Ocean, whose waters are exceptionally warm for their latitude because they have been brought from tropical regions by the Gulf Stream Drift.

It may therefore be deduced that the climate of Europe, in so far as it is determined by these westerly winds, is not only made equable, but on the average is exceptionally warm for its latitude; further, it may be deduced that these winds bring water-vapour which is precipitated as rain or snow over the land, especially on the windward side of the highlands.

But though there is truth in these ideas, there is the complication that the westerlies are not by any means constant, even in those parts where the maps show that the prevailing winds blow from the west in all seasons. In England, for example, the "prevailing" winds may be shown on a climate map as coming from the south-west, but this is the actual direction of the winds only for about 20 per cent. of the observations. Indeed, the most characteristic fact about the winds experienced in England is that they frequently change, depending upon the passage of low-pressure systems called "lows," "depressions" or, less

frequently, " cyclones," or upon the development of high-pressure systems or anticyclones.

Hence the belt of the westerlies may be usefully considered as a belt in which depressions are common and travel in a generally west-to-east direction. In these depressions are two main streams of air, one coming from a south-westerly or

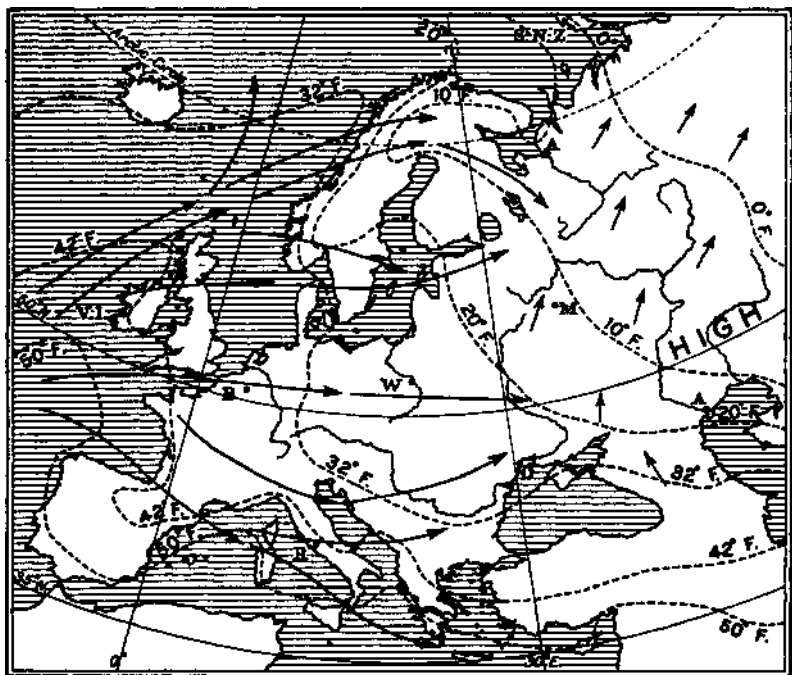


FIG. 7_JANUARY " LOW " TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean January temperatures reduced to sea-level.

southerly direction and bringing warmth and usually rain, the other coming from a north-westerly, northerly or easterly direction and bringing cool and dry weather. As the depressions pass over a given place, there are accordingly changes in the weather as the warmer and the cooler air-streams cover the area in turn ; on the whole, however, the " lows " bring rain, and on their southern side warmth, although cold weather may be found on their northern side. Since the centres pass most frequently over the northern part of Europe, it is their southern sections, with warmth and rain, which most affect the continent.

As the central parts of depressions are areas of low air-pressure, the regions over which they are most commonly found necessarily appear on maps showing the average barometric pressures as areas of lowest pressure, e.g. that between Iceland and north-western Europe.

On the contrary, anticyclonic conditions are marked by high

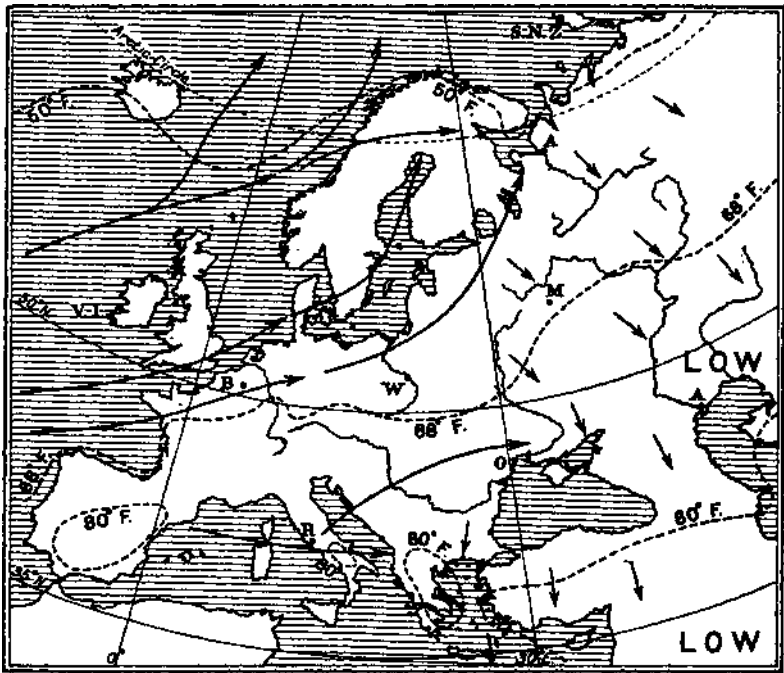


FIG. 8.—JULY "LOW" TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean July temperatures reduced to sea-level.

pressures, gentle winds or calms, and dry weather. Such conditions only occasionally develop within the belt of the westerlies, but they are more common on the southern side of this belt, that is, in the sub-tropical latitudes to the south of Europe, where the climate maps show relatively high average pressure.

Hence, one may shortly say that western Europe is in general under the influence of the belt of the cyclonic, rainy westerlies, while to the south of Europe lies the belt of sub-tropical calms and droughts.

The two belts, however, are themselves not always in the same latitudes, but shift with the sun, southward in winter and northward in summer. Consequently in winter the westerlies cover the whole of western Europe, and their depressions may fairly often pass over the Mediterranean area. In summer, on the other hand, the depressions leave the Mediterranean relatively free, especially in the east, and the south of Europe frequently experiences the calms and drought of the sub-tropical belt of high pressure.

In Figs. 7 and 8 the long arrows show the tracks commonly followed by the centres of "lows," but it must be understood that the area covered by a depression is normally very considerable ; if the centre passes over Berlin, for instance, its influence would probably extend from central Scandinavia in the north to the northern Adriatic in the south. Bearing this in mind, it will be seen from the maps that in winter cyclonic conditions characterize the whole of Peninsular Europe, while in the summer they are generally less frequent, particularly in the Mediterranean region.

In eastern or Trunk Europe the depressions have less influence, for they tend to pass over seas rather than lands, and when they do penetrate the great land-mass, they diminish in intensity. The climate of eastern Europe is therefore more closely related to that of Asia ; it is marked by a reversal of the conditions as between summer and winter which is associated with the monsoonal changes of the greater continent.

In summer the heat sets up a system of continuous low pressure over Asia towards which the winds blow inwards, though deflected, by the earth's rotation, to the right of the most direct path ; consequently in the east of Europe they commonly blow from a more or less north-westerly direction, as is shown by the short arrows in Fig. 8. Even in the eastern Mediterranean this influence is felt, and the prevailing northerly winds of this season were there known to the ancient Greeks as the " Etesian " or " annual " winds, whose onset marked the beginning of uninterrupted easy navigation for their small ships.

In winter the continental land-mass is cooled, high pressure is more continuously developed and the air tends to move outward. The winds, deflected to the right of their direct outward path, usually blow from a more or less southerly direction over most of eastern Europe (see Fig. 7), though in the Mediter-

ranean region they are more frequently interrupted by the passage of cyclones.

Temperatures.—The wind systems combine with the direct heating effect of the sun to determine the temperature conditions,

In the summer the sun's direct influence is the greater, as may be seen from Fig. 8, in which are shown the isotherms drawn from the records of the mean monthly observations of air temperatures in July. (To simplify the maps, the temperatures have been reduced to sea-level; consequently the uplands and highlands have cooler conditions than are indicated.) Where the sun is relatively high in the sky, that is, in southern Europe, the heat is greatest, and over the southern parts of the three peninsulas the lowlands have mean temperatures at, or even over, 80° F. during July. In the far north the temperatures are at about 50°. The course of the isotherm of 68° is worth noting: in the Atlantic area it is well to the south of latitude 50°, for the ocean is relatively cool; in eastern Europe it passes considerably to the north of this latitude because the continental mass is greatly heated by solar radiation; in central Europe the isotherm runs almost along the line of latitude, and places east and west of one another have about the same summer temperatures.

It is convenient to say that when the mean temperature is above 68° F. (20° C.) the climate is "hot"; when between 68° and 50° F. (20° and 10° C.) it is "warm"; when between 50° and 32° F. (10° and 0° C.) it is "cool"; and when below 32° F. (0° C.), it is "cold." Adopting these terms, we may point out that the temperature map shows that in July the climate of most of Europe south of latitude 50°, together with all south-eastern Russia, is hot, that of most of Europe north of latitude 50° is warm, but the lands adjoining the Arctic Sea are cool.

The January map indicates marked contrasts, for in the latitudes of Europe the winter sun is visible for a shorter time in the day and is lower in the sky than in the summer; consequently the sun has much less effect and the winds have relatively more influence, as they bring warm air from the Atlantic Ocean.

The isotherm of 50° is now the highest and, away from the Atlantic, only the southern Mediterranean lands have this temperature. This is due partly to the latitude and partly to the influence of the Mediterranean Sea itself, for this sea remains remarkably warm in the winter because it is shut off

TABLE OF CLIMATIC CONDITIONS

Climate Stations		Lat. N.	Height above Sea-level (Feet)	Temperatures (Deg. F.)				Precipitation (Inches)				
				Mean Monthly		Mean Annual		Annual Total	Seasonal Totals			
									Win. D.J.F.	Spr. M.A.M.	Sum. J.J.A.	Aut. S.O.N.
				Jan.	July	Min.	Max.					
Arctic	South of N. Zemlya	72	50	2	44	—	—	6	0.9	0.8	2.2	1.7
Boreal	Haparanda	66	10	11	59	—27	81	19	4.0	3.2	5.4	6.6
	Archangel	65	50	8	60	—32	84	17	2.5	2.7	6.6	5.0
Sub-boreal	Stockholm	59	150	27	62	—2	83	21	4.6	4.2	7.0	5.5
	Moscow	56	500	12	66	—17	88	21	3.5	4.6	7.7	5.2
Oceanic Temperate	Bodo	67	10	30	55	7	75	36	9.1	6.3	7.7	12.5
	Bergen	60	70	34	59	12	79	84	24.5	15.2	17.6	27.0
	Valentia Is.	52	30	45	59	28	72	56	17.3	11.4	11.8	15.2
	Brest	48	180	43	64	23	90	32	9.5	6.2	6.2	10.6
	Santiago	43	890	45	66	28	95	65	21.7	17.1	6.9	19.1
Mid-Temperate	London	51	20	39	63	18	88	25	5.6	5.2	7.3	7.0
	Brussels	51	200	34	63	14	88	30	6.6	6.0	8.7	8.3
	Paris	49	180	37	65	12	93	21	4.1	4.8	6.0	5.9
	Karlsruhe	49	390	33	66	8	91	38	7.3	8.7	12.1	9.7
	Lyons	46	570	36	70	10	95	40	7.0	8.7	10.1	11.1
	Milan	46	480	34	75	14	93	40	7.7	10.2	9.3	12.5
	Bordeaux	45	250	41	68	18	95	33	8.0	8.0	7.4	10.0
Interior Temperate	Konigsberg	55	20	27	63	—2	90	25	4.1	4.6	8.8	7.8
	Berlin	52	160	31	64	7	91	23	5.0	5.0	7.6	5.1
	Warsaw	52	440	26	66	6	90	22	3.8	4.7	8.5	5.0
	Munich	48	1,700	27	63	0	86	35	4.8	8.6	14.2	7.6
	Budapest	47	500	28	70	10	91	25	4.6	7.0	7.0	6.7
	Sona	43	1,800	27	69	2	95	26	4.3	7.1	8.0	6.2
Mediterranean	Genoa	44	180	45	75	28	90	52	13.2	11.7	6.9	20.3
	Marseilles	43	250	43	72	21	91	22	5.2	5.2	2.8	8.3
	Borne	42	160	44	77	27	95	32	9.8	7.7	3.2	11.9
	Oporto	41	270	48	67	32	93	48	15.8	13.4	3.4	15.4
	Madrid	40	2,100	40	76	18	104	16	4.0	5.4	2.1	4.9
	Valencia	39	70	49	75	32	99	19	4.5	4.8	1.6	8.2
	Palermo	38	230	50	76	39	99	29	11.7	6.7	1.5	9.3
	Athens	38	350	49	81	28	100	15	5.9	2.9	1.4	5.2
Steppe	Orenburg	52	360	4	72	—23	97	15	3.1	3.3	5.0	3.7
	Odessa	46	210	26	73	0	91	16	2.9	3.5	5.6	4.1
	Bucharest	44	280	25	73	—4	95	23	4.0	6.2	8.0	4.9
Arid	Astrakhan	46	—50	19	77	—15	97	6	1.3	1.5	1.7	1.3

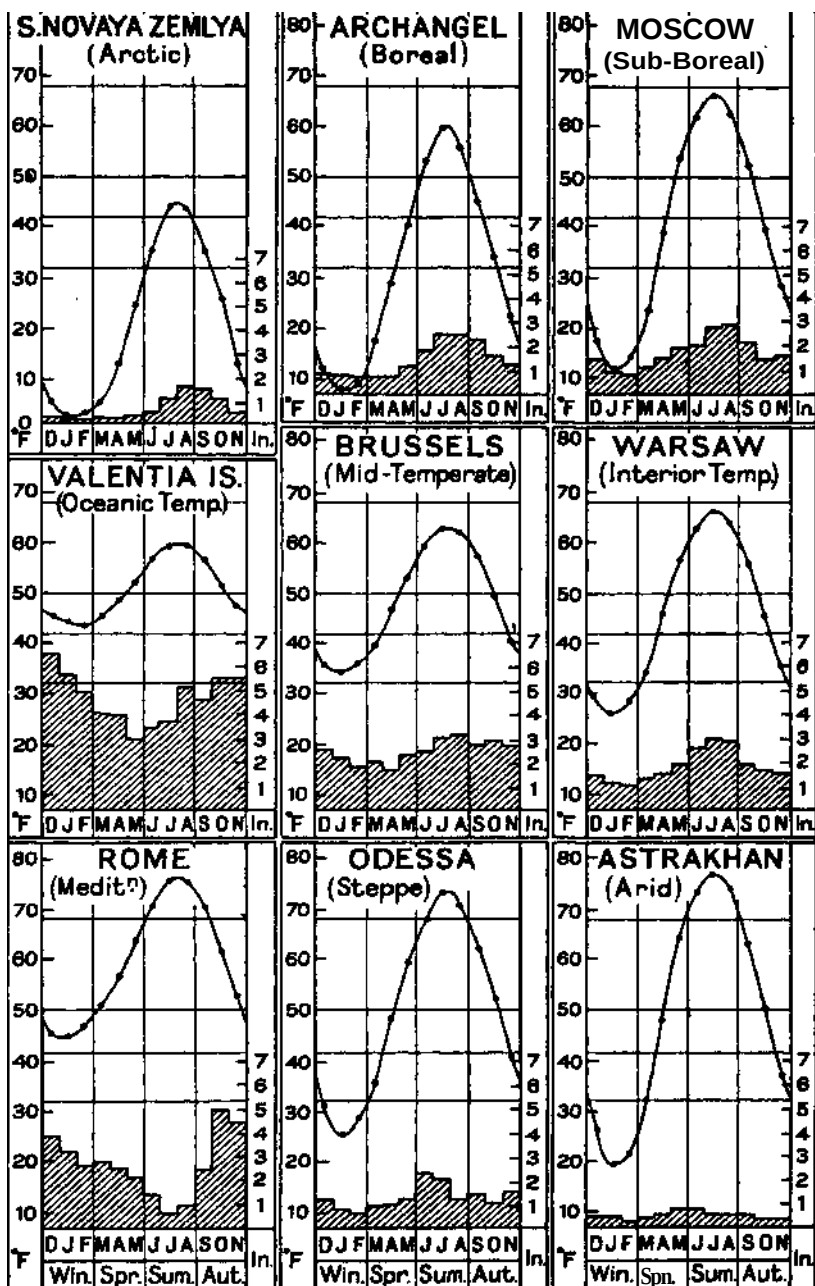


FIG. 9.—TEMPERATURE AND RAINFALL GRAPHS OF CLIMATIC TYPES.

from the cold waters in the depths of the Atlantic by the narrow and shallow entrance at the Strait of Gibraltar.

Most of the other isotherms of the January map have a course broadly similar to that of 50° : in the Atlantic area they run from north to south, showing that the oceanic west is warmer than the continental east, while towards the interior of Europe they run more from west to east because it is colder in the north, where the sun has very little effect.

The isotherm of 32° F. is of special interest, for it marks out an area to the east and north of it where, during a normal January, the average temperature is below freezing-point. As a consequence, within this area, precipitation in January normally takes the form of snow instead of rain, and if the snowfall is heavy there is a snow-cover to the land lasting for at least a month. Moreover, except in a narrow belt adjoining the course of the isotherm, inland waters are normally frozen over and harbours are closed by ice for a month or more ; the chief exception to this latter rule is that the warm Atlantic waters drifting along the coast of Norway keep the harbours of all the west coast of Scandinavia open throughout the year. The extremely cold winters in north-eastern Europe should be observed ; in the neighbourhood of the northern Ural Mountains the mean temperature in January is 0° F., i.e. 32° below freezing-point.

Employing the terms " cool," " cold," etc., as stated above, we may summarize the conditions in January by saying that in eastern Europe as a whole, together with most of Scandinavia and the eastern part of central Europe, the climate is cold ; in most of western Europe it is merely cool, while the south of the Mediterranean area has even warm conditions in this month.

By comparing the mean temperatures in January with those in July, as shown either on the maps or in the table on p. 26, it may be seen to what extent the climate of any place may be regarded as extreme or equable. Subtracting the figure for January from that for July, the annual range is obtained : e.g. for Valentia Island it is only 14° , for Warsaw it is 40° and for Moscow it is 54° . A climate with an annual range of about 30° or less may be regarded as equable, and western Europe as a whole and most of the coast-lands around the Mediterranean Sea have an equable climate. One with an annual range of over 40° is extreme, and all eastern Europe has an extreme climate.

Between these well-marked types comes central Europe, transitional in this respect.

The map of mean temperatures for January shows the average reading of the thermometer in that month, but the actual conditions are at some times above, and at other times below, this average ; hence the winter temperatures are at times more severe than the mean temperature suggests. The lowest temperature which is normally experienced in winter (i.e. the average of the lowest taken over a number of years) is called the mean annual minimum, and for certain stations is given in the table on p. 26. In this table it will be seen that, for example, while the mean January temperature at Moscow is 12° F. (20° below freezing-point), the mean annual minimum is -17° F., i.e. 29° lower (49° below freezing-point). Again, at Archangel the normally lowest reading in January is -32° F. (64° of frost).

Similarly the July map shows the mean temperatures for that month, but the summer temperatures actually rise much higher than these ; the table shows that while at Moscow, for example, the mean July temperature is 66° F., the mean annual maximum, which is the mean of the highest July readings, is 88° F. In the south of Europe the mean annual maximum at Athens is 100° , and at Madrid it reaches even 104° F.

All the conditions hitherto considered relate to those of the coldest or hottest months, but it is also important to know what is happening during other times of the year. This is to some extent shown by the graphs in Fig. 9, which indicate by dots the mean temperatures of each month and join these by curves depicting the normal " march of temperature " throughout the year. From such curves useful deductions may be made ; for instance, at Moscow the mean temperature falls below freezing-point (shown by the line at the level of 32° F.) about the beginning of November and does not rise above it until about the end of March ; we may therefore conclude that normally there is a period of frost lasting about five months. Similarly it may be deduced from the graphs that the period of frost at Archangel is about six months, while at Warsaw it is rather more than three months ; a map showing by lines the lengths of the normal period of frost in all parts of Europe is given in Fig. 10.

Another example of the deductions that can be made from graphs of the normal march of temperature is the duration of the " warm " period, i.e. the time during which the mean

temperature is above 50° F. (10° C). At Valentia Island, off south-west Ireland, the curve rises above the 50° F. line at the beginning of May, and falls below the 50° F. line again near the end of October; the warm period therefore lasts about six months; compare the curve for Archangel, where the warm period lasts only about three months. A map showing the

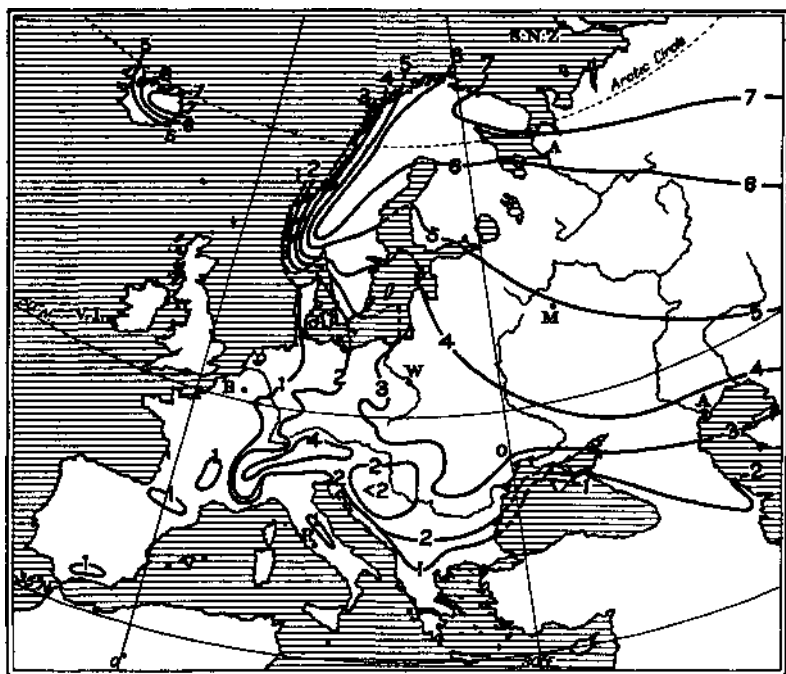


FIG. 10.—DURATION OF FROST PERIOD.

Note.—The lines show the number of months during which the mean temperature is below freezing-point (32° F., 0° C), the calculations being based on actual temperatures (not reduced to sea-level). On the Alpine margins the lines of 3 and 4 months are so close that the former has been omitted, and for a similar reason the 1-month and 2-month lines have not been separately indicated on the margins of the SE. Alps and Dinaric Alps. Note that the area of the Central Danubian Lowlands, marked < 2, has a period of less than two months of frost.

duration of the warm period in all parts of Europe is given in Fig. 11.

From the point of view of the relation of climate to plants the mean temperatures for the hottest month give a very inadequate idea of the temperature conditions which affect growth. For example, the figures for July show that the mean midsummer temperature is about the same at Valentia Island as at Archangel, and yet the graph shows that the warm period is twice as long at the former place as at the latter.

An important fact regarding the relation of climate to plant-life is that for a number of plants growth can begin only when the mean temperature rises above about 42° F. (6° C). This level is shown by another horizontal line on the temperature graphs, and it may be deduced from the curves that, for example, wheat can begin to grow earlier at Brussels than at Moscow, although the latter place has a higher midsummer temperature.

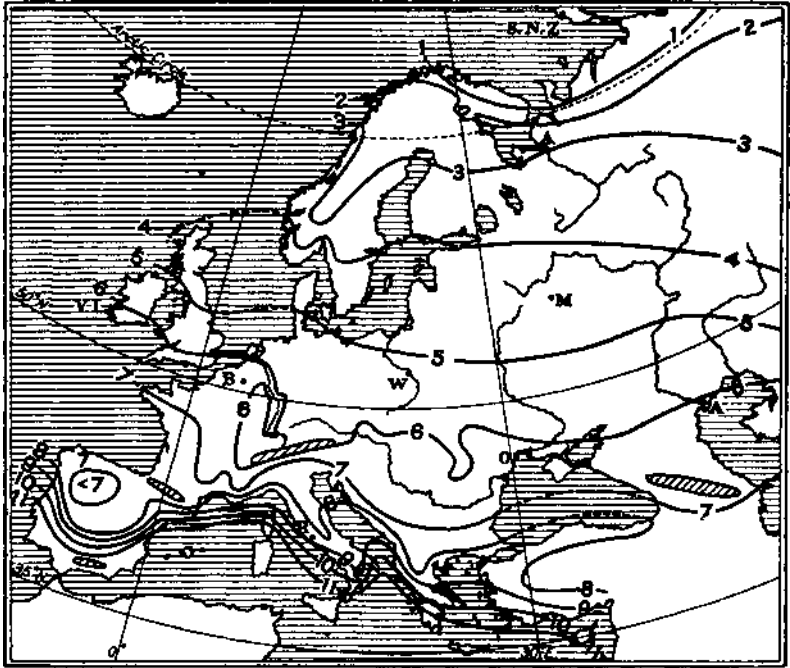


FIG. 11.—DURATION OF WARM PERIOD.

Note.—The lines show the number of months during which the mean temperature is above 50° F. (10° C), the calculations being based on actual temperatures (not reduced to sea-level).

Conditions in the Alps and other high mountain regions vary so greatly that these areas have been excluded from the map. Note that in the interior of Spain an area marked < 7 has a period of less than seven months of warmth.

Precipitation.—The next element of climate to be considered is precipitation in the form of rain or snow, and this study may well be begun in connexion with the wind systems for July and January respectively.

In July, depressions advance from the Atlantic over northern and central Europe, and since in them the warmer air from the Atlantic rises, it is cooled and water-vapour is precipitated in the form of "cyclonic rains." In eastern Europe the prevail-

ing winds come from the north-west, and have sufficient water-vapour for rain to occur, although in less amount than in the west (see Fig. 13). The greatest precipitation is on the highlands which compel the air currents to rise and to produce "relief rains." In the Mediterranean region and in southern Russia depressions seldom occur, and cyclonic rains are therefore slight, though relief rains give a rather better water-supply

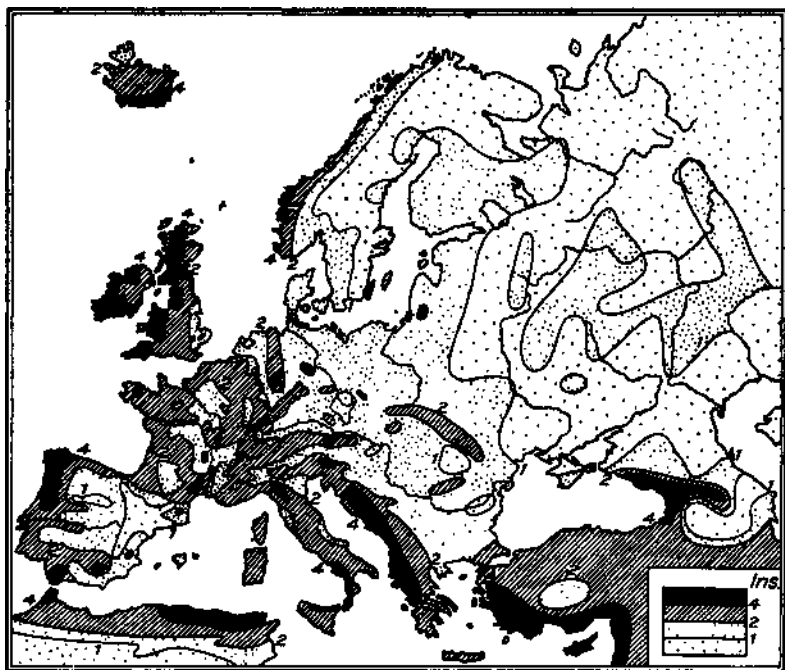


FIG. 12.—MEAN JANUARY PRECIPITATION.

to the mountains, especially to the Caucasus. In the far north there is little rainfall, even in connexion with the depressions, for the cool air can hold but little water-vapour and though the air is further cooled by ascent only a small precipitation can result.

Where cyclonic influence is weak, settled weather is the general rule, but during a period of such weather in summer there may occur thunderstorms and heavy rains, due to the relatively great heating and the consequent rising of the air in particular localities ; such " convectonal rains " account for a considerable proportion of the precipitation in central and eastern Europe.

In January, depressions normally affect the whole of the continent except the extreme east, and where the air is warm enough to contain much water-vapour, precipitation may be considerable. This is the case particularly along the Atlantic margins, where there are the heaviest rains, and in the Mediterranean region ; moreover, on the highlands relief rains add to the total (see Fig. 12). But away from the relatively warm areas adjoining the Atlantic and the Mediterranean the air is so

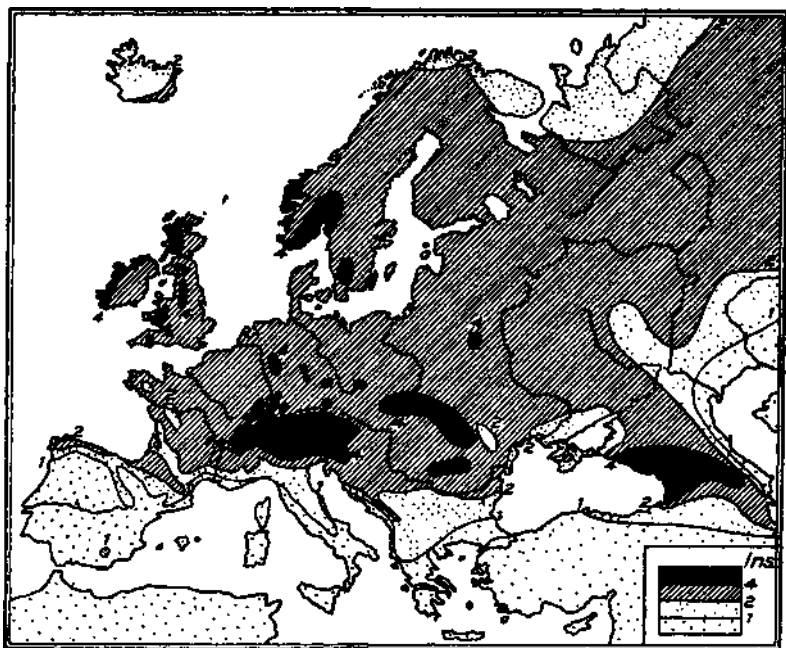


FIG. 13.—MEAN JULY PRECIPITATION.

cold that it can contain little water-vapour and precipitation is generally slight, though relief rains, or falls of snow, occur on the highlands. (In reading maps or statistics of precipitation, it must be remembered that in their compilation one foot of snow is taken as the equivalent of one inch of rain.) In eastern Russia the cold, out-blowing air from the Asiatic high-pressure area is necessarily dry, and this part of Europe would be rainless in winter but for occasional depressions.

The maps for January and July are in general indicative of the whole of the winter and summer seasons respectively ; this

can be seen by the rainfall graphs in Fig. 9, in which the three winter months of December, January and February and the three summer months of June, July and August are marked off by vertical lines.

The rains of spring and autumn are equally important, but as they are to a considerable extent transitional between the more extreme conditions of winter and summer, they are more evenly distributed over the continent. Near the Atlantic and in the Mediterranean region, however, the autumn rains are frequently heavier than those of any other season. These statements about the rainfalls of spring and autumn should be verified by examining the graphs for the stations given in Fig. 9 and the accompanying page of statistics.

A useful summary of the distribution of precipitation during the year at any particular place can be made by adding together the amounts in each group of three months to get the totals for the four seasons respectively, and this has been done for certain places in the table on p. 26. Further, the total for the whole year for the selected stations is given in the same table, and the distribution of the total annual precipitation over the continent is shown by the map in Fig. 14.

By putting together the facts given in the maps, the graphs and the table, a fairly complete idea of the precipitation can be obtained, and some of the main conclusions may be summarized as follows : (i) The regions adjoining the Atlantic have a heavy rainfall fairly well distributed through the year, although greatest in autumn and winter, (ii) Central Europe has an annual total varying according to elevation, considerable on the highlands and moderate on the lower lands ; on the whole, the rainfall is fairly evenly distributed through the year, although the greater amounts occur in summer and autumn and the tendency to a summer maximum increases towards the interior, (iii) Eastern Europe, including most of Scandinavia, has a rather small total precipitation with a summer maximum, and in the extreme north-east and south-east the amounts at all seasons are very small indeed, (iv) In the Mediterranean region the total annual rainfall varies from being very considerable on the highlands behind the Adriatic to being very slight over most of eastern Spain, but the common characteristic is that of summer drought; in the northern part of the Mediterranean region the period of drought is short, but towards

the south the period becomes longer and the intensity of the drought may be severe.

Indeed, throughout all southern Europe, including the south of Russia, the summer is normally a time of drought, for the high temperatures cause rapid evaporation, and the efficiency of what precipitation may occur is thereby greatly reduced. Conversely, in northern Europe evaporation is much less and the rainfall is correspondingly more effective.

Another important consideration is the variability of the rainfall from year to year. This variability is, in the main, greatest where the total amounts are least, and it is consequently quite considerable in the east and in some parts of the Mediterranean region. Moreover, while in a well-watered region a decrease from the average is not a serious matter, in the areas of scanty rainfall it may have calamitous results; thus, in particular years the normal summer drought of the Mediterranean may be unusually prolonged and may even become disastrous, while in southern Russia in years of sub-normal rainfall harvests fail and famines result.

One more point must be noted: when there is little rainfall either during the whole year or during one season of the year, that rainfall tends to occur in short, sharp downfalls; this is frequently the case in the Mediterranean region and with the summer thunderstorms of eastern Europe. A rapid fall means that the immediate run-off of water to the streams is great, and the plants cannot use so much of it; also, after the rain bright weather quickly follows, and evaporation may dispose of much of the water and thus further reduce the value of the already small precipitation. The rapid run-off, moreover, tends to wash away the soil, and therefore soil erosion is a serious factor in the utilization of the Mediterranean and other areas of short and sharp rainfall.

Other Climatic Elements.—The frequent passage of depressions over the Atlantic margin has effects upon the climate of that region besides the equability of the temperature and the heavy precipitation; there are, for instance, the facts that the winds are often violent and the sky covered with cloud. On the contrary, the relative absence of depressions in the Mediterranean region, even in winter, allows a clearness of the sky and an abundance of sunshine which are important factors in attracting visitors from north-western Europe. Similarly eastern Europe has in general clearer skies than the west.

The importance of the element of light in climate is, of course, great, and in this connexion latitude is the main factor. In northern Europe, which lies near and even beyond the Arctic Circle, there is a very marked contrast between winter and summer. In summer the days are very long, and within, the Arctic Circle the sun is above the horizon for the whole of the twenty-four hours during a period which at the Arctic Circle is

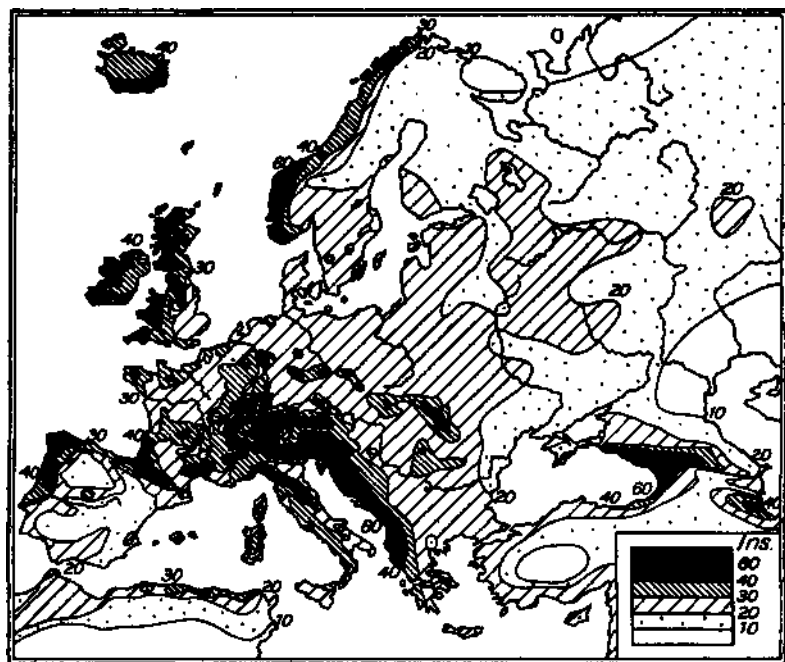


FIG. 14.—MEAN ANNUAL PRECIPITATION.

limited to one day, but at North Cape in Norway extends to over two months.

Conversely, at midwinter the sun is invisible at the Arctic Circle for twenty-four hours, and at North Cape for more than two months. Moreover, even during the short periods in winter when the sun is visible, it rises but little above the horizon.

Climate Regions.—The various elements of climate, e.g. winds, temperature, precipitation and light, of course all exist in the closest association ; they influence one another and have a combined effect upon other geographical phenomena and upon mankind. Regarded in this way, climate is seen to differ very

markedly in different parts of Europe, and it is useful to divide the continent into several regions, in each of which the climate has distinct characteristics. Yet climatic regions seldom have definite boundaries, and it must therefore be emphasized that, when maps are made like those in Fig. 15, the various regions usually "shade off" into one another and the descriptions are only generalizations which apply best to the central parts of the respective regions.

It is convenient, however, to draw lines to serve as approximate boundaries of climatic regions, and for this purpose two devices are commonly employed. In the first place, there are lines based upon meteorological records, like those drawn on the maps showing the conditions of temperature and precipitation. Such lines may be without much significance if they are based merely upon some arbitrarily selected numbers, such as 68° F. (rather than 70° F.), or a duration of frost for one month (rather than three weeks), or a rainfall of 10 inches (rather than 12 inches). It is often better, therefore, to employ the second device, i.e. the adoption of some more natural indication of the climates, and for this purpose vegetation, either natural or cultivated, is a useful guide. In the following chapter the main types of vegetation will be described, and it will there be pointed out how these types are related to climatic conditions ; in some cases it appears that the limits of the growth of particular plants correspond with a line indicating certain climatic conditions ; e.g. the northern limit of trees is found where the period of warmth (over 50° F.) decreases to one month. Hence the line indicating this condition on the map in Fig. 11 has been adopted on the map showing climatic regions (Fig. 15) as separating the "Arctic" from the "Boreal" type of climate. Similarly the other lines showing boundaries to climatic regions have been adopted because of some special significance which will be stated when the climates are described.

The conditions of the climates of Europe may now be summarized in the following paragraphs :

The Arctic climate is experienced around the Arctic Sea, and in the main within the Arctic Circle. Its "winter" is very long, with about seven months of frost, very cold, and for a considerable period almost sunless ; for most of the year the ground is covered with snow, and the subsoil is always frozen. The "summer" is correspondingly short, and although at mid-

summer the daylight is practically continuous, the sun is low in the sky; consequently the mean temperatures rise little above the limit of plant growth, and that only for a short period. Most of the scanty precipitation comes during the time of relative warmth, and is therefore available for plant-life; moreover, evaporation is little and the "effectiveness" of the precipitation is considerable.

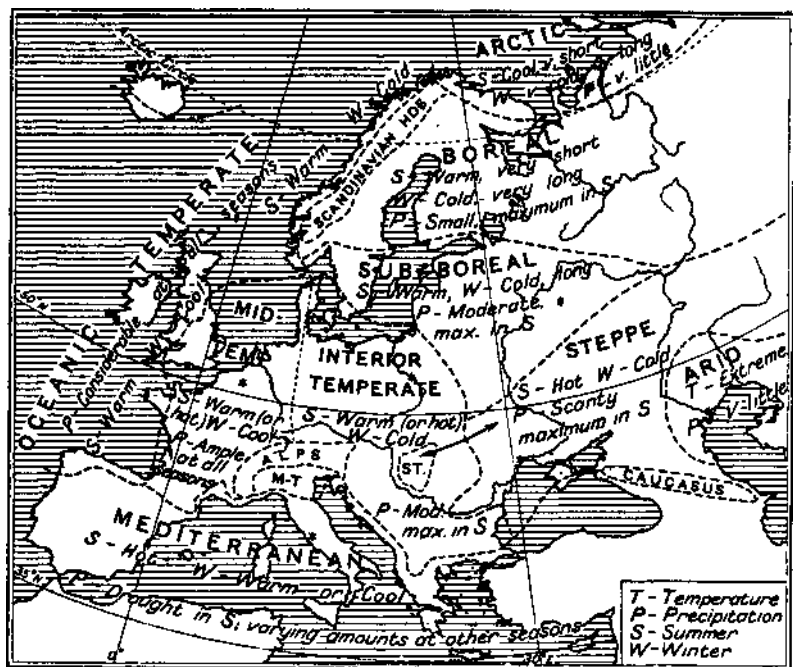


FIG. 15.—CLIMATE REGIONS OF EUROPE.

Note.—In all regions, the uplands or highlands show modifications of the general conditions, but the Alps, Caucasus and Scandinavian Highlands are shown as independent regions.

Except in areas of very marked relief, the boundary lines represent transitional belts rather than definite divisions between the regions. The asterisks indicate the situation of the stations for which graphs are given in Fig. 9.

The *Boreal climate*, or northern climate, is so called because it extends over much of the northern lands of the world which border upon the Arctic Circle; in Europe the belt begins immediately behind the Scandinavian Highlands, which largely exclude it from Atlantic influences. The cold is about as severe as in the Arctic climatic region at midwinter, but it has a shorter duration, and the thick cover of snow due to the winter precipitation lasts for less than half the year. In spring there is a

rapid rise of temperature above the limit of plant-growth, and the summer has from one to four months of warmth, with a small but effective rainfall. The contrast between the light conditions in summer and winter is very marked, though not so extreme as in the Arctic region.

The Sub-boreal climate is transitional between those of markedly continental character and those largely influenced by the Atlantic Ocean; it is experienced in a region in which Atlantic influence can just penetrate into eastern Europe, between the barriers of the Scandinavian Highlands on the north and the Alps and Carpathians on the south. The annual range of temperature is not much less than that of the European part of the boreal climatic region, but both in summer and in winter the temperatures are higher. The period of warmth lasts four months along the northern limit of this region, and increases southward. Also, during this period as well as during the rest of the year there is greater precipitation than in the boreal region. Hence conditions are more favourable for plant-growth, and for the utilization of the resources by man, than under the boreal type of climate.

The Steppe climate is a convenient label to apply to those conditions under which have developed the various forms of steppe vegetation which will be described in the next chapter. This type of climate, like all the others of eastern Europe except the transitional sub-boreal type, is definitely continental and extends far into Asia. It is exceptionally complex, especially as regards the interaction of the temperature and the precipitation, and demands a separate consideration of each of the four seasons.

For about three months or more there is a winter during which the mean temperature is below freezing-point, and for a considerable period the ground is covered by snow. In spring there is a rapid rise of temperature above the limit of plant-growth, and this growth is aided by the melting of the snow-cover and by a moderate amount of rain. In summer the precipitation as recorded by a rain-gauge is greater, but it tends to occur in heavy and short showers, while the weather becomes "hot" (over 68° F.) for about three months; consequently evaporation is great, the effectiveness of the rainfall is small, and the summer is a season of drought during which plant-growth ceases. In autumn, as in spring, the temperatures are moderate,

and the rainfall is consequently more effective ; yet it falls upon parched ground, and a reawakening of vegetable life is soon followed by the cold of winter.

As the complex climatic conditions are closely reflected in the periods of growth and rest which are characteristic of steppe vegetation, the approximate limits of this vegetation are here taken as the boundaries of the region.

In addition to southern Russia, there is an area in the central Danubian Lowlands which has a climate of this type, and may therefore be regarded as an " exclave " of the main steppe region.

The Arid climate is characteristic of the Caspian-Aral depression in the heart of the Eurasian continent, and is therefore only experienced on the south-eastern margin of Europe.

While in the north of the continent it is low temperatures which cause limitation of certain forms of life and activities, and while in the steppe region both the cold in winter and also the drought in summer are the critical phenomena, here in the Caspian-Aral region the precipitation is so scanty, irregular and ineffective, that aridity is the characteristic of the region during the whole year.

That is not to say that the temperature conditions are negligible. In the first place, the ineffectiveness of the precipitation is due to the high summer temperature, for a rainfall of less than 10 inches per annum, which here marks out the arid region, is accompanied by wet surface conditions in summer in north-eastern Europe. In the second place, the extreme character of the climate is in itself of geographical importance ; during the year a " cold " winter, which lasts about three months, is followed by a spring in which the climate rapidly passes through the " cool " and " warm " stages to a summer during which the weather is " hot " for three months, while the mean and maximum temperatures are among the highest in Europe.

The Temperate climate.—None of the regions of eastern Europe has climatic conditions which can be considered " temperate,"¹ for they all experience either considerable heat or considerable cold at some season of the year. In the south-east, moreover, there is a period of deficient moisture, and this characteristic of seasonal drought exists also in the Mediterranean lands.

¹ In accordance with the dictionary definition: " temperate = moderate in degree of any quality . . . cool, mild, moderate in temperature...."

Only in north-western and central Europe is there a comparative moderation of climatic conditions throughout the year ; hence the term " temperate " is restricted to the climate of this region. Within this region, however, conditions are by no means uniform, and three varieties of the temperate climate may be distinguished in Europe.

The Oceanic Temperate climate of the Atlantic margins of north-western Europe is markedly affected by depressions, accompanied by strong or even violent winds and by precipitation which, though heaviest in winter and autumn, is abundant at all seasons. The frequency of winds from the warm waters of the Gulf Stream Drift results in the warmth of the winters and the marked equability of the climate.

The extent of the region thus affected by the westerlies at all seasons is great from south to north ; hence there are considerable differences, especially as regards temperature, between the areas bordering on the Mediterranean climatic region at the one end, and those beyond the Arctic Circle at the other. Contrast the figures given in the table on p. 26, for Santiago in Spain, for Valentia Island, and for Bodo just within the Arctic Circle on the Norwegian coast.

The region which may be termed oceanic is clearly limited inland by the Scandinavian Highlands in the north, and almost as clearly by the uplands of the Iberian Peninsula ; but between these extremes there is a more gradual transition towards central Europe. In the British Isles the English lowland is less equable and less rainy than the uplands of the west and north, and may be better classed with the region next treated.

The Mid-Temperate climate has rather warmer summers, and the winters are so much less influenced by the maritime influences that there is a period during which plant-growth is checked ; also the precipitation is not so heavy. Except in the winter the conditions of heat and water-supply are sufficiently favourable to allow a considerable variety in the forms of plant-life which can here develop.

The North Italian Plain may be grouped with the warmest part of the Mid-Temperate climatic region, for its temperature and rainfall conditions closely resemble those of the nearest part of this region, viz. the Rhone Valley just below Lyons. (Compare the figures for Milan and Lyons in the table on p. 26.)

The Interior Temperate climate shows a further reduction in

the effects of proximity to the ocean. Apart from the higher areas, on which the temperatures are necessarily lower, a line drawn southward from the peninsula of Jutland separates the regions south of the North Sea, where in the coldest month the mean temperature is above freezing-point, from those south of the Baltic Sea, where the winters have a cold period lasting one, two or three months. Also, the precipitation is lower, and has a maximum in summer.

Eastward, conditions gradually approach those of the sub-boreal and steppe climatic regions, and it is convenient to take as the eastward boundary the approximate limit of the beech, which, because of its need for a fairly long vegetative period, is often regarded as a criterion of temperate as distinct from continental conditions.

The region extends far to the south-east, the main modification being a lengthening of the warm period and an increase in the midsummer heat, as may be seen by comparing the July temperatures at Berlin and Budapest.

The Mediterranean climate requires separate consideration for each season. In winter the temperature is almost everywhere above the limit of growth, and in the southern part it is definitely warm, while the rainfall is considerable ; hence neither plant-growth nor the outdoor activities of man need cease. In spring there is everywhere warmth, and in most parts there is sufficient rainfall for the processes of plant-life, enabling flowering, fruiting and ripening to continue. In summer there is a period of three months or more of heat (above 68° F.), and the maximum may be very high ; the rainfall becomes scanty or even fails, and with the high temperature this season is one of drought in which plant-growth ceases, except for deep-rooted types. In the autumn there is still warmth, and usually sufficient rainfall for a resumption of the growth of vegetation ; indeed, in much of the European part of the region the autumn is the season of maximum precipitation.

It is convenient to summarize the more striking features of the Mediterranean type of climate as "winter warmth and summer drought," but, as in the case of the steppe type, no simple meteorological formula can adequately express its character. For this reason the limit of the growth of the olive,, the most typical plant, is adopted as the northern boundary of the Mediterranean region save where, as in the interior of the

Iberian Peninsula, altitude modifies the climatic conditions and prevents the growth of this plant. (Compare the map showing the distribution of the olive in Fig. 18 with that of the climate regions.) It should be noted that, apart from the special case of the interior of the Iberian Peninsula (which will be discussed in a later chapter), the Mediterranean climate in Europe is rather closely restricted to the coast-lands of the Mediterranean Sea, together with the southern shores of the Crimean Peninsula.

Uplands and Highlands.—To simplify matters, it is lowland conditions which have been indicated in the text and in the map of climatic regions. In some parts, however, there are considerable complications, due to the lower temperatures and the greater precipitation which occur with higher altitudes. Such modifications will be taken into account in the more detailed regional studies which will follow, but here, and on the map in Fig. 15, attention can only be briefly drawn to the outstanding highland regions of the Alps and in Scandinavia. In several respects the latter highlands continue southward the characters of the Arctic climate, while conditions in the Alpine region are so complex that they must be specially described in a later chapter.

QUESTIONS

1. State the characteristics of the wind-belts which affect Europe. Explain how they influence different parts of the continent.
2. Draw a graph showing the annual "march of temperature" at any one place you name. Show (a) what deductions you can make from the graph, and (b) its incompleteness as a record of the temperatures.
3. For any one selected part of Europe, state and account for the essential characteristics of its rainfall.
4. Discuss whether it is possible to find and express definite limits to climatic regions.
5. Examine the truth of the statement that the critical element of climate in Europe is temperature in the north, and rainfall in the south.
6. "The Mediterranean climate has a mild winter and dry summer." Show in what ways this dictum is too simple.
7. Trace the normal succession of climatic conditions through the seasons in the steppe-lands of Europe.
8. Show by reference to one or more particular regions how the various elements of climate interact with one another.
9. To what extent can the climate of "Peninsular Europe" be regarded as a contrast to that of "Trunk Europe"?

CHAPTER I I I

VEGETATION, SOILS AND LAND- UTILIZATION

NATURAL VEGETATION

IN England and in other parts of Europe which have long been settled, the natural vegetation has been either greatly modified or entirely superseded by cultivated plants, but over other parts of the continent the natural vegetation still dominates the landscape and greatly influences mankind.

It assumes many forms, according to the climate, soil and other factors which determine its growth, but certain main types may be perceived ; we will consider each of these in turn, beginning with those of eastern Europe, where the contrasts are clearly displayed.

Tundra and Alpine Vegetation.—In the preceding chapter it was pointed out that trees cannot grow where the period of warmth is less than one month. The Arctic climate, therefore, with its cool and very short vegetative season, can support low woody shrubs only on the margin of the forest, and the characteristic vegetation of the tundra region consists of mosses and lichens, in addition to many kinds of small flowering and berry-bearing plants. On the drier parts of the tundra lichens grow together so as to form close mats ; in wetter situations mosses grow in abundance, and peat accumulates from dead vegetation and may form hillocks covered with living moss. Wet meadows occur, and swamps with cotton-grass and sedges occupy hollow places.

The region formed by the Scandinavian Highlands, known as the Fjeld, continues Arctic-like conditions southward, the change of latitude being largely offset by increasing altitude ; consequently, below the ice-fields of the highest parts, the mountain flora closely resembles that of the tundra, and may be considered as of the same type.

There are, however, considerable areas on the Scandinavian Highlands, where in the summer there is a thick growth of grasses and herbaceous plants, which afford a fairly rich pasture of the Alpine type. This pasture is so named from the

zone of the Alps situated above the tree-line but below that of perpetual snow ; it is found also on other mountain regions—for example, on the Urals, Carpathians and Pyrenees.

It is impossible to show such a zonal arrangement of vegetation, varying according to altitude, on a small-scale map, and consequently only the type which occupies the greatest area has been indicated in Fig. 16. Thus, while the northern Urals and the Fjeld have been marked as belonging to the tundra and Alpine type, the other mountain regions have been shown as being mainly forested, but with Alpine pasture.

The Coniferous Forest.—Between the tundra and lowland forest is no sharp line of demarcation. Outposts of forest extend northwards into the tundra region, and patches of tundra vegetation are found within the limits of the forest. The dwarf birch which grows on the borders of the Arctic region is replaced by a larger kind farther south, while the spruce and pine increase southwards in number and size till they form the dominant trees in the great unbroken region of the coniferous forests.

In the eastern part of this region, extending into Siberia, the forest is known as the taiga ; here Siberian species of spruce and pine are found, and fir and larch are subordinate members of the plant associations. In the west, the forest is composed of European species ; the pine is that often known as Norway pine or Scots pine, and a zone of birch frequently forms the boundary towards the tundra or the fjeld. Throughout the coniferous forest, on the drier soils the pine predominates, and on the damper soils the spruce, while in the areas of poorest drainage moors with sphagnum moss are common.

Adaptation to the climate, with its short period of warmth, is shown by the needle-like form and leathery surface of the leaves. They are thus protected against the cold winds, and against the loss of moisture by transpiration at seasons when the water in the soil is frozen and there is therefore a time of " physiological drought." Yet the leaves do not fall in winter and are ready to take advantage of every spell of growing-weather ; the forest, therefore, is evergreen. A store of food in the form of starch in the tissues of the wood is another adaptation to the climatic conditions, and the coniferous forests supply timber which is " soft," as compared with the " hard " woods of the deciduous forests.

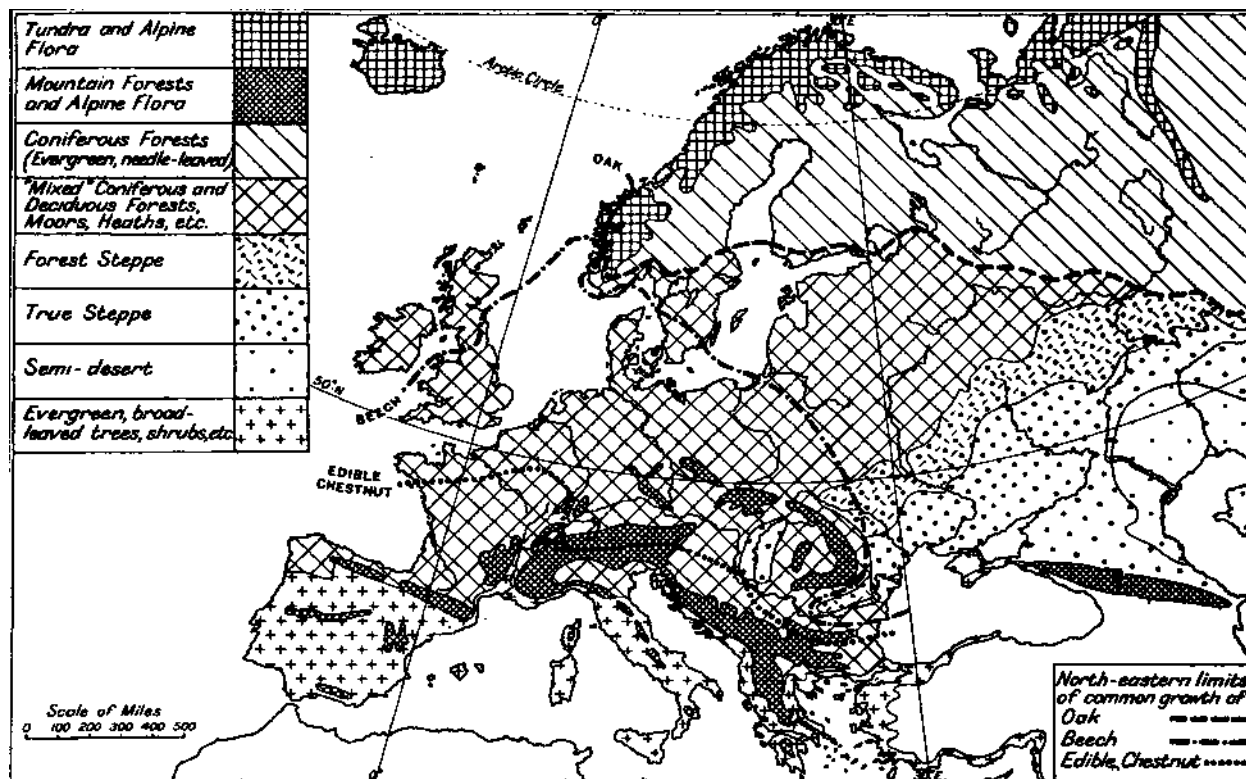


FIG. 16.—NATURAL VEGETATION REGIONS OF EUROPE.

The trees rise tall and straight, almost like poles, from a carpet of fallen needles, for there is little undergrowth in the coniferous forest. Factors which hinder the development of undergrowth are the lack of light beneath the high canopy of leafy branches, and the frequent freezing and thawing of the soil in spring and autumn, with the consequent injury to rootlets.

The "Mixed" Forest.—Even in the coniferous forests, there are representatives of the deciduous broad-leaved trees—for example, the birch, alder and poplar—and in more southerly regions these become more abundant, while others, such as the oak, appear and at last become common. Indeed, the occurrence of the oak is commonly taken as indicating the limit of the forests known as "mixed," and this criterion is here adopted on the map of natural vegetation. Yet the limits of even one species of tree cannot be accurately shown by a definite line, and those of the oak, beech, etc., shown on the map are necessary simplifications.

The annual leaf-fall of the deciduous trees is a protection against the cold and the consequent physiological drought of the winter, but this adaptation can occur only where the summer vegetative period is long enough, first for the growth of the new leaves, and then for their functioning. It appears that for this purpose it is necessary that the mean temperature should be above 42° F. for over five months.

The increasing length and warmth of the summers towards the south-west allow the growth of other species of trees which add to the variety, and in some cases to the value, of the deciduous forests. On the map in Fig. 16 this is illustrated by lines showing the approximate limits of the areas within which the beech and the edible chestnut are widely grown.

The varying nature of the mixed forests of coniferous and deciduous trees depends partly on the climate of the particular localities. In this respect, altitude, with the accompanying modifications of temperature and precipitation, is the main factor in causing the uplands and highlands to have forests of distinctive character; in central Europe the lower slopes are largely covered with deciduous trees and the upper with conifers, until the limit of forest growth is reached. Soil conditions as well as relief affect the character of the natural vegetation, and upland heaths and moors and lowland fens occupy considerable areas.

Over the greater part of the mixed forest region man has modified or transformed the original tree-cover. This has been done either intentionally, by cutting down the trees for timber or to clear the ground for agriculture, or unintentionally by fire or by allowing the young shoots to be eaten by goats[#] and other animals. Once destroyed, forests may be gradually replaced by a natural extension from neighbouring regions ; more commonly, however, new species are deliberately planted, in some parts forming woods of particular broad-leaved trees, and in other parts woods of conifers. In the main, however, cleared forest land has been utilized for agriculture or pasture.

On its southern margin, a climatic limit is set to the deciduous forest by an interruption of the period of summer growth. In the south-west and south this interruption is caused by the summer drought of the Mediterranean region, though the greater precipitation on the higher lands of that region allows trees to extend along the mountains far into the southern peninsulas of Europe.

In the south-east of the continent the hot and dry summer prevents tree growth in general, though there are tongues of forest stretching down the river valleys and " islands " of woodland or scattered trees in the damper places beyond the general limit. Indeed, the transition is so gradual that the northern belt of the steppe region is often known as the forest-steppe.

The Steppe Vegetation.—South-east of this transitional belt is the extensive region of the true steppes in which grasses and herbaceous plants, either annual or biennial, form the characteristic vegetation. As stated in the preceding chapter, the spring is the main season of plant activity ; the grasses and herbs appear above ground, grow rapidly, flower and produce their seeds in the short period between the winter cold and the drought of midsummer. Then they die down, and life is hidden beneath the surface, where, in tubers, bulbs, etc., a store of food is formed and preserved in readiness for the next season. A second short and less pronounced period of plant activity occurs in the autumn, but for most of the year until the next spring the ground appears bare.

According to differences of climate and soil within the steppe region, there are differences in the kinds, and the abundance, of the plant-forms. In the better-watered, northern and western parts of the true steppe there are areas of " meadow

steppe," of tall tufted grasses and gay flowering plants such as campanula and clover, which make a continuous thick cover to the ground ; even in a natural state, this can be mown to obtain a rich harvest of hay for use in the dry and cold seasons. In the less-watered districts, less succulent grasses and herbs which grow closer to the ground and are rather sparsely scattered form the greater part of the vegetation ; this can be utilized for grazing rather than for the cutting of hay.

As in the case of the more fertile forest regions, so here on the steppes the more productive areas have been much changed by man, both by pastoralists mowing or grazing the natural growths, and by agriculturalists cultivating the land for crops.

The Semi-desert Vegetation.—In the poorer steppe lands there appear some shrubs which have deep and long roots to obtain as much water as possible, and whitish, felted leaves from which the moisture is but slowly transpired ; there are also plants which are protected against the wind and the resultant loss of moisture by growing close to the surface of the ground. In the semi-desert, such forms of life adapted to an arid climate represent an increasing proportion of the vegetation as the grasses and herbaceous plants become fewer ; the amount of vegetation of any kind is but small and the bare soil is everywhere visible. As protection against still greater aridity, the woody growths commonly have their leaves reduced to spines. Also, as the conditions approach those of the deserts in which there are only occasional rains, the annual plants remain dormant below the surface for longer periods ; but whenever in the summer the soil receives a supply of water, they may appear, and pass rapidly through their very short vegetative period.

In the small areas in the extreme south-east which may properly be called desert, the vegetation is very scanty indeed, and only the " halophytes " adapted to living in salty soils, or plants which can find sufficient moisture in the sand-dunes, can exist.

The "Mediterranean" Vegetation.—As the winter temperatures are generally above the limit of growth, trees and woody shrubs which live throughout the year are the characteristic plant-forms ; they are protected against the loss of water in the dry summer by various devices, including deep and wide root development, a thick, rough bark, such as cork, and leaves of a different kind from those of the more northerly forest trees.

As the winter allows growth, there is no common period of leaf-

fall, nor need there be the extreme adaptation of a reduction of the leaves to needle-form ; the trees are evergreen and the leaves are broad, but their glossy and hard surface prevents rapid transpiration. The evergreen oak, cork oak, olive, holly, laurel and myrtle are of this kind and are typical of the region, although some of them may grow also in the south-western parts of the deciduous forest region where the winters are sufficiently warm.

Yet these broad-leaved evergreen trees are not the Only plants which can live under Mediterranean conditions, and an important group consists of low shrubs : e.g. heaths which are evergreen but have small and narrow leaves ; thyme, lavender and other aromatic shrubs ; the brightly flowering cistus, and many others.

Originally the Mediterranean region was largely forested, but these forests have almost disappeared ; now the natural vegetation, in the sense of that not deliberately planted by man, is only exceptionally forest or woodland, and that is found mainly on mountains or uplands where the temperatures are lower and the rainfall is greater than is normal. In such situations there are woods of evergreen oak or cork oak, as in the Iberian Peninsula, and there are also areas where the trees are those which are more common in other vegetation regions, such as the beech and edible chestnut, which extend southwards along the mountains of Italy, or the pines which grow on the uplands of the Balkan Peninsula.

Much more extensive are the thickets of evergreen shrubs which have replaced most of the original forests ; these growths may include low trees, such as the laurel and myrtle, and bushy plants, such as tree-heaths, cistus, broom and juniper. Such thickets are known as maquis in France, macchia in Italy and monte bajo in Spain.

Still poorer growths of lower bushes are formed of thyme, sage, lavender, small heaths, etc., with thistles and various flowering herbs, such as the asphodel and iris. These associations show bare earth between the plants; they are widely developed on the drier soils and are known as garrigues in France, tomillares in Spain and phrygana in Greece.

Meadows of the north-western European type are rare ; in well-watered situations there are associations of grasses and bulbous plants which give pasture, but these commonly dry up in the summer.

On the other hand, in very dry areas, such as the interior plateaus and the south-eastern lowlands of Spain, the climatic conditions and the vegetation approach those of the steppes of eastern Europe ; here grasses may predominate, and esparto grass is still the vegetation cover of some districts in Spain.

The natural or semi-natural vegetation is now found mainly on the higher parts, the steeper slopes and the poorer soils of the Mediterranean region ; most of the lowland and much of the hill-country has been taken in for cultivation.

SOILS

It might be expected that the nature of the soil is largely determined by the geological factor—the rock from which it is derived, for in England differences between soils often correspond to differences of the parent material. This view was generally held until Russian scientists, studying the soils of their vast country, which has such contrasted climates, realized that the climatic conditions are the main cause of the striking contrasts in the soils. To appreciate this, as well as to understand the essential character of the soils and their relation to agriculture, we may examine in turn the main soil types and soil regions of Europe, beginning with those of eastern Europe.

The Podsoles.—Beneath a thin superficial layer formed of fibrous vegetable material, the podsoles have an upper level, or "horizon," of an ashen-grey colour from which they were named (Russian : pod = under, zola = ash). This upper horizon has a loose structure, and consists of sandy and gravelly material. Both colour and structure are due to the washing down, or leaching, of the soluble salts, the lime constituent (calcium carbonate) and the clay from the uppermost to the second horizon, situated a foot or more beneath the surface. This second horizon, because of the materials washed into it, is usually compact, and often contains a layer cemented together by iron into an impermeable "pan." The essential process of leaching is the consequence of the downward drainage of water, and this occurs when the precipitation exceeds the combined loss by evaporation, the surface run-off and the transpiration of water by plants.

Hence climate is the main control of the development of the podsoles, and, moreover, the degree to which soils are leached is, directly and indirectly, due to the climate. The map in Fig. 17

shows the distribution of two types, the strongly leached and the moderately leached. The former extends widely over north-eastern Europe (excluding the tundra and mountain areas, which will be considered later), where the summer warmth is not enough to cause great evaporation. Also, the climate has here an indirect effect, since it allows the growth only of the coniferous forest, of which the vegetable residues tend to accumulate as a peaty layer, giving almost permanently wet conditions. The abundantly watered western side of Scandinavia also has soils of the same type. Farther south the coast-lands around the south-eastern corner of the North Sea have similar conditions, for the predominantly sandy character of the subsoil allows easy downward movement of the rain-water.

Soil conditions react upon the vegetation ; for example, the northern limit of the oak is partly determined by climate and partly by the difficulty with which this tree grows on the more strongly leached podsoles. Moreover, these strongly leached podsoles, having lost much of their plant-food constituents from the upper horizon, are unfavourable for cultivation ; to be productive, they need to be supplied with a considerable amount of lime and other manures and to be very thoroughly tilled.

The moderately leached podsoles are found in warmer well-watered regions, and in these the less-marked grey colour of the upper soil and the usual absence of a compact and cemented lower horizon bear witness to the retention of more of the plant-foods in a condition available for plant-life. The deciduous forests, too, supply an annual leaf-fall which is incorporated with the soil.

The map shows that the moderately leached podsoles extend over the deciduous forest regions of eastern Europe and over much of the north-western coast-lands of the continent, excepting the mountain areas ; they are also found on interior uplands. As there are no definite limits to climatic conditions and seldom sharp changes in the vegetation, so the resultant soil types usually merge into one another.

In areas of abundant water together with poor drainage, the podsol regions are characterized by the development of peaty soils. Moorland peats form acid soils of little value to man, but since the fen peats found in lower situations form less acid soils and contain more plant-food, they may prove productive when drained.

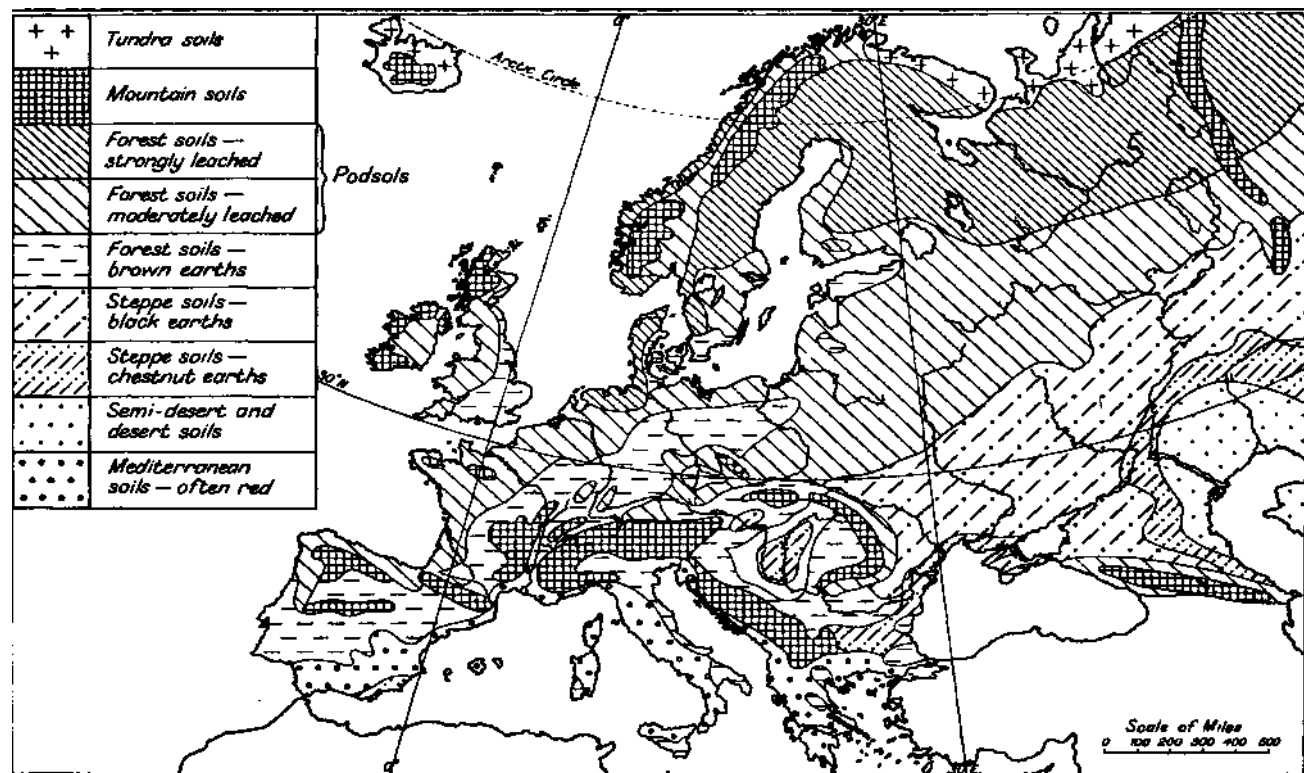


FIG. 17.—SOIL REGIONS OF EUROPE.

The Tundra Soils.—These soils of the far north are largely the result of their water-logged condition and the low temperatures. Evaporation is very slight and the subsoil is permanently frozen below a depth of 2 or 3 feet. Humus, the partially decomposed organic matter formed from plant residues, remains as a surface layer, for downward leaching is impossible, and the low temperatures hinder chemical or other changes ; peat is commonly formed.

It thus appears that an abundance or an excess of water is the main factor in determining the soil conditions in all the northern part of eastern Europe. In the south-eastern part, on the contrary, seasonal or permanent aridity is the controlling factor.

The Black Earths are the characteristic soils of most of the steppe areas, where they are known as chernozem. The black colour is due to a large proportion of humus in the upper horizon, which is usually about 3 feet in depth, and at the base of this there is an accumulation of calcium carbonate, before a transition to the parent material. This parent material is often, but not always, loess.

The humus is derived from the annual addition of vegetable matter from the grasses and herbaceous plants ; the decomposition remains incomplete, because it depends upon the activity of bacteria and other soil-organisms, which is limited, like that of the vegetation, by winter cold and summer drought.

Of great importance is the occurrence of rains and the melting of snow in spring followed in summer by heat and drought. In spring the calcium carbonate is washed down from the surface ; in summer the surface soil becomes dry, and by capillarity the water rises from below and brings up soluble matter, including calcium carbonate, which is then deposited as the water evaporates. There is thus an accumulation of the calcium carbonate at the base of the upper horizon—an indication of a balance in this black earth region between the downward leaching of the well-watered north and the upward movement which becomes most important in the arid south-east.

In the black earths there is an abundance of plant food, and cultivation is made easy by the crumbly structure of the humus-bearing layer ; consequently the black earths stand among the best of the world's soils from the point of view of fertility.

The Chestnut-coloured Soils.—On the northern side the

black earths pass through grades of greyness to the ashy soils of the forest regions ; on the south-eastern side they change to a light-brown, chestnut colour, since the dark humus decreases in amount as the plant-life from which it is derived becomes more scanty. Because of the increasing aridity there is still less leaching than in the black earths, and there is more calcium carbonate in the upper horizon. In themselves, these soils are nearly as valuable as the black earths, but the climate is not so propitious to agriculture.

It should be noted that the steppe soils, besides covering most of south-eastern Europe, are found in the middle Danubian lowlands and in other areas of central Europe too small to be shown on the map.

The Semi-desert and Desert Soils.—The marked aridity in the Caspian Depression continues the change just described, and the upper horizons of the soils progressively contain less humus and more calcium carbonate. Their colour changes through brown to grey, and their fertility decreases. In the most desert-like areas, blown sand is accumulated and even heaped up in dunes. Also, in some parts there appear upon the surface thin crusts, or efflorescences. These are formed by water from the occasional rains sinking some distance into the soil, which then again dries ; the water, after a period during which it dissolves the salts in the soil, works upward by capillarity and evaporates on the surface, where it leaves saline or alkaline deposits.

In these arid regions soil conditions combine with climate to make them inhospitable to man.

Brown Forest Earths.—From the point of view of the formation of productive soils, northern Russia suffers from an excess, and southern Russia from a deficit, of water ; the best balance occurs in the central Russian regions. A similar balance as regards the water-supply occurs in much of central and western Europe, and here it is associated with less severe temperature conditions than in the eastern part of the continent.

Consequently in these regions there is less leaching than in the case of the podsoles, while a greater activity of the soil organisms reduces the amount of humus as compared with that of the black earths. With a natural vegetation of deciduous forest, there is an annual leaf-fall which UNIVERSITY LIBRA

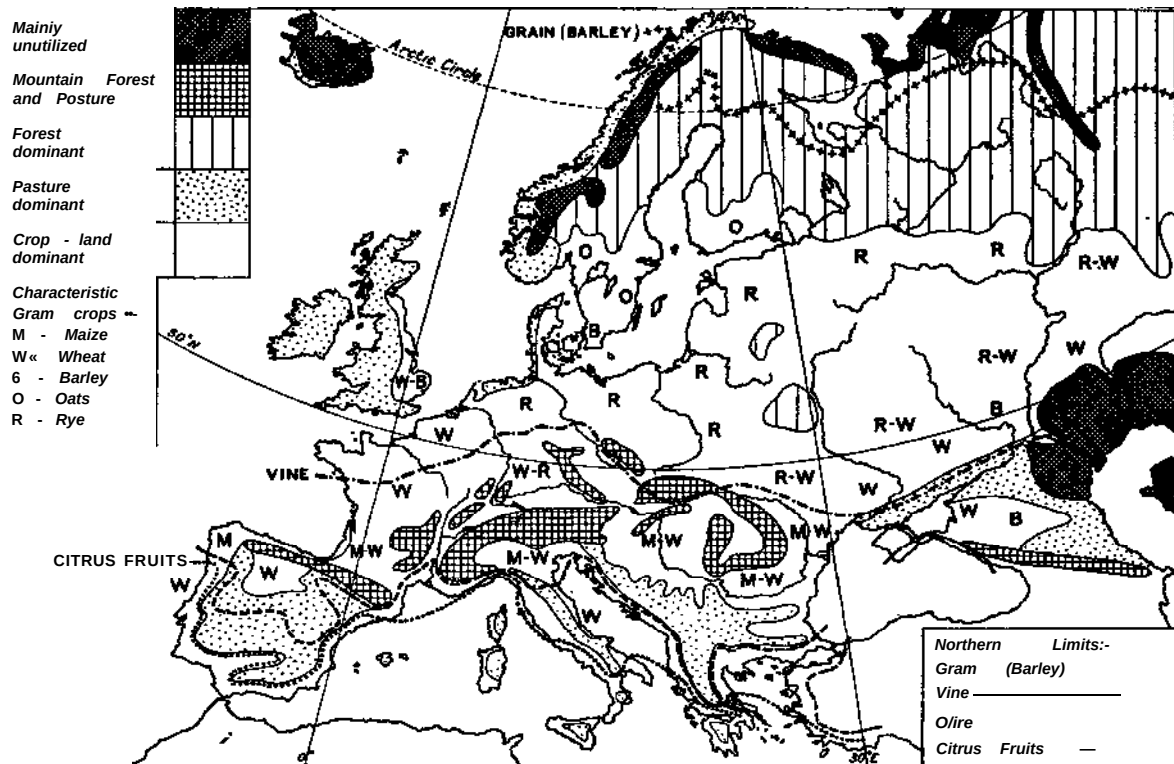


FIG. 18.—LAND-USE REGIONS OF EUROPE.

[Adapted from Jonasson.

the soils for cultivation, and their generally crumbly structure aids tillage.

This group of soils is a large one, and there are many differences in the colour and the other conditions, partly because with this "balanced" type of climate differences in the nature of the parent rock show themselves in the soils, as is well illustrated in the case of south-eastern England.

Moreover, since these soils are generally quite remunerative and have been worked by farmers for centuries, they have often been transformed from a natural to an artificial state.

Mediterranean Soils.—These are varied in character, but frequently have a reddish colour, and although they are often derived from limestone, they are typically fairly heavy clays; unfortunately soil science has not advanced far enough to reach an unquestioned explanation of their mode of origin. In several parts of the Mediterranean lands the red clays provide "oases" of cultivable land in otherwise almost barren limestone areas.

Mountain Soils.—Because of the low temperatures the weathering of the soils of mountain regions has been largely physical, and their development has not in general proceeded far. In the soils of areas above the forest limit there may be a humus layer, recalling that of the tundra, and below this a tendency to a podsol character shows itself. On the slopes there is usually only a thin covering of coarse rock fragments, while the finer material may be deposited as a deeper, and sometimes fertile, soil in the valleys.

LAND-USE AND CULTIVATION

The use that men make of the land depends partly on their desire for particular necessities and comforts, partly on their knowledge and equipment for obtaining these, and partly on natural conditions of climate, vegetation and soil.

Hence the map showing the main forms of land-use (see Fig. 18) shows certain broad similarities with the maps showing the climatic regions, the natural vegetation and the soil types.

Like those maps, that of land-use regions has had to be generalized, and the respective forms of utilization overlap considerably, but the following regions can be distinguished.

The "Mainly Unutilized" Areas.—In the cold north there are the tundra lands which offer practically nothing except a little pasturage for reindeer, the northern Urals and the parts of

the Scandinavian Mountains to which at best cattle may be driven for a few weeks in the year, and the greater part of Iceland, in which there are some areas of summer feeding for sheep. In the arid south-east of Europe there are only poor exclaves of the steppe-lands and small areas where irrigation is possible.

Dominant Forest areas are those of the coniferous forests in the broad belt of country forming the northern portions of Sweden, Finland and Russia. They are still mainly unbroken, although there are occasional clearings in which some agriculture and pastoral work are carried on. In the extreme north only vegetables can be grown, but in the remaining area barley, the grain crop which can ripen in the shortest vegetative period, is cultivated. . It should be noted that this grain is the " six-row " barley which is used for man's food ; it is an entirely different plant from the much more productive " two-row " barley which is grown in England mainly for malt, and in the south-west Baltic lands also as food for pigs. Farther south there are many " islands " of uncleared forest in the region marked on the map as dominant crop-land ; two of these are diagrammatically shown, one being the lake-studded area where Latvia, Lithuania and Russia adjoin, and the other the great Pripet Marshes.

Mountain Forest and Pasture.—These regions are the uplands and highlands of Central Europe and the Caucasus Mountains. In general, they are characterized by having deciduous forest with coniferous forest at higher levels, and then alpine pastures, and in some cases these are succeeded by culminating areas of bare rock and perpetual snow ; only in the valleys is cultivation possible. The use of the land varies from region to region, as will be explained in more detail in later chapters.

Dominant Pasture areas are those in which the main occupation of the people is the keeping of animals and in which a high proportion of the land is used for growing hay or for grazing, although there may be some crops grown either for fodder or for human use, and there may also be forests, moors or heaths. These largely pastoral areas fall into three main groups :

(i) Over much of north-western Europe, including the southern coast of Iceland, the climate is too wet for grain growing to be the most remunerative form of farming. In

Iceland sheep are reared ; in Britain both sheep and cattle are kept; in Norway, and in parts of the North Sea Lowlands, the keeping of cattle and the production of milk, butter and cheese are the main objects of farming. Grasses, clover and root crops are therefore grown and, as food for men, potatoes and oats—a grain which can ripen in relatively cool and wet summers.

(ii) In the Mediterranean region poor pasture has to a considerable extent superseded the forests of the uplands, while in parts woods of evergreen oak yield acorns as mast for animals. Not all the upland areas are used for pasture, however, for there are woods of cork oak, as well as of chestnut and other trees which yield their fruit. Sheep and goats are the animals most commonly kept, and in the Balkan Peninsula swine, too, are numerous. In the northern uplands of this peninsula, where the climate is not of the Mediterranean type, the forests have been so largely cut that even here pastoral work is now dominant ; cattle are relatively more important in these Balkan regions than in the other two southern peninsulas of Europe.

(iii) In the steppe-lands of south-eastern Europe the growing of crops gradually becomes less, and the work of the people becomes more restricted to the keeping of animals, towards the south-east. Cattle are reared in the rather better-watered part of the predominantly pastoral area around the Sea of Azov, and sheep mainly on the still drier country draining to the Caspian Sea.

Dominant Crop-land areas form the largest, as well as the most productive, group of agricultural regions of Europe. They are very varied in type, and one useful way of distinguishing them is according to the grain which is most commonly grown, although almost everywhere the keeping of animals is one aim of the farming, and generally vegetables are a product of considerable importance.

Grain Crops.—*Oats*, as stated above, form the characteristic crop over much of the pasture-lands of the north-west, and the crop-land in which they are predominant extends over southern Scandinavia to the lands north of the Gulf of Finland. Yet other grains, as well as root crops, are grown in the same area, and the two-rowed barley is particularly important in the region around the entry to the Baltic Sea. In eastern England, too, barley is largely grown, and here it rivals wheat as regards the amount of land devoted to it.

Rye.—The rye belt stretches from central Europe south of the North Sea and Baltic Sea across the middle of Russia as far as the Ural Mountains. Although rye requires a longer vegetative period than barley, and drier conditions for ripening than oats, it is a hardy grain and is largely grown on the inhospitable podsols of Russia and the glaciated areas of Germany and Poland. Rye bread has now been displaced by wheaten bread in western Europe, but it is still largely used in central Europe, and remains the staple food in the east. In Russia buckwheat and oats are also grown in the region in which rye is dominant.

Wheat.—The wheat zone is the most extensive, for its northern margin forms a great curve stretching from eastern England into central Europe and across Russia south of the rye belt, while it is largely grown in the warmer parts of central Europe and in the Mediterranean region. Thus wheat overlaps with barley in England, with rye in the Rhine-lands and in the black-earth areas of Russia, and with maize in the southern part of central and western Europe. Comparing the map of crop distributions in Fig. 18 with that of the duration of warmth in Fig. 11, it will be noticed that the northern part of the rye belt has a warm period lasting about four months, that of the wheat belt about five months and that of the maize belt over six months.

Yet the climatic conditions are, of course, by no means uniform over the whole range of wheat production of Europe, and the methods of cultivation consequently vary. In the west "winter wheat" is cultivated; that is to say, the grain is sown in autumn, remains dormant during the winter, grows as soon as the vegetative period begins in spring and is harvested in late summer. In the east the winters are too severe for this type of wheat, and "spring wheat" takes its place; though it is not sown until well in the spring, the hot summers allow a rapid growth and the harvest occurs rather late. In the Mediterranean region the wheat is sown in autumn, slowly continues its growth during the winter and ripens in the dry weather of the early summer.

On the map showing the crops, wheat is marked as the "characteristic" grain of certain regions, either with or without others indicated on this map, but it is almost always only one of several crops grown in rotation in successive years.

Maize.—In its climatic requirements this is the most exacting of the common grain crops of Europe, for it requires both con-

siderable heat and also a good supply of moisture ; hence it is grown in the parts of temperate Europe which have the warmest summers, but not commonly in the Mediterranean region nor in the eastern part of the steppe-lands, where there is a lack of rain in summer.

Barley.—Barley, and particularly the six-rowed varieties, can mature with little heat and with little moisture. Accordingly, barley is the marginal crop, not only in the cold north, but also in the dry south-east ; here and in the neighbouring parts of Asia it is the grain grown by the semi-nomadic peoples in the areas dividing " the desert " from " the sown."

Other Crops.—Space does not permit a separate comment on the distribution of all the other crops. Some are grown as food for men or animals, including grains such as rice, buck-wheat and millet, potatoes, root crops, and vegetables of many other kinds. Other are " industrial " crops from which other products are obtained ; e.g. sugar-beet, flax and tobacco. Among these, the sugar-beet is largely grown over an area which almost coincides with the northern part of the wheat belt, that is, from eastern England across the north of France into Belgium and Germany, and thence across Poland and Czechoslovakia into the black-earth region of Russia. Flax is another important industrial plant, from which the fibre is used for manufacturing linen and the seed is crushed for oil and cattle - food. It has a fairly wide climatic range and is cultivated in districts as far apart as northern Ireland, and northern and southern Russia.

Fruits.—The northern part of the area shown as crop-land can allow the growth only of the more hardy kinds of fruit, notably apples and cherries ; in the central part appear others, such as pears and plums ; in the south there is an increasingly great variety. The northern limits of three fruits of considerable importance are drawn on the map. The vine is very widely cultivated, and the wine made from it is used both as a common drink in many of the vine-growing countries and for export as a luxury in cooler lands. It is significant that although the greatest amount of wine is produced in the Mediterranean region or on its margins, some of the most valuable kinds are obtained from near the northern limit of the vine, e.g. in Champagne in France and by the middle Rhine and its tributaries in Germany.

The olive, the most characteristic tree of lands with the Mediterranean type of climate, yields oil which is locally used to supply fat in the diet as butter is utilized in the cooler cattle-rearing countries. Citrus fruits, mainly oranges and lemons, need higher temperatures for ripening than generally occur in the northern part of the Mediterranean region ; therefore, although their limit is shown on the map to approach this margin in the Riviera district of the Gulf of Genoa, the yield here is neither so good nor so great as farther south. Indeed, the distribution of the citrus fruits indicates fairly well the extent of a " very warm," as distinct from a " warm," variety of the Mediterranean climate. As in the case of the other fruits of southern Europe, the oranges and lemons are grown partly for local use and partly for export, particularly to central and north-western Europe.

Besides citrus fruits, olives and grapes, many other fruits are cultivated in the Mediterranean region, e.g. apricots, peaches and edible nuts, such as almonds and walnuts.

So important is fruit growing, and so much of the work of the people is directly or indirectly bound up with it, that the area of the Mediterranean climate may almost be labelled as the fruit-growing region of Europe.

QUESTIONS

1. Describe the *transitions* between tundra, forest, steppe and desert in Russia.

2. Show how the natural vegetation is adapted to the climatic conditions of the " Mediterranean " region.

3. Give a description of the typical " black earth " of Russia, and account for its characteristics.

4. Distinguish between the various types of pastoral work in Europe, and give reasons for the differences.

5. To what extent, and in what ways, is the cultivation of wheat related to climatic conditions.

6. Explain how the differences between types of forest found in Europe are related to climatic differences.

7. Describe the nature and distribution of the podzols of Europe, and show how they are interrelated with both climate and natural vegetation.

8. Discuss the truth of the statement: "Natural vegetation regions are also regions of characteristic types of farming."

GEOGRAPHICAL REGIONS

IN the preceding chapters we have considered separately the most important factors in the geography of Europe, viz. relief and structure, climate, natural vegetation, soils and the use of the land ; in connexion with each of these factors a map has shown its special regions. Now, as geography concerns itself with the interaction of the various factors, we shall indicate regions, each of which has a character depending upon a special grouping and a special form of interaction of all the factors. These regions we call " geographical," preferring that term to " natural," which is likely to be regarded as equivalent to " physical," because here the human factors are also considered ; indeed, in some of these geographical regions man has very greatly modified, and even transformed, the natural conditions.

The geographical regions form definite and distinct environments of man, where people work in certain ways and in which they have developed characteristic modes of life ; in one sense, however, the regions are more than environments, for man himself is an essential element in them.

From the preceding chapters it will have become evident that climatic conditions occupy a pivotal position in this study of Europe ; in the first place, they depend upon the position and the relief of the constituent areas of the continent, and, secondly, climate very largely determines the natural vegetation, the soils and the use that is made of the land. Hence it is not surprising that the larger geographical regions correspond very closely with the climatic regions, as may be seen by comparing the maps in Figs. 15 and 19. That is true of the major geographical regions, but within these there are minor geographical regions which are distinguished from one another sometimes by minor climatic differences, and sometimes by other differences, particularly those of relief and structure.

Because the climatic conditions in the east and south of Europe extend over the adjoining parts of Asia and Africa, the major regions of eastern and southern Europe stretch far

beyond the limits of this continent; the map in Fig. 75 should be studied to see the relation between Europe and the other continents in this respect.

The Arctic Region.—The Arctic Region is primarily characterized by its cold climate, which has already been described, and it is to be noted that the region is considered as including both the tundra lands within the Arctic Circle and also the higher areas of the Scandinavian Highlands. When the minor regions of Arctic Europe are studied separately, the differences between these two parts must be taken into account. It may here be pointed out that the common climatic conditions of extremely long, cold and dark winters, with very short and cool summers, in both parts of the Arctic Region have resulted in similar conditions as regards the soil, which is wet in summer on the surface, but below this is permanently frozen. Consequently the natural vegetation is mainly of small growths, such as mosses, lichens and low shrubs, and man has been able to make little use of the region.

To the southern part of the Scandinavian Highlands cattle are driven in summer from the neighbouring lowland areas of Norway, while the northern part of these uplands and the tundra region are traversed by reindeer, which seek as food the sparse pastures of "reindeer moss," growing so slowly that it needs several years to form a fresh pasture after it has been cropped by a herd. The people who own the reindeer are necessarily nomadic and few in number; they retire in winter to the forest, where hunting is possible, and in summer advance to the coast, where fishing adds to their scanty resources. Since this region offers little which can be exchanged for the products of other regions, and since its position is so remote and the means of communication are so poor, there is very little contact with the rest of Europe, and the inhabitants live in a relatively primitive manner.

The Boreal Forest.—This is the region with the Boreal type of climate and with a natural vegetation cover of coniferous forest; the soils have been in general strongly leached and the surface is often swampy. Largely because of the unfavourable physical conditions, only small clearings have been made in the forests. This is most markedly the case in the east, where the winters are coldest and longest, and where the rivers, which offer the easiest routes, drain to the Arctic Sea. During the

winter the snow accumulates on the land, but with the rapid rise in temperature in spring it melts and floods the country; in this region the thaw occurs in the southern part while the lower courses of the northward-flowing rivers are still ice-bound. The inundations are therefore serious, and work on the land and traffic on the rivers are both delayed; the effective period of activity in summer is thus curtailed, and agriculture, pastoral work and trade are further handicapped.

In the north vegetables are the main crop; in the south barley is grown, and some oats and rye; some cattle, sheep and horses are reared, but the amount of farming is very small in relation to the great extent of the region. The maps in Figs. 18 and 19 show that only along parts of the southern margin have crop-lands extended into the Boreal Forest region.

In the main, forestry is still the characteristic occupation, and even this is largely limited to the southern part and to the neighbourhood of the rivers. Another resource is the hunting and trapping of the fur-bearing animals, though these have now been much reduced in numbers. With the exception of some towns situated on the rivers, and mostly either by the northern seas or near the southern margin, the settlements are small and widely scattered, and the population is scanty.

On the eastern margin of the region in Europe, the Hercynian block of the Urals yields mineral ores which have made possible industrial development.

The western part of the Boreal Forest region, in Finland and Sweden, is made more accessible by the existence of the Gulf of Bothnia, towards which the rivers drain; here there has been more development in connexion with all the resources of the lands and the waters. This is especially the case at the mouths of the rivers and around the coasts of the Gulf of Bothnia, where agriculture and pastoral work gain from some amelioration of the climate, and where the timber from the forests is worked up in saw mills and factories run by water-power from the streams. Moreover, in this western area the ancient rocks of the Baltic Shield emerge from below the sedimentary deposits of the Russian Platform; some minerals are obtained, and by the Gulf of Bothnia a little iron-working utilizes ore from inland mines. The population following these occupations is therefore more considerable in this narrow coastal belt than elsewhere in the Boreal Forest region.

The Sub-boreal Farmed Forest.—The more favourable conditions of the Sub-boreal climate region are reflected in the "mixed" character of the natural vegetation and the less thorough leaching of the soils. To these conditions is added greater accessibility from central Europe, whence came the greater developments in regard to the use of the land. Consequently the clearings have been more extensive than farther north, and now the region may be conveniently labelled "farmed



FIG. 19.—GEOGRAPHICAL REGIONS OF EUROPE.

forest." There are considerable areas of still virgin forest where timber is cut for export, but most of the region may be regarded as crop-land, oats and rye being the chief grain crops.

In the Baltic Shield area in Sweden there has been a development of mining and manufacturing, and around the shores of the Baltic Sea there have grown up a number of towns and cities dependent upon the agricultural and industrial occupations and the associated commerce. In the Russian area are the past and present capitals, Leningrad and Moscow, while industries and trade have grown up at a number of other large centres.

Yet in general the Sub-boreal Farmed Forest region is predominantly agricultural, and it is one of the less densely populated regions of the continent, with the exception of the Tundra, the Boreal Forest and the arid Caspian depression. The map of the geographical regions should be compared with that in Fig. 82, showing the density of population in Europe.

The Steppe Lands.—The steppe lands offer greater returns to agriculture than the forests situated north of them, because of their easier working and the greater fertility of their soils, especially in the belt of the black earth. The climate, too, is more favourable, with its longer summers and the higher temperatures in the growing season, except where the supply of water is scanty, as on the south-eastern margin. Although agriculture has only relatively recently superseded a primitive form of pastoral work, and although modern scientific methods of cultivation have still more recently been introduced, nevertheless this region has a wide range of products and is capable of giving high yields. This is particularly true in the western part of the steppe-lands, where the more valuable grains, maize and wheat, are grown in great amount, together with beet, flax and other industrial crops, and where the vine and other fruit trees are cultivated.

Towards the east the variety of products is reduced by the more extreme temperatures and the poorer supply of water; also the normal yield of the crops is less, and the keeping of animals is relatively more important than in the west. Moreover, the rainfall is more variable in the eastern steppe-lands and failure of the harvests is a serious menace. For these reasons, the population dependent upon agriculture is considerable in the west, but decreases greatly towards the east.

Mineral resources are associated with the two areas where the older rocks come to the surface in southern Russia. Within the eastward bend of the Dnieper the ancient rocks yield ores of iron and manganese, and where the river cuts through the resistant outcrop the rapids give enormous water-power, which is used for the production of electricity. In the Hercynian block of the Donetz region is a large coalfield which has also led to the growth of industries in southern Russia. There are oilfields on the margins of the Carpathians in the south-west, and of the Caucasus in the south-east, of the steppe-lands.

In spite of various drawbacks to navigation, the rivers, as

well as roads and railways, carry traffic through the steppe-lands between the Black Sea and the interior of Russia and Rumania.

With these varied resources and activities, the western part of the steppe-lands has much urban as well as rural development, and the density of population is greater than in any other part of eastern Europe. Indeed, the manner of life of the people is becoming similar to that of the central countries of the continent.

At its south-eastern margin, the region adjoins the Caucasus Mountains, which are geographically more closely related to the highlands of south-western Asia than to the neighbouring regions of Europe.

The Arid Caspian Lowland.—The low and irregular rainfall, the infertility of the soils, the lack of other resources and the remoteness of the position combine to make this extreme south-east of Europe a region of difficulty to man, and comparable in this respect with the extreme north-east of the continent. The lower valley of the Volga, with its port, Astrakhan, is the main exception to this rule.

The Mediterranean Lands.—To its position on the globe this region owes both its general climatic conditions of a mild, moist winter and a hot, dry summer, and also its general structural characteristics of fold-mountains enclosing sea-filled subsidence basins, as a result of which there are commonly narrow coastal lowlands rising rather steeply to hills or mountain ranges.

In the eastern part of the Mediterranean lands of Europe the climate tends to dryness and there is relatively little lowland ; here the growing of the characteristic fruits is one of the main occupations of the people, who have terraced the lower slopes for this purpose, while at higher levels there is little more than poor pasturage.

Around the western basin of the Mediterranean Sea and by the Atlantic coast in the same latitude, there is generally a better rainfall or better possibilities of irrigation, while there is also a greater area of lowland. Consequently there is a wider range of products, and grain and vegetables, in addition to fruits, are grown to a considerable extent.

The interior of the Iberian Peninsula is largely plateau, and while some higher ranges are well watered and bear a vegetation cover of woodland, much of the remainder tends to aridity

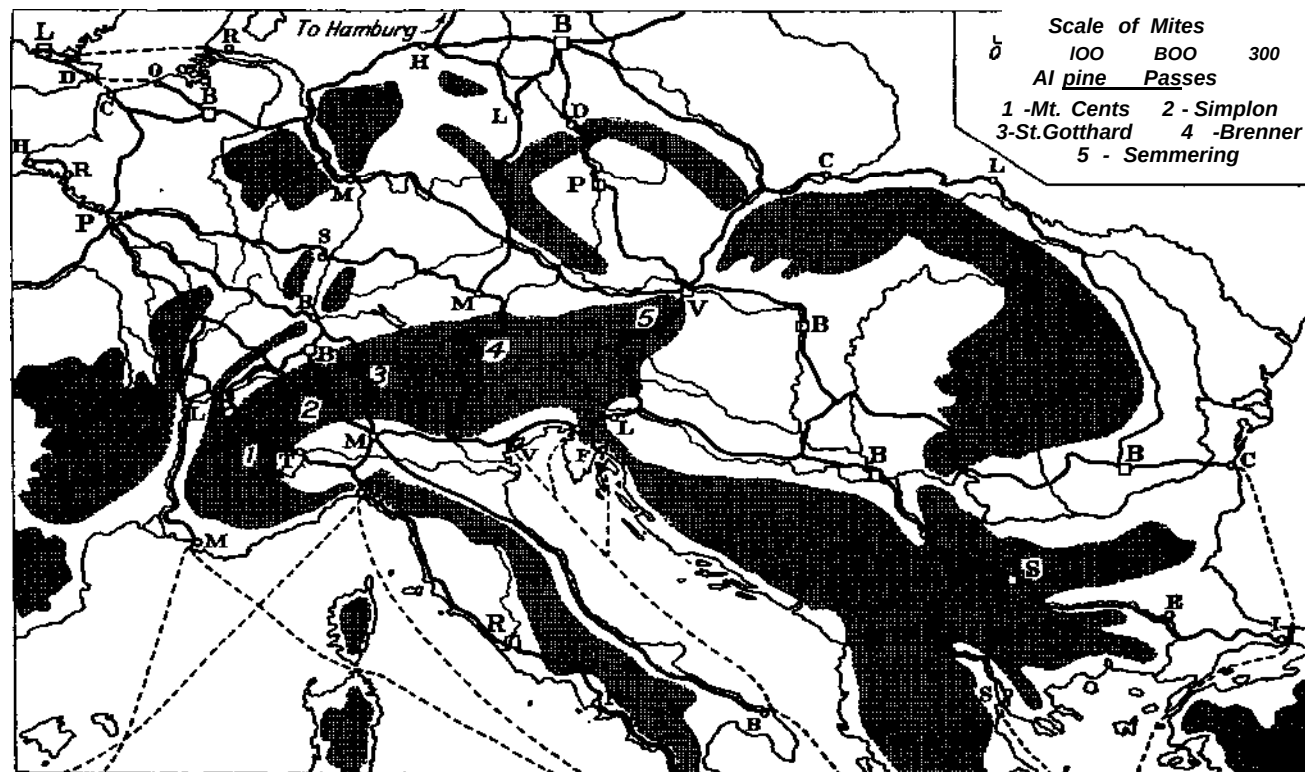


FIG. 20.—RAILWAY ROUTES AND COMMERCIAL CENTRES.

and is dependent upon an artificial water-supply for its utilization.

Coal deposits are lacking, and only in scattered areas are there other forms of mineral wealth, and in the Mediterranean region industrial development is mainly limited to certain ports at or near river-mouths.

The Mediterranean Sea and its extensions, the Adriatic, Ægean and Black Seas, give access from the ocean to a great part of southern Europe, and with the cutting of the Suez Canal the Mediterranean Sea links Europe with the Indian Ocean and the Far East. But the mountain-folds encircling the sea impede communications between the Mediterranean lands and those of the remaining part of the continent, and land traffic is restricted to a few breaks or passes in the mountain barriers ; hence in a few ports on the northern shores is concentrated a considerable amount of commerce, both in local products and in goods of wider origin. (The situation of the chief ports and their relation to the routes leading to central and north-western Europe is shown in the map in Fig. 20.) Trading is therefore important in certain parts of the Mediterranean region, and this occupation and the intensive agriculture and horticulture of the larger coastal lowlands have together given rise to some great cities and some areas of dense population.

Temperate Europe.—The region with a temperate climate is the only major geographical region which is entirely European, with the exception of the adjacent Sub-boreal Farmed Forest, for all the other major regions extend far beyond the limits of the continent. As shown on the map of Europe in Fig. 19, this temperate-climate region appears very extensive, but the map in Fig. 75 of the major regions of Europe and north-western Asia shows that its area is not remarkably great as compared with those which overlap the continents.

It has within it, however, such a variety of relief and structure that its constituent areas vary considerably, and no single descriptive label, such as " lowland " or " forest," would be applicable to it as a whole. It is, therefore, convenient to term it simply " Temperate Europe." The differences within it are so marked that it is necessary to divide it into three minor regions, as shown on the maps in Figs. 19 and 21, and these minor regions will now be separately considered.

The Atlantic Margins.—The characteristic feature of the

climate of Temperate Europe is the influence of oceanic winds during the whole year. This influence is particularly marked along the Atlantic Margins from the north of the Iberian Peninsula to the northernmost part of the continent, and throughout this extent it produces a very equable and rainy climate.

Also, along this marginal belt, the earth's crust has suffered dislocations which have resulted in the drowning of large areas and the upraising of most of the remainder, and hence the lands have a considerable elevation. Their altitude combines with the rainy character of the climate and the associated leaching of the soils to handicap agriculture. Forests, moors and heaths cover the highland and upland areas, and the relatively small areas of lowland are mainly given over to grass ; with the rather higher temperatures of the southern part, however, there is more cultivation.

There are scattered deposits of minerals, but only the coal of the British portion has served as the basis of manufacturing to any extent. Elsewhere, besides farming the chief resource is fishing, for the region is too remote from the busier districts of the continent for trading to be important. Hence the population is, with small exceptions, rather scanty. Even in Britain, as was explained in Volume I of this series, the Atlantic Margins differ markedly from the English Lowland, which belongs to the next minor region.

The Developed Lowlands and Wooded Uplands.—The map of climate regions in Fig. 15 shows that within this minor region there are modifications in the climate, particularly noticeable in an approach to extreme conditions towards the east. Moreover, a relief map shows that, apart from the Alps, there are in Central Europe considerable upland areas which are high enough to have distinctly cooler and wetter conditions than the adjoining lowlands ; these uplands areas are indicated also on the map of structural regions in Fig. 1 as belonging to the Hercynian group or as due to foldings of the Alpine type.

Putting these facts together, it will be seen that this minor region of Temperate Europe comprises (a) lowlands of sedimentary material, and (b) uplands of generally older and more resistant rock, and that each of these groups is composed of a number of relatively small areas with climatic differences corresponding to their respective positions (see Fig. 21).

The former group is here labelled as " developed lowlands,"

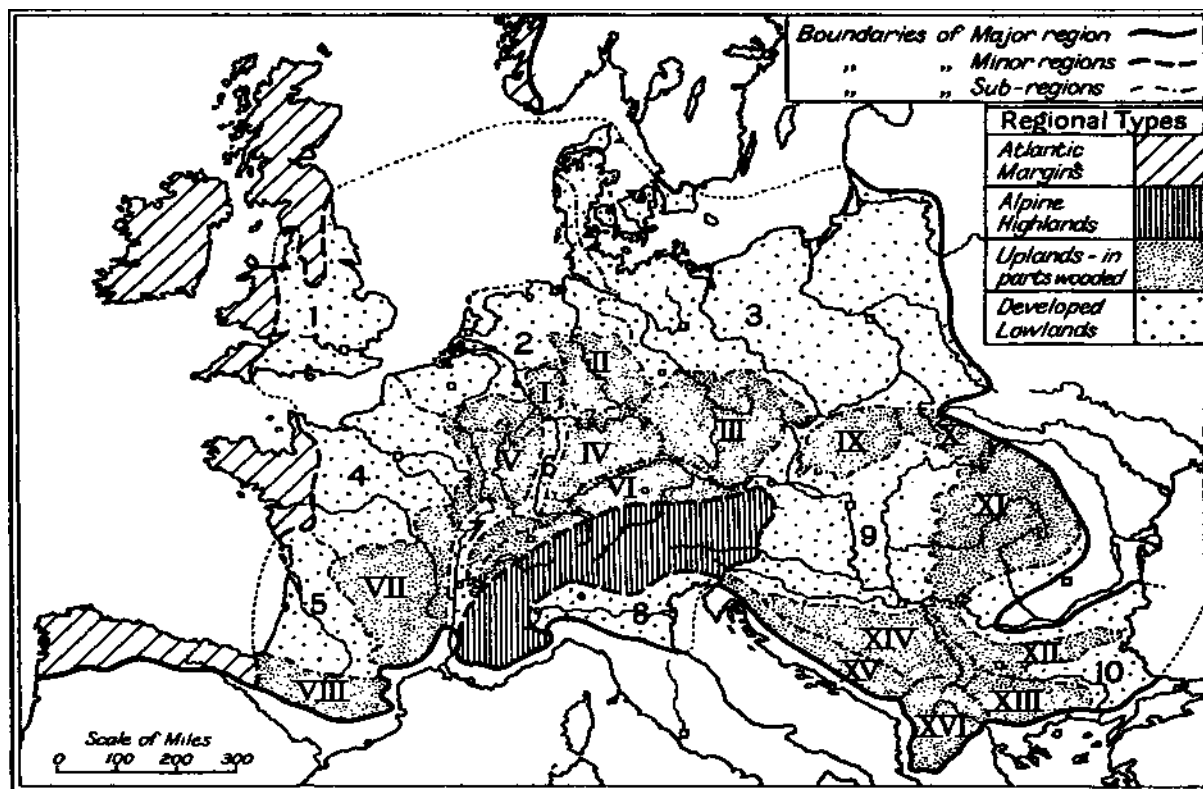


FIG. 21.—REGIONAL TYPES OF TEMPERATE EUROPE.

because their resources have been very thoroughly exploited and in them a number of districts have been largely transformed by human agency. In general, the climate and soil favoured early settlement, and for centuries men have used and improved the natural conditions, while even less-favoured parts, such as the marsh areas near the delta of the Rhine, have for various reasons also attracted settlers, who have converted them into productive lands.

Practically the whole of the lowlands are farmed, and much of the area is cultivated in an intensive manner, with a high yield as well as a great variety of products. According to the varying climatic conditions, rye, barley, wheat and maize are characteristic in different localities, generally associated in a rotation with other grains, industrial crops or fodder crops. Pastoral work in many parts is carried on in its most remunerative form, viz. dairy farming, to meet the needs of large urban populations. Minerals, too, have been exploited where they exist, particularly where coalfields dip down from the Hercynian Uplands under the margins of the lowlands, and some of the greatest and most densely populated industrial regions of the world have grown up in these lowlands.

The "drowning" of the continental margin has brought the sea far into the region, and from much of the interior of Europe the rivers bring traffic to the English Channel, the North Sea and the Baltic Sea. Because of the great amount of manufactured goods produced in the region, and the need of the dense populations for raw materials and food, commerce has developed here as in few other parts of the world and many important trade routes meet in the lowlands, as is shown in Fig. 20; there are also great ports, especially near the mouths of the rivers on the continental and English shores of the North Sea. Manufacturing and trading have thus led to immense urban development in the more northerly of the lowlands, viz. the English Lowland (numbered 1 on the map in Fig. 21), the North Sea Lowlands (2), the South-West Baltic Lowlands (3), and the North French Lowland (4).

On the other hand, some of the more southerly regions have more favourable climatic conditions and give a greater return to agriculture, as is exemplified in the Basin of Aquitaine in France (5), the Rhine Rift Valley (6), the Rh6ne-Sa6ne Trough (7) and the North Italian Plain (8). On the eastern side a lack

of rain may be a handicap in the Middle Danubian Lowlands (9), while a transition to steppe-like conditions is observed in the drier South-eastern Lowlands (10), which include the Walachian Hill-lands and the East Balkan Lowlands.

Each of these ten areas has sufficient unity within it, and sufficient difference from its neighbours, to be regarded as a distinct sub-region of the " Developed Lowlands and Wooded Uplands " of Temperate Europe.

The uplands of Temperate Europe, with their cooler and wetter weather, are less suited to crop growing ; they have considerable areas given to pasturage, but their characteristic vegetation-cover is forest. There is quite a variety of trees, and forestry is one of the chief occupations. The minerals, which in a number of districts first attracted settlers, have in several cases been largely worked out, and only relatively small industries are based upon them. Trade naturally avoids the higher areas (again see Fig. 20), and because of these combined conditions, the uplands are, in general, the homes of much smaller populations than the lowlands.

These uplands form a number of distinct sub-regions, which may be grouped according to their position. The Central Uplands of Europe comprise the Rhine Plateau (marked I in Fig. 21), the Weser-Saale Hill Country (II), the Bohemian Diamond and its margins (III), the East Rhine Scarp-lands (IV), the West Rhine Scarp-lands (V), the Jura Mountains and the Alpine Foreland (VI). In western Europe are the Central Plateau of France (VII) and the Pyrenees (VIII). On the eastern side are the three Carpathian sub-regions (IX, X and XI), and five more constitute a great part of the Balkan Peninsula (XII—XVI).

The Alpine Lands.—The great differences in elevation make it difficult to summarize the characteristics even of this relatively small minor region. It may be briefly said that the valleys provide sites for settlement, and offer opportunities of farming and other occupations which support the comparatively small numbers of inhabitants, while through some of the valleys pass routes connecting central and north-western Europe with the Mediterranean region. At higher altitudes forests supply timber, and still higher are summer pastures to which animals and people migrate for a few months. Above this habitable zone, dwarf shrubs, low cushion-like growths, lichens and other forms of alpine flora appear in summer and recall, in the heart of

Temperate Europe, the plant-life of the Arctic Region ; in the highest zone of all, only steep slopes and culminating peaks of bare rock emerge from snow-fields.

Peninsular and Trunk Europe.—We may regard Peninsular Europe as that part of the continent which adjoins the Atlantic Ocean and has been given peninsular form by the penetration of the North and Baltic Seas on the north and the Mediterranean Sea on the south. It may be broadly limited eastward by a line drawn through the Gulf of Bothnia and the Baltic Sea to near the mouth of the Niemen (Memel) River where Temperate Europe adjoins the Sub-boreal Farmed Forest Region, and thence the limit approximately follows the boundary of Temperate Europe to near the delta of the Danube.

By such a division, both Peninsular and Trunk Europe include portions of several geographical regions, but the former is more open to maritime and western influences, while the latter has a continental and eastern orientation. The physical causes of the differences have now been shown ; corresponding contrasts in the human geography of the two areas will be brought out in several sections of the next chapter.

QUESTIONS

1. Define the limits of the " Arctic " region of Europe, and show how the geographical factors within it interact with one another.
2. What justification is there for regarding the Boreal Forest region as a geographical unit ?
3. Describe the common characteristics of the Mediterranean geographical region, apart from its climate.
4. Discuss whether it would be better to incorporate the region here termed " Sub-boreal Farmed Forest " into one or more of the neighbouring regions.
5. Consider whether the areas marked as " Atlantic Margins " should be distinguished as a separate minor region of " Temperate Europe."
6. It is difficult to find short names which well denote geographical regions. Discuss, and suggest alternatives to, two names adopted here for major regions, which seem rather unsatisfactory.
7. Discuss the possibility of dividing Europe simply into two great regions, " Peninsular " and " Trunk," on the basis of their general character.

THE PEOPLES OF EUROPE

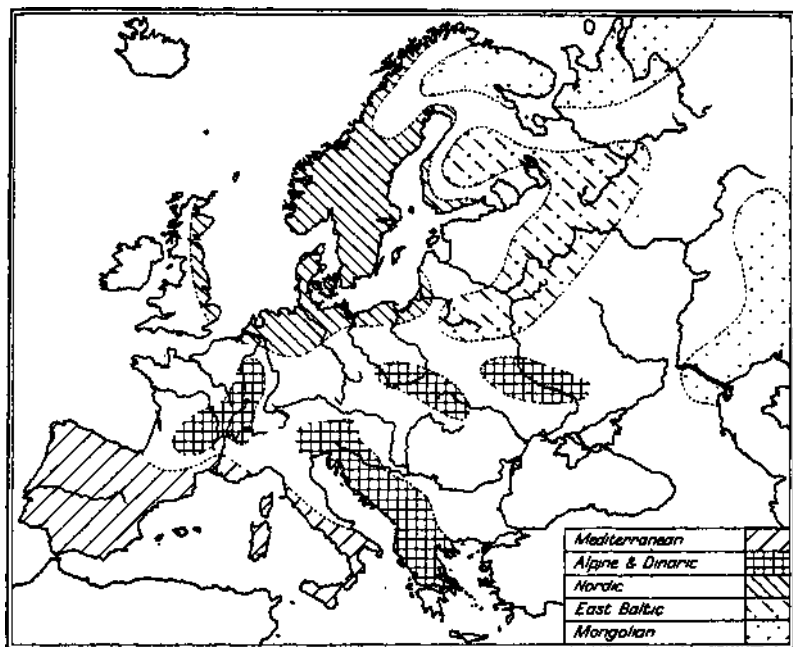
IN the preceding chapters the people who live in the various parts of the continent have been referred to mainly in relation to their respective environments ; we will now consider the peoples themselves.

The Racial Elements.—The physical characters of people are fundamentally determined by their descent, being handed down from generation to generation, and are therefore taken as indications of the race to which people belong. It is important to restrict the term " race " to groups of people who have in common a number of physical characters due to a more or less common ancestry, and never to use the term to denote groups who, although speaking the same language, or having the same religion, or being members of the same political State, nevertheless differ from one another physically because they have a mixed ancestry.

Anthropologists classify the greater part of mankind into three main racial or ethnic groups, distinguished from one another by the structure of the hair and the colour of the skin. These three groups are : (i) that of the negroes with woolly hair and black or very dark skin ; (ii) that represented by the Chinese and other Mongolians with straight, lank hair and yellowish skin ; (iii) the group to which the peoples of Europe mainly belong, with wavy or curly, yet smooth and not woolly hair, and with skins which are more or less white or light brown.

Among the Europeans, the various shades of skin colour are often, but by no means always, associated with the colour of the hair and eyes : a fair skin is in many cases accompanied by light-brown or even yellow hair and by blue or grey eyes, while the rather darker-skinned people commonly have dark-brown eyes and black hair. These contrasts between fair and dark are very clearly seen by comparing the typical Scandinavians showing the former characters with the inhabitants of southern Italy showing the latter, and they are so marked that they are taken as indicating distinct racial or ethnic stocks, to which the terms

"Nordic" and "Mediterranean" are respectively applied. People belonging to the Nordic type constitute a considerable proportion of the inhabitants of the northern plains of Europe west of Russia, and those of the Mediterranean type form a majority of the population of the western Mediterranean lands (see Fig. 22). Between them, in the highlands and uplands of Central Europe, most of the people have an intermediate



After Giinther.

• FIG. 22.—DISTRIBUTION OF PREDOMINATING RACIAL TYPES.

Note.—The shaded areas are those in which the respective racial types are common. In the intervening areas the mingling is so great that no type can be regarded as characteristic.

grade of coloration with chestnut-brown to black hair, and hazel-grey to brown eyes. Moreover, the people of the Nordic stock are generally tall, those of the Mediterranean stock are relatively short, while those of the central uplands and highlands are of medium height.

Yet these intermediate conditions of coloration and stature do not result from a mixing of the other two racial stocks, for they are commonly associated with a quite different shape of the head. Both the Nordic and the Mediterranean stocks are

characterized by " long " heads, that is, the length of the skull from front to back is markedly greater than the breadth from side to side, whereas the inhabitants of the central uplands and highlands usually have rather broader heads. Hence the peoples here are representatives of another racial stock, and to these people the name " Alpine " is applied.

Closely associated with these Alpine peoples are another group who are also broad-skulled, but do not resemble them in appearance, for they have a greater stature, a more slender figure and a longer face. They are numerous in the coastlands north-east of the Adriatic Sea, and for that reason this group is known as " Dinaric " or " Illyrian." Judging by the physical criteria, members of this stock spread northwards and now form one of the important racial elements in the plains of Silesia and south Poland.

The three ethnic groups—Mediterranean, Alpine-Dinaric and Nordic—together comprise the greater part of the population of Europe, and it is therefore commonly stated that there exist these three European races.

The ancestors of these groups worked their way into Europe thousands of years ago, displacing or mingling with the scattered hunting peoples who had occupied the south of the continent during the Ice Age and had moved northward as the climate improved and the ice retreated.

Of the three main races, the Mediterranean stock peoples were the first comers. It was probably before 4000 B.C. that they settled on the warm and fertile shores of the great sea ; there they had opportunities for growing grain and fruit, and for extending westward in Europe the civilization which had arisen in Egypt, Mesopotamia and the lands around the eastern part of the Mediterranean. In course of time they passed around the Iberian Peninsula to the Atlantic coasts, and thus reached the west of France and the British Isles (see Fig. 23).

Later, when climatic conditions in central Europe had become more favourable, the Alpine peoples migrated from Asia Minor and extended their settlements along the uplands and the neighbouring lowlands drained by the Danube. The loess areas of central Europe, fertile and free from forest, favoured the agriculture and pastoral work upon which they depended. They gradually worked their way westward into the valleys of the Alps and over the upland areas of what are now southern

and central Germany, Belgium and central France. The related Dinaric peoples followed those of the Alpine stock by much the same routes through the Balkan Peninsula and into central Europe, but they did not penetrate so far westward.

At a very much later date one branch of the Alpine stock spread from the Carpathian region into the adjoining plains to the north and east which now form part of Poland and Russia. These peoples are known as Slavs, and their descendants form a considerable proportion of the Russian people. A further migration southward gave rise to another group, the South Slavs or Yugoslavs, who occupied much of the Balkan Peninsula.

The ancestors of the Nordic peoples seem to have entered Europe after the Mediterranean and Alpine immigrants; originally pastoralists, they migrated across the plains of southern Russia, and eventually settled in the lands around the Baltic Sea.

Associated with the greater stature of the Nordics is usually greater physical strength than that of the peoples of the other stocks, and this doubtless helped them, at a much later date, to spread southwards and, in many instances, to conquer other peoples and to occupy parts of western, central and even southern Europe. For example, there were the settlements in Britain by the Angles, Saxons, Jutes and Norsemen, the incursions of the Goths into the Balkan Peninsula and Italy, and the penetration by the Vandals into the Iberian Peninsula and even into northern Africa.

Besides these peoples who have been so long established in this continent that they are regarded as truly "European," there are others whose origins are more recently Asiatic, and who are related to the Mongolian races of Asia. The Samoyeds have migrated from Asia into the northern forests and tundra of Russia, and the Lapps have spread even into the north of Scandinavia. They belong to the Ugrian racial group, who are characterized by broad heads and rather short stature, and often have a flat face and prominent cheek-bones ; the slanting eyes which are shown most strikingly among the Chinese and Japanese appear among the Samoyeds, and occasionally among the Lapps.

Allied to the Ugrian folk are the Finnish group of peoples who had earlier worked their way across the Ural Mountains into

northern Europe, and now occupy the greater part of Finland and the adjoining region of Karelia across the Russian border. Yet the Finns of the present day do not show the characteristic Mongolian features to the same degree as the Lapps or the Samoyeds, probably because the original Finnish immigrants here settled in an already populated area. It frequently happens that a group of intruders may dominate an area and intermarry with the inhabitants, upon whom they impose their name,

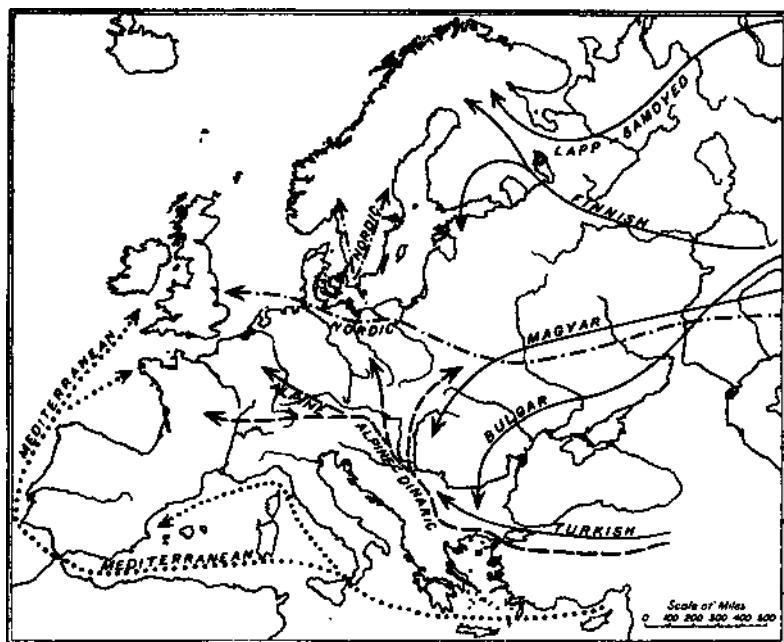


FIG. 23.—RACIAL MIGRATIONS INTO EUROPE.

language and traditions ; yet, if these subject people are relatively numerous, in the course of generations the blood of the dominating group becomes progressively diluted, as it were*. Hence, anthropologists are frequently faced with the fact that the name and speech of a people suggest one origin, and their physical features another. In the case of Finland it is certain that, in spite of the absence of Mongolian features, some of the ancestors of the present Finns migrated from northern Asia.

South of the Gulf of Finland are the Ests or Esths of Estonia, who are closely related to their Finnish neighbours. Moreover, in all the East Baltic region there are many individuals of a

type which seems to have resulted from a mingling of stocks of northern Asiatic and Nordic origin. These people are regarded as having by now been welded into a distinct ethnic sub-group, called East Baltic (see Fig. 22), and they form part of the population of a very wide area extending into Prussia on the west, Russia on the east, Finland on the north, and Latvia, Lithuania and Poland on the south.

Rather more recent immigrants from Asia of definitely Mongolian origin and speaking Ugrian languages came by a more southerly route along the steppe-lands. The Bulgars were nomadic horsemen, who in the seventh century A.D. crossed the lower Danube, conquered the Slav inhabitants and gave their name to Bulgaria. But though their name and some of the traditions of the invaders have survived, the language of the Bulgarians is now in the main Slavonic, and the people show little of the original physical characters of the immigrants.

A century or two later, other Asiatic tribes swept across the steppes, and some of these worked their way across the Carpathian Mountains into the Pannonian or Hungarian Basin. One group of these invaders spoke a language which was compounded of two Asiatic elements, the Ugrian and the Turki; the people of this speech were the Magyars, and the present inhabitants of Hungary still retain the name Magyars and speak the Magyar language, though their physical appearance shows that they have altered but little the predominating Alpine stock of the Slavs whom they conquered.

At about the same time that south-eastern Europe was thus invaded, the Moors of northern Africa crossed into the Iberian Peninsula and for a time ruled much of that region; yet they did not make great changes in the racial composition or the language of the people of the Peninsula, and the results of their occupation will be referred to in later sections.

The last of the great invasions was that of the Turks, i.e. tribes speaking a Turki language; they came from central Asia, and one group, the Osmanli Turks, overran Asia Minor, occupied Constantinople in A.D. 1453, and forced themselves as masters upon the people of the Balkan Peninsula. But throughout their long and victorious advance, they freely intermarried with their subjects, and accepted as "Turks" many who adopted their Moslem religion. Thus the Turkish State known as the Ottoman Empire spread from south-western Asia over much

of the Balkan Peninsula, and imposed its rule upon that region, but, nevertheless, the Balkan peoples still remained mainly of Alpine, Dinaric or Mediterranean descent and retained Slavonic, Albanian or Greek languages.

Other movements of peoples have occurred, some of which must be referred to in the next section in connexion with the spread of languages, but it may already be realized that the contacts and conflicts of the various migrant peoples have resulted in a mingling of the population in such a way that few districts show a uniformity of type.

Languages.—To use the words "Aryan race" for the Nordic ethnic group is doubly misleading, for in the first place the word Aryan applies only to languages, and in the second place it denotes a widespread group spoken by the great majority of Europeans (see Fig. 24). The Aryan languages have extended over almost the whole of the continent of Europe and through south-western Asia into India. Hence they are also known as Indo-Germanic, though they include not only the German or Teutonic family of languages, but also Greek, the Romance languages which have derived from Latin, the Slavonic family and the Celtic languages, as well as others spoken by some of the smaller communities.

Although in some areas, as in Wales, two languages exist side by side and many individuals may speak both, it is nevertheless possible to show the broad distribution on a map. This is done in a generalized form in Fig. 24, and in more detail for the central part of Europe in the end-paper map within the back cover of this book.

It is not possible to say what were the languages of the earliest folk who came into Europe; only the later movements of people, during historical times, can be definitely associated with the spread of the present-day languages.

By the generally westward migrations of conquering tribes the pre-Aryan languages became extinct, the one striking exception being the Basque speech, which has survived in the mountainous borderland of South-western France and Northern Spain. With the language there have remained old customs and traditions, and even a feeling of a distinct nationality among the Basque folk; nevertheless, the physical characteristics of the people do not show a uniformity of racial origin.

Another early language which has survived in the west of

Europe is the Celtic tongue. It is a member of the Aryan group carried across Europe in successive waves of settlement about 1000 years B.C. by folk probably of mixed descent ; later these people were themselves displaced or forced to adopt the languages, Teutonic or Romance, of other conquerors. Hence Celtic is now found, in several varieties, only in the peninsulas and islands of the Atlantic Margins in Brittany, Wales, north-western Scotland and Ireland.

The Greek language is spoken in the southern part of the Balkan Peninsula, and on the islands of the *Mgesm* Sea and Krete.

The Romance languages have a very wide distribution, for their spread resulted from the great extension of the Roman Empire. Italian is most directly derived from Latin, and is now spoken in the Italian Peninsula, the islands of Sicily and Sardinia, the North Italian Plain and some of the coast-lands north-east of the Adriatic ; it is also spoken in the part of Switzerland which projects southward to the edge of the North Italian Plain between Lakes Maggiore and Como.

East of Lake Como there are several small areas of the Alps in which the inhabitants of the mountain valleys speak distinct Romance dialects : Romansch or Rhaetic, Ladin and Friulian,

In the Iberian Peninsula, apart from Basque, are several languages belonging to the Romance family. The difference between them may be related to the invasion by the Moors, who at one time occupied all the Peninsula except the northern mountain regions, where the Christians held out and whence they reconquered the land. One line of reconquest spread the dialect of the north-west corner, Galicia, southward along the Atlantic region, thus leading to the growth of a distinctive language in all this western part of the Peninsula. Later, most of this area formed the independent State of Portugal, in which evolved the present Portuguese language. Hence the Galicians, or Gallegos, speak a dialect akin to Portuguese and markedly different from the Spanish language.

Spain was mainly reconquered from the north by way of the plateaus of Castile ; the Castilian rulers gradually extended their power over the whole of Spain, and thus Castilian became the standard form of the Spanish language.

In the north-east of the Peninsula the defeat of the Moors allowed the return to Spain of refugees from France who brought

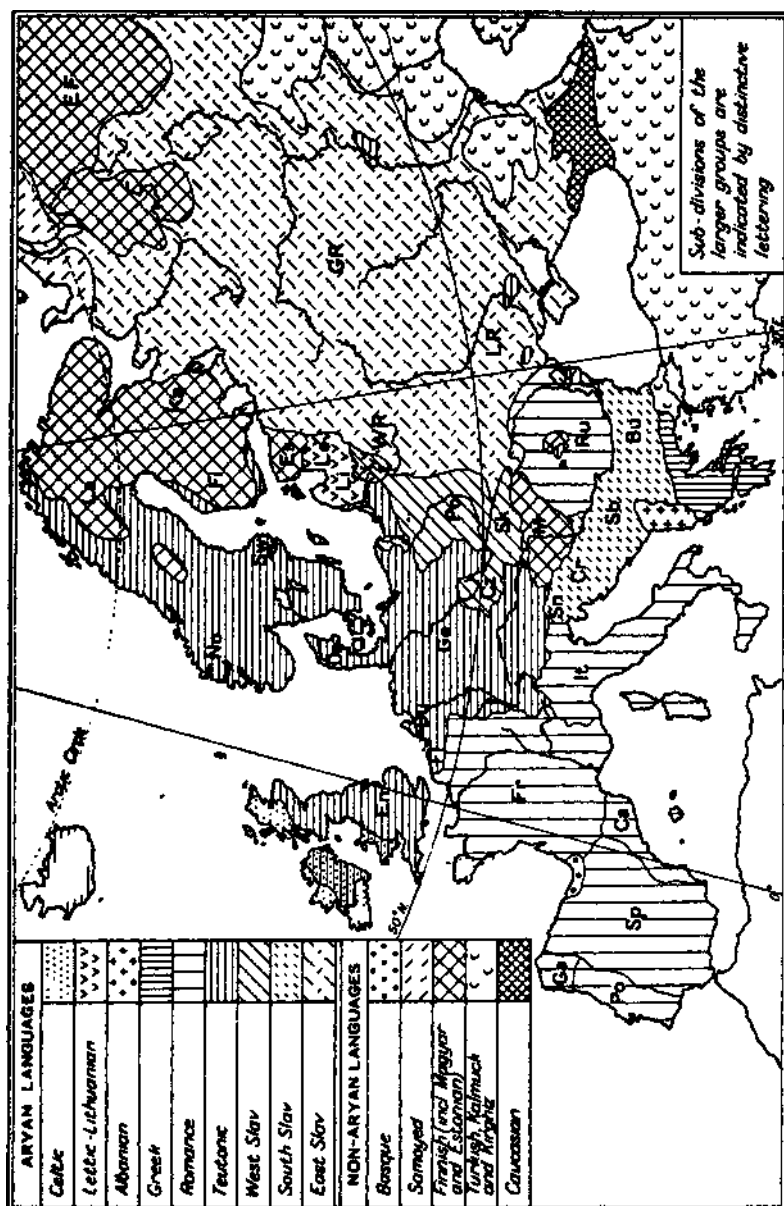


FIG. 24.—DISTRIBUTION OF LANGUAGES.

with them a dialect of the " Languedoc " spoken in the south of that country and akin to the modern French dialect Provençal; in eastern Spain this language became Catalan, and has spread to the Balearic Islands. In Catalonia, the north-eastern part of the Iberian Peninsula, the Catalan language has developed a considerable literature, and the distinctive language, traditions and literature have made the Catalonian people conscious of possessing a unity among themselves, and differing from the other peoples of the Peninsula.

The extent of the French language does not coincide with the territory of the French State, for while on the west Breton is spoken together with French, on the east the boundaries of the language and of the State diverge at several points. This is especially the case in three areas : (i) where the French speech extends into Switzerland, being spoken by about one-fifth of the population of that country ; (ii) where German-speaking peoples live in French territory in Alsace and Lorraine ; (iii) where French is the language of the Walloon people who form the population of the southern part of Belgium, viz. south of a line running approximately from east to west a little south of Brussels.

Rumanian is derived from the Roman language, as is clearly suggested by the native spelling of the name of the country—" Romania." It has been handed down from the provincials of this north-eastern outpost of the Roman Empire, but it has been greatly modified by the Slav-speaking and other peoples who have since then occupied the country. In most other parts of the eastern portion of the Roman Empire in Europe the later invaders have imposed their Slavonic speech, with the exception of Greece and Albania. In the latter mountainous country the Albanian language appears to be a survival of a primitive Aryan tongue.

The Teutonic family of languages probably had its home among the Nordic folk living in the plains around the west of the Baltic Sea and the south-east of the North Sea ; thence settlements and conquests in all directions led to the development of distinct Teutonic languages among peoples of varied origin. In the north there are the Scandinavian languages, of which Danish and Norwegian are almost identical; Swedish is closely related to the other two.

The English language is based in the main upon the speech

of the Teutonic invaders, modified by Romance elements introduced as a result of the Norman conquest. Other westward migrations of Germanic peoples have resulted in the development of the Dutch language in Holland and of Flemish in Belgium. This latter language is very closely akin to Dutch ; it is spoken by the Flemings, who form rather more than half the population of Belgium and occupy the part of the country north of the Walloon area.

Southward the Teutonic languages have had a wide extension over lands in which the people show relatively little influence of Nordic stock, i.e. from the racial point of view. German is spoken not only throughout Germany, but also beyond its borders in the Alsace-Lorraine portion of France, over the greater part of Switzerland, and in the upper Adige basin in Italy (see the end-paper map).

Eastward and south-eastward are " islands " of German speech, some of which are due to past wars between the Teutonic and Slav peoples. The Teutonic Knights won back East Prussia from Slavonic invaders and dominated the country now forming the States of Estonia and Latvia. In Poland, too, there are many German communities bearing witness to a similar ebb and flow of conquest. German settlers also went far into south-eastern Europe—into the Danubian plains and the upland basins and valleys of Transylvania, and even into the steppe-lands of Russia.

The Lithuanian and Latvian (or Lettish) languages, like the peoples of those countries, have a mixed origin. They are alike, and are regarded as a survival of an archaic Aryan type ; in each country the ancient tongue has been modified by the introduction of Slavonic and other elements.

The Slav languages have spread over the greater part of east-central and eastern Europe. There is the western group, including Polish and the closely related Czech and Slovak languages. There is the southern group, which includes Slovene, Croat and Serbian spoken by the three peoples who form the bulk of the population of the Yugoslav State. Bulgarian is another of the South Slav group of languages.

The widest extension of the Slavonic-speaking peoples has been eastward into the previously scantily occupied forests and steppe-lands of Trunk Europe. Of the East Slav languages " Great Russian " is the standard literary form, and is spoken

by the vast majority of the Russian people ; " White Russian " approximates to Polish, as its geographical distribution would suggest; " Little Russian " is the language of the Ukraine. The word " Ukraine " means borderland, and here the Russians had to oppose, and in course of time were to some extent influenced by, the invading horsemen from the Asiatic steppes ; consequently the Ukrainians developed differences from the Great Russians in several respects, and now Little Russian or Ukrainian is claimed to be a distinct literary language.

Lastly, there are non-Aryan languages of relatively recent introduction from Asia. In northern Europe, in addition to the speech of the relatively few Samoyeds, there is the Finnish group ; in the north-east are people speaking East Finnish dialects, while the West Finnish languages are spoken by the Karelians, the Lapps and the Finns themselves. These last people have developed the Finnish language proper and created a Finnish literature. Another west Finnish speech has spread southwards across the Gulf of Finland and has there become the Estonian language.

Magyar belongs to the same Finno-Ugrian family, although it has been carried into distant regions and imposed upon other peoples ; hence the Magyar speech of Hungary and Transylvania contains quite different elements from those of the Finnish group.

Of the other " Asiatic " languages, Turkish is now spoken by few people beyond the borders of the Turkish State, and the allied tongues of the Kirghiz, Kalmucks and other peoples of the south-eastern margins of Europe are giving way before the advance of Russian colonization and government. In the Caucasus and Transcaucasia there are spoken various non-Aryan Caucasian languages.

It will be observed that while Peninsular Europe has been influenced by many language developments and their associated forms of culture, Trunk Europe has seen the extension only of the Eastern Slav and the relatively late Asiatic groups of languages.

Religions.—It would be out of place here to attempt to state the faiths of the various religions or the effects they have upon individual people, but the religions have a geographical significance because the churches into which they are organized have had effects upon political, social and economic affairs, while their distribution is related to geographical conditions.

Christianity was adopted as the creed of the Roman Empire, and its spread was influenced by the extent of that power, but Christian missionaries carried even beyond the Empire both their faith and also such advances as reading and writing, better methods of cultivating the land, and various handicrafts ; hence the spread of religious ideas was often marked by a spread of other forms of culture.

Because the Roman power extended over a great part of western Europe the allied religious and cultural influences had more effect in transforming the lives of the " barbarians " in the west than was the case in the east of the continent, and these influences were one factor in bringing about the greater development in knowledge, in arts and sciences, in forms of government, and in economic matters, which long characterized western as compared with eastern Europe.

In the eleventh century the Christian Church was permanently split into two portions : in the east was the Greek or " Orthodox " Church ruled from Byzantium (now Istanbul), and in the west was the " Catholic " Church ruled from Rome. From the original home of European civilization in the Mediterranean region the line separating the areas influenced respectively by the Roman and Orthodox Churches runs from the head of the Adriatic Sea first north-eastward and the northward to the Arctic Sea, as can be seen from the map in Fig. 25.

In the east of Europe the influence of Christianity was greatly weakened by exposure to the attacks of Asiatic intruders. In the Balkan Peninsula the Turkish occupation resulted in a widespread adoption of the Mohammedan religion, and although the Turkish rule has been withdrawn from nearly all the region, nevertheless the people of parts of Yugoslavia and Bulgaria and of most of Albania remain Mohammedan. Here, in south-eastern Europe, the tall minarets of the mosques give an " oriental " appearance to the villages and towns, and from their summits the muezzins call the people to prayer. The Moslem women are still veiled, and the men still wear the round, tasselled fez, although in Turkey itself these distinctive marks of the Mohammedan religion are banned in order to avoid religious animosities between the different sections of the Turkish population.

Farther to the north-east, over most of Trunk Europe, the spread of religious and cultural influences was hindered by geo-

graphical conditions, for between the Mediterranean region and the homes of the early Russians in the clearings of the "farmed forest" region lay the steppe-lands; along these open lands passed wave after wave of nomadic invasion from Asia, which prevented effective contact between north and south. For the many centuries before the Russians dominated the steppe-lands, the advances made over the rest of Europe could reach the

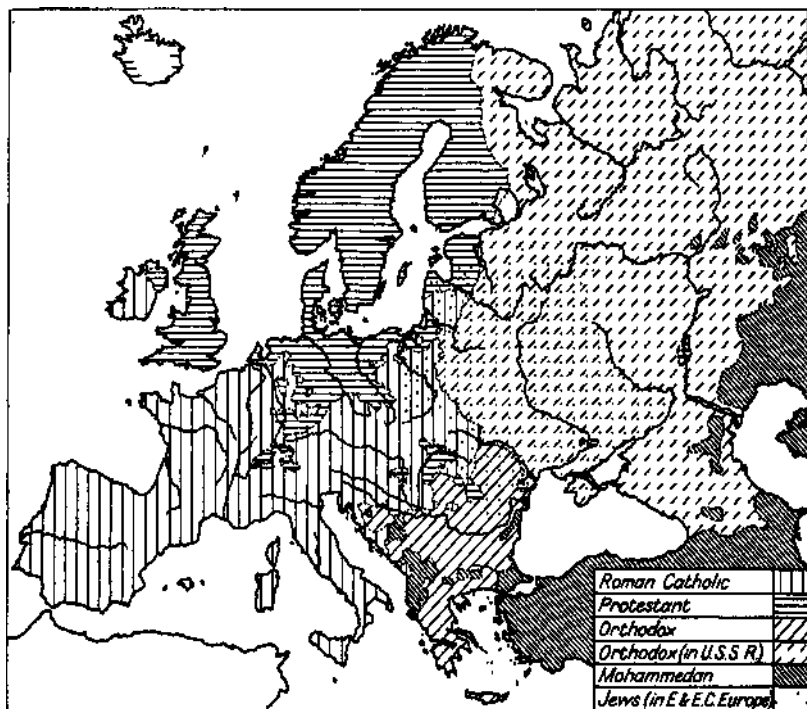


FIG. 25.—DISTRIBUTION OF RELIGIONS.

Russians only by a roundabout route through the Baltic Lands. This retardation is an important factor in explaining the differences between the peoples of Peninsular and Trunk Europe respectively.

The Orthodox faith at last spread over most of Russia and had a great influence for several centuries, but after the revolution of 1917 the new Government was so hostile to the Christian religion that now it is held, as a rule, only by people of the older generation who were brought up in that faith.

Yet one effect of its previous power is shown by the fact that here, as in the other countries in which some form of the Orthodox religion exists, the present alphabet is based upon the ancient Greek alphabet; on the other hand, in the countries to which the Roman Church extended the Latin alphabet is used, even though the language is not of the Romance family. The exception to this rule is Rumania, where the religion is Orthodox, but the Roman characters are used.

Yugoslavia illustrates the influence which religious differences may have on political conditions. The three peoples comprising the majority of the population are the Serbs, Croats and Slovenes, and, as stated in the preceding section, they speak similar languages, but while the Serbs are in the main of the Orthodox faith and have an alphabet derived from Greek, the Croats and Slovenes are Roman Catholic and use the Latin alphabet. These differences add to the difficulty of welding the three groups into one harmonious and firmly knit State.

After the close of the Middle Ages, a number of the States of northern Europe broke away from the Roman Catholic Church, and several Protestant Churches were formed; in determining the distribution of these new Churches the political power of the princes of that time was a greater factor than geographical conditions, and although the religious differences had very important consequences two or three centuries ago, they now count for less when one region is compared with another.

Separate reference must be made to the Jews as a religious community. Although a proportion of the Jews show a facial resemblance by an aquiline nose with a depressed tip and wide nostrils (characteristic of an " Armenoid " ethnic group related to the Alpine race), they have a very mixed racial origin. They have a language of their own—Yiddish—a blend of Hebrew and German elements, but they also speak the languages of the countries in which they have settled. The essential bonds between them are their religion and the traditions associated with it, and their feeling of difference between themselves and other peoples has been greatly intensified in several countries by their being forced into living apart from others. The map shows that they are relatively numerous in the transitional region between eastern and central Europe; here they are largely town-dwellers, engaged in trade, and are not easily

assimilated into States which are mainly composed of peasants. In all Europe, the Jews number nearly 8 millions.

Nationalities.—When a considerable group of people have lived together in one area and feel themselves to be bound by common ties to the extent that they wish to form a Government of their own, they may be said to constitute a "nationality." The ties that unite the members of a nationality are various : belief in a common racial origin (whether this belief is justified by scientific knowledge or not) ; the use of a common language and the enjoyment of a common literature; sharing of a religion ; living in one political state ; association in defence against enemies. Any one or more of these factors may be powerful in creating a feeling of national unity, but any one or more may be lacking among the members of a nationality. Perhaps the most usual indication of a feeling of national unity is the possession of a common language, for this is the result of long association and helps intercourse between those speaking it ; hence the map showing the language of Europe is, as a whole, useful as showing the nationalities of Europe. There are, however, some marked discrepancies ; e.g. the Swiss people certainly form a definite nationality, for they feel among themselves a unity which demands that they form a State independent of any other, yet among them are spoken four official languages—German, French, Italian and Romansch.

If a nationality is able to form a self-governing State, it is fortunate ; if it cannot, it may become a minority within some State in which it is held against its will, and in that case its discontent may be a danger to peace.

Political States.—A State is an association of persons living under one Government and inhabiting a definite territory. The reasons for the existence and extent of a particular State are generally complicated and reach far back into history ; it is clear from what has already been written that the members of a State are not necessarily bound by all the ties which have been discussed, though a feeling of a common nationality usually unites a considerable proportion of the subjects of a State. In the case of Switzerland we have an example of a State coinciding exactly with a nationality, but the Russian Empire as it was in the early part of the present century comprised a number of different nationalities.

It is important to consider the relation of States to geo-



FIG 26 —STATE BOUNDARIES BEFORE AND AFTER THE WAR OF 1914-18.

Note.—The various shadings show the extent of the States before the war of 1914-18; the thick In 1938 Germany incorporated Austria and the north-western margins of Czechoslovakia, and smaller areas of Czechoslovakia were lost to Hungary and Poland.

graphical conditions, and an examination of a map of the political units in Europe shows that they seldom bear any close relationship to natural or geographical regions (see the end-paper map at the front of this book). Indeed, there is a strong tendency to the contrary, for a State may be tempted, if an opportunity arises, to make itself stronger by extending its territory into a region which is of a different type and possesses resources which it has hitherto lacked. A desire to be self-sufficing, or to secure access to trade-routes by which commodities can be secured from abroad, has in many instances been a factor in advancing the frontiers of States across regions of contrasting geographical character.

For this reason, political frontiers seldom coincide with the boundaries of geographical regions, although well-marked natural features, such as rivers or water-sheds, maybe adopted as convenient and definite limits of States ; this is particularly the case when such a frontier offers a useful means of defence.

The difference between geographical and political units is brought out still more clearly when one thinks of the great and sudden changes which the States of Europe have undergone during the last few hundred years : old ones have disappeared, new ones have been formed, and others have expanded or shrunk to various degrees. In the last quarter of the nineteenth century—during the lifetime of many people now living—the Balkan States were carved out of the former Ottoman or Turkish Empire. In the present century, the political map of a broad belt running from north to south of the continent, and overlapping Peninsular Europe on the west and Trunk Europe on the east, has been completely transformed. There is no certainty that political conditions are yet stable in Europe, particularly in this " belt of political change."

The present-day geography has been greatly affected by the alterations brought about by the war of 1914-18; these are shown in Fig. 26. Particular attention must be drawn to the break-up of what were two of the greatest States of Europe before 1914, viz. the " Dual Monarchy " of Austria-Hungary, in which the Austrian Empire and the Kingdom of Hungary were united under one sovereign, and the Russian Empire. Under the strain of war, these great Powers fell to pieces, and several of the nationalities which had been unwillingly included obtained independence.

In the case of Russia, the Finns, Ests, Letts and Lithuanians set up the new States of Finland, and the three "Baltic States" of Estonia, Latvia and Lithuania, and the Poles of Russia united with those of Austria and Germany to re-create an older State of Poland.

Over most of the remaining part of Russia, after a period of revolution, there was formed the "Union of Soviet Socialist Republics" (U.S.S.R.), comprising eleven republics, which may be arranged in four groups on a geographical basis, (i) The "Russian Soviet Federated Socialist Republic" includes the greater part of European Russia, and all the northern and eastern portion of Asiatic Russia; it is the predominant partner in the Union, and at its capital, Moscow, is centred much of the administration of the whole of the Russian territories, (ii) The White Russian Republic (capital Minsk) and the Ukrainian Republic (capital Kiev) make up the remaining portion of Russia in Europe (see the map of eastern Europe in Chapter 17). (iii) The three republics of Georgia, Azerbaijan and Armenia together form the Russian territory of Transcaucasia, (iv) Across the Caspian Sea, in the south of Asiatic Russia, is another group—the Turkmen, Uzbek, Tadzhik and Kirghiz republics.

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When the Austro-Hungarian Monarchy fell to pieces, the hitherto subjected Czechs and Slovaks formed the new State of Czechoslovakia in the north, the Slovenes and Croats united with Serbia and Montenegro to form Yugoslavia in the south, the Rumanians of Transylvania were united to those of independent Rumania across the Carpathians. Thus the previously dominant peoples, the Austrians and the Magyars of Hungary, shorn even of parts of lands they themselves occupied, were left in 1919 to constitute the new small States of Austria and Hungary. Nineteen years later, in 1938, Austria was taken into the German Realm, "Deutsches Reich," and became one of the provinces of Germany.

In thinking of the relation between natural and political units, it must be borne in mind that States may have considerable influence on the geographical conditions of the regions they include, and in particular they may modify economic activities. Thus, in later sections of this book instances will be given of the way in which traffic may be diverted from natural routes because of political frontiers. Here special mention must be

made of the policy of "self-sufficiency" adopted very widely after the war of 1914-18.

With a desire to help their own subjects, and often to assure within their boundaries supplies of food and of materials and armaments which would be required for warfare, many Governments adopted measures such as giving bounties to the producers of particular commodities, and erecting "tariff walls" around their territories; by this latter method duties had to be paid when certain goods passed the Customs barriers at the ports or along the frontiers, and thus such goods were prevented either partially or entirely from entering the country. By such means States have stimulated certain forms of production at the expense of others, and have thus modified the natural economic development of the regions they comprise.

QUESTIONS

1. How can the "race" of peoples, as related to their descent from a common stock, be determined? Illustrate by reference to the Nordic race.

2. What is the "Mediterranean race"? Why is it so called, and in what ways might the term be misleading?

3. What are the Romance languages? Give an account of their spread in southern and western Europe.

4. To what extent does the extension of the German language correspond to the distribution of people of Nordic race?

5. Which peoples may be termed "Slavs"? Give reasons for your decisions, and comment upon any doubtful cases.

6. Magyars and Finns may be grouped together as regards their language. To what extent are they alike (a) in their speech, and (b) in other respects?

7. The Roman Catholic and Orthodox faiths have a markedly contrasted distribution over much of Europe. How is this distribution related, either as cause or effect, to geographical conditions?

8. Show how the entry of Mohammedanism into Europe was connected with the physical geography, and how it has affected the human geography.

9. Distinguish between (1) "language group," (2) "nationality," and (3) "State," quoting examples from Europe.

10. Discuss what truth, if any, there is in the statement that the people of European Russia are more Asiatic than European.

PART II

THE REGIONS

CHAPTER VI

THE NORTH SEA LOWLANDS

THE traveller from England to the Continent, crossing the Strait of Dover towards Calais, sees before him the chalk cliffs of France which are the counterpart of the North Downs. As he nears the coast, however, he observes that his boat passes to the east of the chalk country and approaches a low shore which stretches eastward as far as the eye can see.

Calais marks the beginning of a great lowland region, which forms the north-eastern corner of France and extends behind the North Sea through Belgium, Holland and northern Germany, and along the western side of Denmark (see Fig. 30).

With occasional breaks there is a coastal strip of dunes, and this has behind it a belt of natural marsh-lands, much of which is now transformed into polders, interrupted by shallow inlets of the sea. Behind the marsh-lands is a rather higher area, partly sandy country to which the term "geest" is applied, and partly fertile agricultural plains or low plateaus. Near the uplands of central Europe which form the boundary of the lowlands occur coal deposits, and associated with the mining of the coal are important industrial areas (compare the map in Fig. 80 with the section in Fig. 27). Thus the whole of the North Sea Lowlands region is composed of a series of belts running in a general south-west to north-east direction as far as the south-eastern angle of the North Sea; here, in the peninsula of Jutland, the coastal belts change their direction and run from south to north, while the belt of fertile plains is no longer to be observed, but gives place to another type of country near the Baltic Sea. The North Sea Lowlands region has characteristics marking it off from the neighbouring areas, and it may therefore be regarded as one of the sub-regions of the "Developed Lowlands and Wooded Uplands" of Temperate Europe (marked "2" in Fig. 21).

The surface conditions of the region are in the main due to its position on the south-eastern margin of the shallow depression now invaded by the waters of the North Sea. To this depression rivers drain through the North Sea Lowlands from all the surrounding regions: the Schelde (Scheldt or Escaut) and its tributary the Lys from the scarp-lands of northern France; the Meuse (Maas), the Rhine and the Weser from the Central Uplands of Europe; the Elbe from the South-west Baltic Lowlands and the Central Uplands. Consequently these rivers deposit alluvium in the marsh-lands of this lowland. The sea, too, plays its part in the building up of the coast; strong tidal currents drag sand eastwards along the shores, and the prevailing and occasionally stormy westerly winds heap it up to form the belt of dunes.

In the past, however, conditions have been different, particu-

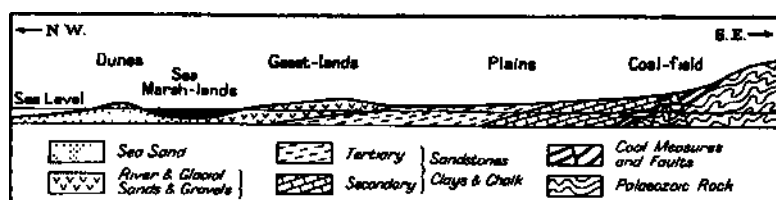


FIG. 27.—DIAGRAMMATIC SECTION THROUGH NORTH SEA LOWLANDS.

larly because of changes in the relative levels of land and sea. During parts of the Secondary and Tertiary Eras, the sea covered much of the region, and beneath its waters were laid down marine clays and sands, and in parts even chalk, which now constitute the fertile interior plains. In the later part of the Tertiary Era, moreover, the rivers accomplished much more work than they do at present: they deeply dissected the uplands to the south, and with the eroded material they built up the huge accumulations of sand and gravel which form much of the geest type of country.

Oscillations of level have characterized also the later geological history of the region. Thus at the close of the Ice Age the land was relatively higher, and the present area of the North Sea was above the sea-level. Since then, however, there has been a general rising of the sea-level, and in early historical times the waters had advanced to the line indicated by the islands and dunes on the outer edge of the present coast. Here

was a continuous line of dunes behind which lay marshes broken only by one great lake in the Zuider Zee hollow. These marshes were gradually drained and occupied by men, but Nature has worked against them: the alluvium tends to consolidate and settle down, and very possibly a relative sinking of the land occurred, and in consequence in the Middle Ages the sea broke in; moreover, wars caused the neglect or destruction of the defences, and altogether some thousands of square miles were lost. In modern times the work of protection has been resumed, and now, in spite of occasional and local floodings, the struggle goes in favour of man.

The position of the region determines its climate, which is broadly similar to that of eastern England, although its continental situation gives it rather colder winters, particularly in its eastern portion (compare the temperature statistics for London and Brussels, given in the table on p. 26). Consequently, the farming possibilities of the North Sea Lowlands are in general like those of eastern England, and differences in production are due largely to soil or economic conditions. We will now consider in turn each type of country constituting this region.

The Dune-lands.—The sand is least in amount in the French and Belgian part of the region, where the available material is mainly that which has been driven through the Strait of Dover, but becomes far more abundant by accumulation towards the east. Moreover, the dunes are highest and broadest where a stretch of north-to-south coast directly faces the westerly winds, as in Holland and in Denmark. The line is, however, broken at areas of relative depression, and channels are kept clear where the currents due to the high tides of the region sweep up and down the entrances to the great rivers.

Where the sand-dunes form a protection against the flooding of the marsh-lands, they have been strengthened by the planting of grass, shrubs or trees and by the construction of groins. Upon the dunes have been built fishing villages and health resorts, e.g. Scheveningen near The Hague in Holland, and Ostend in Belgium; the latter town is also a port with rapid communication across the North Sea to England. Similar ports, but with much more traffic, are Calais, which has the shortest crossing, and Dunkirk (Dunkerque), for these are the French outlets of the industrial area which depends on the coalfield of north-eastern

France. Farther east are " out-ports " at the entrances to the great rivers, e.g. in Holland are Flushing by the *Sehelde*, and the Hook of Holland by the Rhine.

In Germany, the dune-lands are represented only by the Frisian Islands, but in the Danish part of Jutland they again form part of the mainland. Here has been constructed the port of Esbjerg, connected by railway with the east of the country in order to facilitate the rapid transit of its dairy produce, especially to England,

Throughout their extent, the dune-lands are of similar origin and characteristics, and they therefore constitute a distinctive though small region, to which we give the term " tract." It must be observed, however, that this tract is not continuous, as most others are, because it is broken by the waters ; it may therefore be regarded as a " discontinuous tract."

The Marsh-lands.—Behind the line of dunes and islands, the shallows are constantly covered by water only over a relatively small extent. There are other areas, particularly marked behind the various Frisian islands, which are mud-flats at low tide, but water-covered at high tide. These are known as *watten* or *wadden*; they may be regarded as land in the making, and the natural deposition of mud and sand is aided by fences built out from the land, the resultant accumulation being used for summer grazing as soon as it is covered by vegetation.

The Sea-marshes.—Much more work has been required to form the polder-lands. Near the coast are the sea-marshes, which in Holland are even below the mean sea-level, and everywhere are liable to inundation at high tide or in times of storm ; farther inland are the river-marshes, which, though well above sea-level, need protection from flooded streams.

Reclamation of the sea-marshes is still going on. The *Zuider Zee* (the name " South Sea " was given by Frisian fishermen) is now shut off by a dyke across its mouth, and four polders with a total area of about 800 square miles are being formed on its margins, the water area being limited to a central " IJssel Lake " fed by the waters of the IJssel distributary of the Rhine, as shown by the broken lines in Fig. 30.

The utilization of the polder-land varies partly according to the nature of the soils, sometimes clayey and sometimes sandy, and partly according to the traditions of the people or the economic demands of the neighbouring regions. In the small

strip of the French marsh-lands behind Calais and Dunkirk there is intensive cultivation of industrial crops, mainly beet, flax and chicory, which is associated with the manufacture of their products, sugar, linen and chicory ; wheat and barley are also grown. In the Belgian strip similar crops are produced, though cattle-rearing assumes some importance. In the broader polder-land region of Holland, there are again the cereal and industrial crops, but pastoral work predominates, and butter, cheese and milk are the main objects of the farming.



[Netherlands Information Bureau.]

FIG. 28.—VIEW NEAR HAARLEM.

Note.—The polder-land has been adapted for the cultivation of bulbs by drainage (note the canal), and by making the clay lighter by mixing sand from the pine-clad dunes shown in the background.

In Holland are two areas of special character. In a narrow strip behind the dunes near Haarlem the sand has been mixed with the muds and clays of the marsh-lands to produce a soil exceptionally well adapted to the cultivation of flowers. The horticultural industry, like several others, began when the Netherlanders were one of the foremost maritime peoples of Europe ; tulips, hyacinths and other plants were brought from the East, and centuries of experience and organization have made the growing and export of many kinds of bulbs, flowers, shrubs and fruit an important occupation. The proximity of the port

of Rotterdam, with its rapid communications, has been a significant factor, and now a neighbouring aerodrome offers still quicker facilities for transport.

Farther south, the shelter of the dunes allowed woods to grow in past centuries, and here the counts of Holland had a hunting-box. This became their residence and was called " s'Graven - hage "—"the Counts' Hedge," in its English form, The Hague ; it has now grown into a city of nearly half a million inhabitants, for it is the capital of Holland, and is also the seat of the International Court of Justice.

In Germany the marsh-land again narrows to a belt bordering the coast and the estuaries of the Ems, the Weser and the Elbe, while in Denmark it is not quite continuous but appears as areas surrounding lagoons. (These lagoons are known as Fjords, but like the neighbouring Lim Fjord, they are shallow depressions quite unlike the Fjords of Norway.) In the eastern part of the North Sea marsh-lands cattle rearing is the main occupation, and supports a less dense population than the more intensive farming common in the central and western polder-lands.

The River Marsh-lands.—Although lying above sea-level, these areas are subject to inundation by the rivers ; in some parts they have needed reclamation, but in other parts they require only protection by dykes from occasional floods. These floods generally occur in winter, for most of the rivers have a " regime " in which the flow of water is greatest in the winter season, after the relatively heavy rainfall of autumn and when the run-off into the streams is least reduced by evaporation and the demands of the plant-covering of the land. The Rhine has a more uniform regime than that of the other rivers, for its headwaters come from the Alps, where the melting of the snow in the upper part of its basin provides additional water in summer; consequently, the main stream brings down a summer supply which balances the winter maximum of the tributaries of the middle and lower parts of the basin, which are dependent upon the rainfall.

Parts of the river flood-plains are used for tillage similar to that of the sea-marshes ; elsewhere are long stretches of grassland, absolutely flat with their uniformity broken only by the dykes ; here villages and even houses are rare.

Waterways and Ports.—Much of the importance of the North Sea Lowlands region is due to the rivers which direct into it-

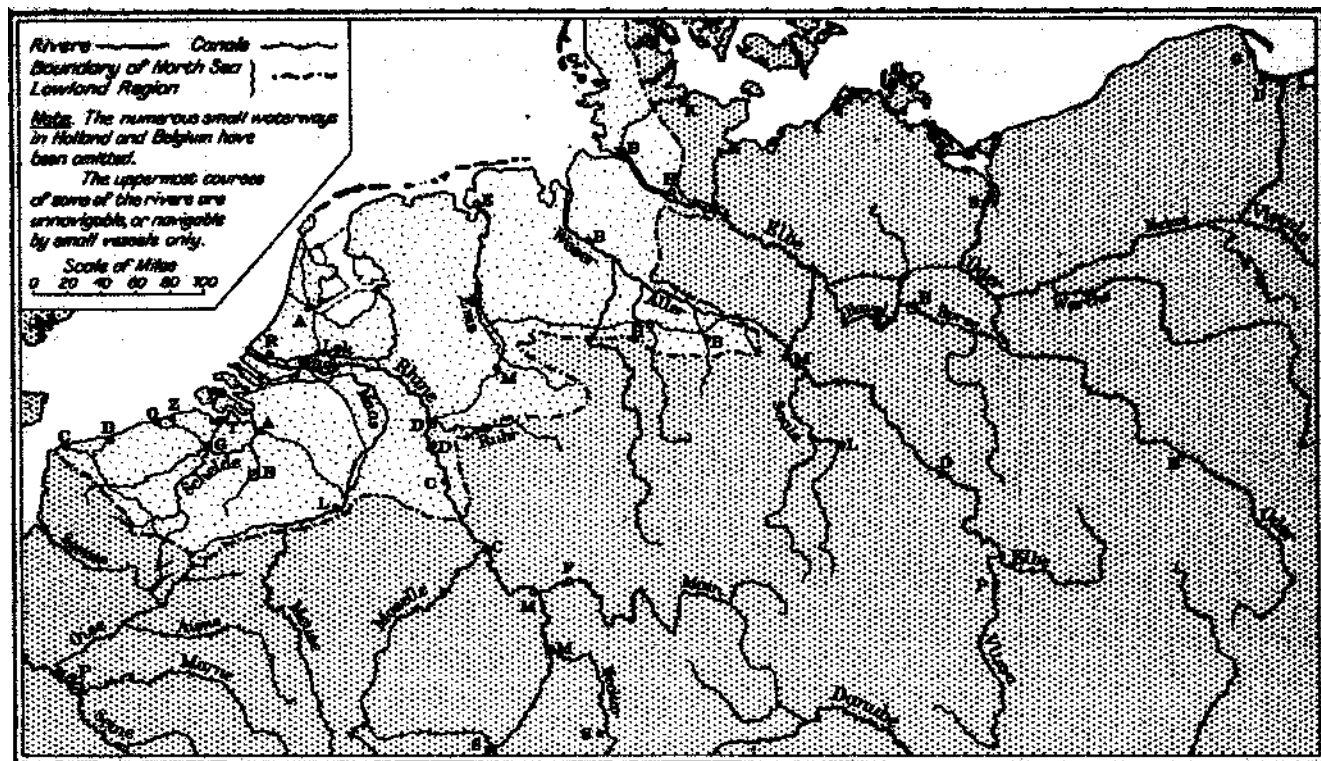


FIG. 29.—WATERWAYS LEADING TO THE NORTH SEA LOWLANDS.

communications from and to a great part of central Europe ; consequently, at or near the mouths of these rivers have grown up several great ports which make the region by far the most important commercial area of the continent of Europe (see Fig. 30). Moreover, most of these ports have been developed at points on the waterways where higher land forming suitable sites for settlement adjoins the marshes ; these sites are mainly at the inner margin of the marshes on the geest lands or the fertile plains, but at the western end of the region they are at the outer margin adjoining the dunes.

The greatest of the ports is Hamburg, on the Elbe estuary, which brings ocean liners 70 miles inland from the North Sea, Fig. 29 shows that while the main stream gives communication with the industrial areas of Saxony and of Bohemia in the Central Uplands region, the Havel tributary leads from the Spree and Berlin ; also a system of canals links the Elbe to the other great rivers of Germany and Poland in the south-west Baltic region. Moreover, a little above Hamburg the Elbe-Trave Canal leads to Liibeck on the Trave, and from Brunsbiittel, near the mouth of the Elbe, the Nord-ostsee (i.e. North-Baltic Sea) Canal leads to Kiel and carries most of the traffic between the various Baltic Sea ports and the outer world.

With such a large hinterland, Hamburg has an amount of trade which makes it rank with London and New York as one of the greatest ports of the world. Its imports consist of all kinds of commodities, while its exports are mainly of manufactured goods ; shipbuilding has developed, and also manufacturing in many forms, particularly the working up of imported materials* Consequently, the conurbation which includes Hamburg and Altona on the north bank of the river, and Harburg on the opposite side, is one of the largest in Germany, and numbers nearly one and a half millions.

Bremen, on the Weser, is nearly as far from the sea as Hamburg ; it is in the river-marsh area, and its trade is chiefly remarkable in that it is the greatest tobacco market in the world ; its population is more than a quarter of a million. At the mouth of the Ems is Emden, but this port is of comparatively little importance, although the river is joined to the Ruhr industrial area by the Dortmund-Ems Canal ; the traffic of the Ruhr region mainly goes by the Rhine to the chief markets and the sources of raw material.

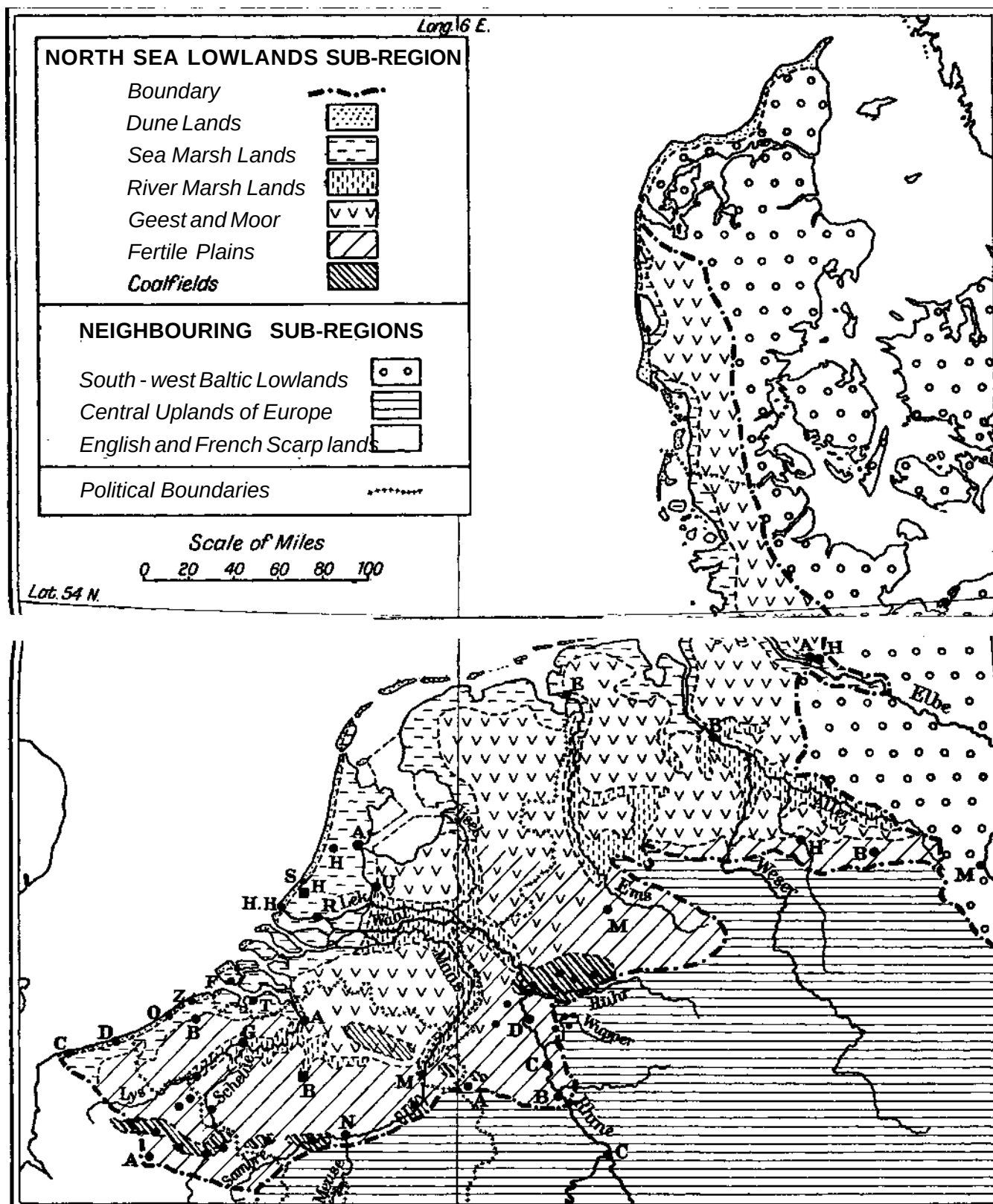


FIG. 30.—REGIONS OF THE NORTH SEA LOWLANDS.

From near the junction of the Dortmund-Ems Canal with the Ems River, another canal leads east near the margin of the North Sea Lowlands (see Fig. 29). This is the Mittelland (Midland) Canal; it crosses the Weser and its navigable sub-tributary, the Leine, on which Hanover stands, and is now continued north of Brunswick to join the Elbe at Magdeburg. By its completion a through route of inland waterways connects eastern Germany and Berlin with the Rhine-lands.

The Rhine is incomparably the most important waterway of Europe. It is navigable for small vessels from Basel downstream, but its great amount of traffic is in the North Sea Lowlands region between the Ruhr and the sea ; while there are river ports of considerable size in German territory, the chief port of transshipment between ocean and inland transport is Rotterdam. This is the one striking exception to the rule that the great ports are on the margins of the marsh-land ; unlike the others it is of recent growth, and became important only when in the latter part of the last century the increase of German trade made it necessary to improve the navigation of the Rhine estuary. Then the " New Waterway " was cut : a deep channel was made from the North Sea at the Hook of Holland, and where the waters of the Waal and Lek were led into this channel at Rotterdam, in the middle of the marsh-lands, great wharfs and basins were constructed, and the port rapidly developed. Of the goods transhipped from sea-going vessels, the greatest amount goes inland up the Rhine, and most of the remainder by the system of canals which forms a network throughout the Netherlands and is without parallel in the world. Railway transport counts for little, one reason being because the traffic consists mainly of heavy and bulky imports, such as iron and other ores and metals for the industrial regions higher up the Rhine and grain for the food-supply of the dense populations of the Netherlands and Germany. With manufactures associated with the imports, particularly for use in Holland, Rotterdam has grown till it has a population of over half a million.

Amsterdam rose to importance centuries ago when the protected waters of the Zuider Zee gave access to the interior of the polder-lands of Holland, but the increasing size of ocean-going vessels made this shallow sea useless ; first the North Holland Canal was constructed through the peninsula to the entrance of the Zuider Zee, and later the North Sea Canal gave a direct

approach available for ships of any size. Thus Amsterdam, although rather off the main lines of communication, has been able to retain a certain amount of ocean traffic, and it affords an example of geographical inertia by the fact that it still remains the chief centre of the organization of the commerce (as distinct from the actual handling of the traffic) and of the financial business of the Netherlands. It also has industries which are traceable to its pre-eminence in trade in the days when Holland was a great colonial power, e.g. cigar making and tobacco preparing, sugar refining and diamond cutting. Moreover, Amsterdam has remained a professional and residential centre, and with more than three-quarters of a million inhabitants it is the largest city in Holland.

The lower Maas is inconvenient for commerce, for being without Alpine tributaries, it is subject to very low water in summer and to floods in winter ; its middle course, however, is connected by a canal in Dutch territory from Maastricht to the Rhine estuary, and in Belgian territory by a canal from Liege to Antwerp on the Schelde (see Fig. 32).

The estuary of this latter river is the entry to a very considerable system of waterways which traverses all parts of Belgium and is joined to the rivers of north-eastern France. Where the Schelde enters the sea-marsh region Antwerp has grown up. This city has a population of more than a quarter of a million ; it is the chief port for Belgian commerce, and its transit trade, mainly for Germany and Switzerland, is of about equal importance. Like Amsterdam, Antwerp has developed industries connected with its import of " colonial " wares. At the junction of the Lys and the Schelde is Ghent, a centre of local trade and small textile manufactures ; from it one canal runs northward to Terneuzen in Dutch territory on the " West Schelde " inlet, and another leads westward to Bruges on the inner edge of the sea-marshes. Bruges was once a port, but its outlet has been silted up, and it is now joined to the sea by canals which cut through the dune belt to Zeebrugge and Ostend.

The canal which runs through French territory roughly parallel with the national boundary shows the influence of political conditions. While the natural waterways would direct traffic from the French coalfield to the Schelde and Antwerp, the desire to keep the trade within France has been an important factor in the construction of the canal which leads to Calais

and Dunkirk; the growth of these ports must therefore be ascribed in part to political causes.

The Geest and Moors.—Behind the tract-group of the Marshlands, extends another and strongly contrasted series of tracts, from near Antwerp north-eastwards to the borders of the Baltic

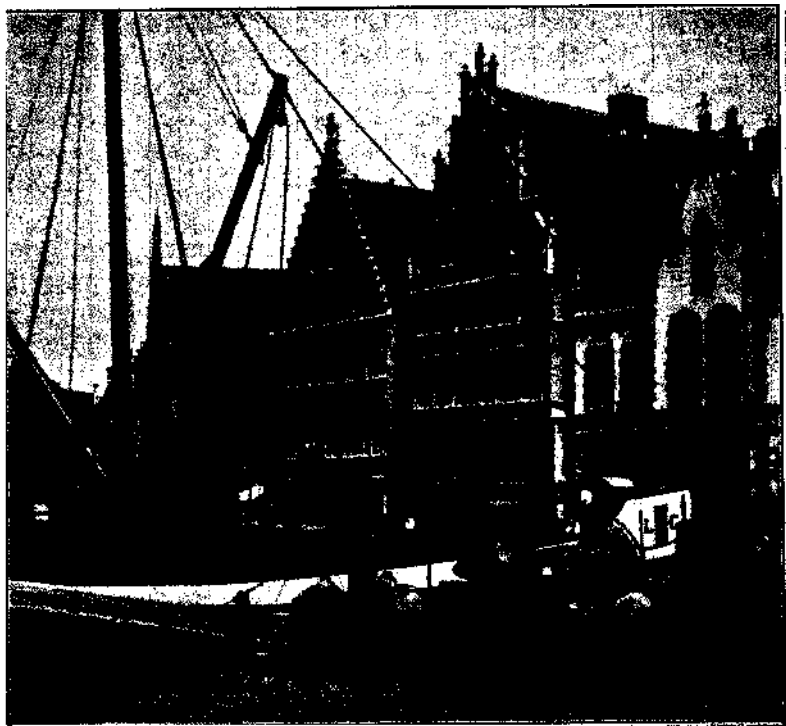


FIG. .31. --VIEW IX GHENT. [Belgian Railways & Marine.]

Note.—The steeply gabled high houses are typical of Flemish-town architecture. The view shows the "Quai aux Herbes," by one of the small waterways, carrying barge traffic, largely used in Belgium and in Holland.

Lands. These areas are in the main wide stretches of heath-land known to the Germans as geest. In the west of the region from near the mouth of the Schelde to about the lower Ems, they have developed upon masses of gravels and sands which were brought down by the Rhine and Maas until the deposits formed a great fan-like plateau. The plateau was highest near the centre of its inner margin, dipping north-westward to the sea (see Fig. 27). Later it was dissected by streams, and great valleys were cut across it. The largest of these valleys are the

two now occupied by the parallel courses of the lower Maas, Waal and Lek and by the Ijssel; consequently, the sandy plateau is divided into three masses : (1) the Campine or Kempenland, which overlaps the boundary of Belgium and Holland within the curve of the Maas ; (2) the Veluwe, between the Lek and the Ijssel; (3) the West Frisian Geest, between the Ijssel and the Ems.

The words " Veluwe " and " Geest " both mean " barren land " and, apart from some woodland on the slopes, the vegetation cover of most of the area consists of coarse grasses and shrubby growths such as heather; the surface is dry and infertile, while in parts the finest sand is blown into small dunes. In other parts iron in the sand has formed a pan of impermeable rock upon which drainage is poor, and moors have developed with marshes, peat bogs and pools of stagnant water.

Reclamation of these lands, for long almost uninhabited, is going on, and " Fen colonies " grow potatoes, beet and some rye and oats. Yet these lands remain scantily populated, and the larger settlements are generally on their margins.

East of the Ems the geest is formed mainly of sands washed away from the morainic material deposited by the ice-sheet which extended from northern Europe, as shown in Fig. 3. The greatest of the moraines are shown on the map, and it is to be observed that they mark out the eastern limit of the North Sea Lowlands region.

Streams brought sandy material from the Baltic morainic areas into the eastern part of the North Sea Lowlands region, where it is widely spread and is the basis of the geest-lands of this part; moreover, among the dry sands occasional sheets of boulder clay play a similar part to that of the iron pans in the western geest-lands and give rise to similar wet moor districts. Reclamation of this type of country has gone on in Germany, but to a less extent than in the Netherlands.

In Jutland, the strong westerly winds have blown the sand from the dune belt inland to combine with that of glacial origin and form a broad belt of dry, infertile country ; the Danes have recently begun to afforest and cultivate the sandy heath-land, but this western part of Denmark remains by far the least valuable part of their country.

In the western part of the geest-land, however, there is another resource which may be developed ; beneath the Campine are

deeply buried coal deposits : a " spur " from the belt of coal-fields of the southern margin of the North Sea Lowlands. The Campine field has a width of about 8 miles and a length of about 40 miles ; working has commenced near the Maas, but whether economic conditions will make a great extension profitable is uncertain.

The Fertile Plains.—To the south of the tract-group of the geest-lands, sedimentary soils of Tertiary and Secondary age emerge from beneath the marshy alluvium and the sandy accumulations (again see Fig. 27), and form plains of relative fertility, while in certain parts this fertility is actually great, due to a superficial deposit of loess.

Owing to the complicated way in which the older rocks of the Central Uplands were faulted, raised and depressed, they project irregularly northward into the lowlands ; consequently, the fertile plains of the latter are in some parts narrow, but in other parts form wide embayments between the upland masses. Thus in the North Sea Lowlands region, four main tracts of generally fertile plains or low plateaus may be observed.

(i) In the easternmost tip of the region is a strip in which the towns of Brunswick and Hanover are situated and which narrows westward where it is crossed by the Weser. This *Loess belt of Hanover and Brunswick* is noted especially for its production of sugar-beet and other industrial crops as well as cereals. Along it run ancient roads and modern railways which skirt the uplands and connect Berlin with the cities of the Netherlands and of northern France.

(ii) *The Westphalian Embayment*, which may be called the Plain of Munster from the town which is its natural centre, is of mixed soils and varied production. On its north-eastern and southern boundaries it is well defined by the edge of the uplands • on its north-western side it passes into an area which gradually becomes more like the geest; in the map of Fig. 30 this area is shown as transitional in its character, by the overlapping markings of both types of country. On the south-west of the Westphalian embayment the agricultural land of the plain is being invaded by the mining of the coalfield of the Ruhr region.

(iii) *The Cologne Embayment* is well defined on its southern and eastern sides, but on the north-west passes into transitional-geest country. The population of the Cologne embayment is great, for its agriculture is intensive, particularly upon a loess

covering in the south, while on the west side of the Rhine near Cologne there are deposits of lignite, or brown coal, a mineral which has been greatly developed in Germany in recent years (see Fig. 32). The Rhine, however, gives the region its greatest significance, for as a waterway it enables sea-going ships to reach Cologne, while its valley provides the most important route between southern and northern Germany and, indeed, between the Mediterranean and northern Europe.

Bonn marks the entry of the Rhine into the lowlands, but Cologne, a Roman "colonia," is a far more important focus of trade, for here the great traffic route which skirts the Central Uplands crosses the river. With industries utilizing both the lignite from the neighbouring deposits and the coal from the Ruhr, Cologne has grown into a city of about three-quarters of a million inhabitants. Farther downstream is Diisseldorf, the river port for the industrial area of Wuppertal immediately to the east in the adjoining upland ; at and about Diisseldorf a population of nearly half a million has congregated. Other centres of industry have developed west of the Rhine, e.g. Munchen-Gladbach and Crefeld, famous for textile production.

(iv) West of the Cologne embayment the fertile belt narrows between the Ardennes area of the uplands and the Campine, and here, near Maastricht, it includes the small southern prolongation of Dutch territory. Beyond the Maas the fertile belt widens to form the *Plains of the Schelde*, a region drained mainly by that river. In central Belgium this forms a low undulating plateau. In this area, again, sedimentary strata have a covering of loess, and there is intensive agriculture yielding wheat and oats, industrial crops, and roots grown as fodder for considerable numbers of cattle. This type of country extends into France.

Farther north, between the Lys and the sea marsh-lands, the plains of Flanders are less productive by nature ; here sandy soils predominate, and arduous toil, involving thorough cultivation and the use of manures, has been necessary to obtain fertility. Cereals are not so widely grown ; moreover, rye is in parts more important than wheat. The predominance of rye over wheat is fairly common on the poorer sandy soils of this section of central Europe, for climatic conditions make both crops possible and the determining factors are the dryness and relative infertility of the soil.

On both the Belgian and the French sides of the political

boundary south of the Lys, a rather scattered form of industrial development has persisted from the days when wool was produced, spun and woven in this region. Other forms of textile manufacture have grown up by "transferred inertia," the traditional skill being adapted first to the working of linen and then to that of cotton. Domestic manufacture still continues, sometimes as a necessary supplement to the scanty earnings of agriculture when winter gives spare time, but most of the work is carried on in a number of towns of moderate size situated to the north of the coalfield: in Belgium are Courtrai and Tournai, and in France are Roubaix and Lille; at these last two towns textile and other machinery is made.

By far the greatest city is Brussels, the capital of Belgium, conveniently situated in the centre of the lowland part of the State. It is at the end of the marsh-land of the Senne, a tributary of the Schelde, and grew up at the head of navigation; now it is connected by canals to the coalfields area to the south, and it has become also a centre of railway communication. As the capital of the country, the seat of much financial business, and the site of manufactures of many kinds, it has grown until its conurbation includes a population of nearly a million persons.

The Coalfields.—Fig. 27 shows in a very simplified manner how Coal Measures, formed in the upper part of the Palaeozoic rocks, have been worn away from the uplands region but outcrop at the surface where this descends to the lowlands, and are buried at increasing depths under the plains. The coal was mined, therefore, first on the inner margin of the lowlands, and the pits were later extended northwards till the deep working became too costly.

The section might suggest that there is a continuous belt of coal-mining all along the edge of the plains, but the geological structure is actually more complicated and the Coal Measures have not been preserved throughout the border of the lowlands; in consequence the coalfields form a series of disconnected patches. The actual mining areas are shown on the maps on Figs. 30 and 32. The most important of the coalfields is in the neighbourhood of the lower Ruhr where the river leaves the uplands to join the Rhine. Here the Ruhr district has become an intensely industrialized region. The industries, like those of the somewhat similar South Pennine coalfields of England, began in the valleys of the adjoining uplands, [where](#) water-power

from the streams was used for an early iron and steel industry which obtained ore and limestone from the uplands and fuel from the forests which clothed their slopes. In some of these valleys geographical inertia has allowed the industries to persist with the aid of the coal from the neighbouring Ruhr field ; thus in the basin of the Wupper, the tributary of the Rhine situated a few miles south of the Ruhr, the towns of Remscheid and Solingen have long been famous for fine steel products, while

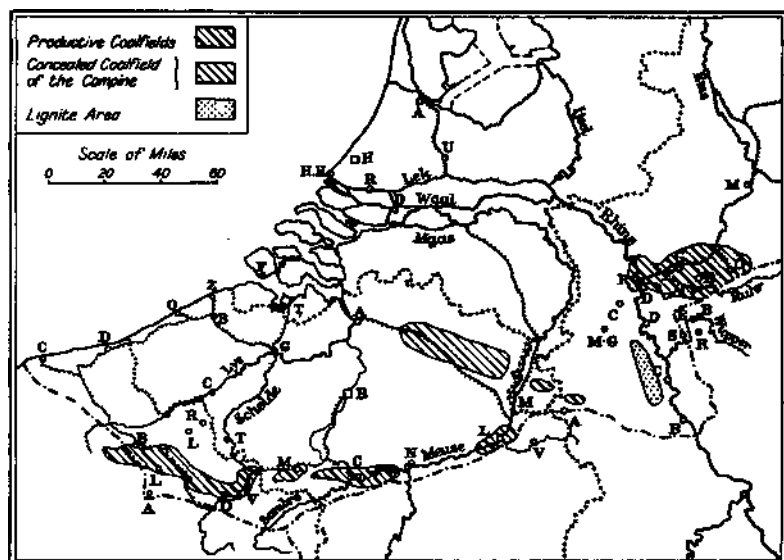


FIG. 32.—COALFIELDS OF THE NORTH SEA LOWLANDS.

a textile industry has persisted, working first wool, and later also cotton and rayon, into many fabrics, notably at Elberfeld and Barmen. These two towns became crowded together into the narrow steep-sided valley of the Wupper above Solingen, and have now been incorporated into one long municipality known as Wuppertal (i.e. Wupperdale) in which nearly half a million people are so packed that the railways have been tunnelled below the houses and elevated above the river and streets.

It is in the plain, however, that the greatest industrial development has occurred. On the Ruhr coalfield a number of towns have grown up, and have so spread that they form an almost unbroken sea of houses north of the river, stretching for about

50 miles eastwards from the Rhine. Where the Ruhr enters the Rhine it is joined by a canal connecting it with the Dortmund-Ems Canal; here a group of river-ports, including Duisburg and Ruhrort, carry on a great traffic in export of coal and import of ore and raw materials, and here are also metallurgical works.

The greatest aggregation of works is at Essen, where, within the municipal boundaries, live two-thirds of a million people, while adjoining it on the east are Gelsenkirchen and Bochum, each of which is about half the size. Several other large towns have sprawled over the coalfield, and the whole region has an unparalleled production of iron and steel goods, among which may be mentioned railway equipment, shipbuilding material, armaments, constructional steelwork, and machinery for manufacturing and agriculture. From the coal are obtained coke and by-products, including tars, dyes and other chemicals. Power stations furnish electricity for the grid system, which, fed also from other centres, distributes power to almost all parts of Germany. Textiles, leather goods and many other commodities are produced, while Dortmund is a centre from which great quantities of coal are sent inland by rail.

West of the Cologne embayment, the coal appears again: a little is mined near the German town Aachen, and also in Dutch territory, where an increasing amount is being obtained east of Maastricht.

The Belgian group of coalfields has a large production. The eastern mining area is in the Meuse valley around Liege, the greatest industrial centre of Belgium; the conurbation has a quarter of a million inhabitants and, owing to an early exploitation of ores of zinc, copper and lead, as well as of iron, metallurgical industries are very varied. In a neighbouring valley of the uplands, at and near Verviers, the manufacture of woollen goods has survived.

West of Namur, the line of the Meuse valley is continued by that of the Sambre, and here around Charleroi is another coal basin and metallurgical industry. Farther west the next outcrop of the Coal Measures occurs north of the river near Mons. Like Charleroi, Mons is itself but a small town, and it is characteristic of these western coal areas of Belgium that much of the mining and the associated work is carried on in groups of numerous small settlements set in rural surroundings.

Just across the French frontier is the last of the series of coal-

fields ; this stretches in a long and narrow belt from near Valenciennes, past Denain, Douai, Lens and Btethune, until its tip ends beneath the chalk sheet of north-eastern France. As in Belgium, there is no large city, but in and around a string of small towns and villages there is a considerable population engaged in the production of coal, coke and chemicals, steel and machinery. A great deal of coal is sent away, much of it northward to the French industrial area or the ports, and the rest southward by water or rail to Paris and elsewhere.

The belt of coalfields of the North Sea Lowlands may be regarded as a discontinuous tract; it supplies by far the greatest part of the coal-supplies of Germany, France and Belgium, and it includes some of the most densely populated areas of these countries.

Thus, with the coalfields of the inner margin and the ports of the outer margin, the North Sea Lowlands is a sub-region with an economic and political importance scarcely equalled in the world.

QUESTIONS

1. Show how the nature of the coastal areas of the North Sea Lowlands has influenced the manner of life of the inhabitants.
2. Show how the rivers of this region have influenced (*a*) the physical conditions, and (*b*) the economic development.
3. Compare and contrast the situation and the functions of three large ports of this region.
4. Write a reasoned geographical account of the Ruhr industrial area.
5. Describe and account for the differences between the farming of various parts of the North Sea Lowlands.
6. State and explain the main facts of the distribution of population in this region.
7. Briefly state how men have transformed three different types of country in the North Sea Lowlands.

SOUTH-WEST BALTIC LOWLANDS

EAST of the North Sea Lowlands is a region which, because of its position, is different as regards its climate, its surface conditions and its relations with other parts of Europe.

Climate and Vegetation.—As was explained in Chapter I I, in summer the temperatures of the lands south of the Baltic Sea are very similar to those south of the North Sea ; but in winter the conditions are more severe. Broadly speaking, the Baltic Lands have a mean January temperature below freezing-point and as one goes eastward still lower temperatures are experienced. As a consequence, the harbours of the Baltic Sea unlike those of the North Sea are normally ice-covered in winter, the period increasing eastwards, e.g. about two months at Stettin and nearly four months at Königsberg; during this period the ports have to be kept open by ice-breakers.

The gradual eastward change to a continental type of climate is also expressed, though less clearly, in the amount and character of the precipitation ; the annual total decreases, mainly due to a lessened amount in the winter half of the year (compare the figures for Brussels, Berlin and Warsaw in the table on p. 26). Moreover, at this season, with the greater cold the precipitation takes the form of snow, and this commonly remains for weeks upon the ground. Yet the sun is often bright, and clear skies are more often enjoyed in the Baltic regions than in the neighbourhood of the North Sea. Because of the above facts the South-West Baltic Lowlands region is included in the " Interior Temperate " climate region.

The natural vegetation shows changes which accord with the shorter period of vegetative growth towards the east. In the region here called the Baltic-Entry Lands the beech is dominant; from the neighbourhood of Lübeck eastward to the lower Vistula the deciduous beech and the evergreen coniferous pines form the " mixed " forest cover; from the lower Vistula to the lower Niemen pines and spruce are the most common trees, but with them are some beech and oak; beyond the

Niemen the length of the winter does not permit the growth of the beech.

The eastern limit of the beech is broadly taken as the boundary of this region, but the precise course of this boundary will be indicated later.

Surface Forms.—The surface conditions of the region are to a large extent determined by the effects of glaciation, e.g. the occurrence of great areas of boulder clay deposited as ground moraine under the ice, broken by great lines of hills formed by the terminal moraines, which have a general east and west direction and are composed of clay, sand and gravel and boulders of all sizes (see Fig. 33).

Beyond the successive margins of the ice-sheet, the water resulting from the melting formed large rivers, which occupied valleys probably existing in some form before the Ice Age ; they are known to German and Polish geologists as "primitive valleys." Along these valleys the great ice-water rivers drained westward, deepening and broadening them, and depositing in them masses of sand and gravel. Now that the ice has gone, the valleys are occupied only by smaller rivers coming from the south, and at a number of places these break through the morainic accumulations northward to reach the Baltic Sea, or in the case of the Elbe to reach the North Sea. Hence the primitive valleys have wide expanses of deposit in which there are either relatively small streams or none at all.

Consequently, in the northern part of the region there are three main types of country : (i) In the *Baltic Entry-lands* behind the line of terminal moraine which almost bisects the Jutish Peninsula is a ground-moraine area in which boulder clay predominates. These lands form the region marked (I) in Fig. 33. (ii) Farther east are the *Baltic Plateaus* (marked II), on which varied morainic material is thickly heaped, (iii) South of this belt is that of the *River Lowlands* (III), where the terminal and ground moraines of the earlier stages of the Ice Age were cut by the waters from the ice in the later stages ; here the primitive valleys are important elements in the geography.

Finally, in the south, beyond the limits of all but the earliest extension of the ice, and therefore where glaciation has had relatively little effect, the underlying rock formations have a greater influence on the geography ; here are the relatively fertile *Interior Plains and Plateaus* (IV). These areas in some

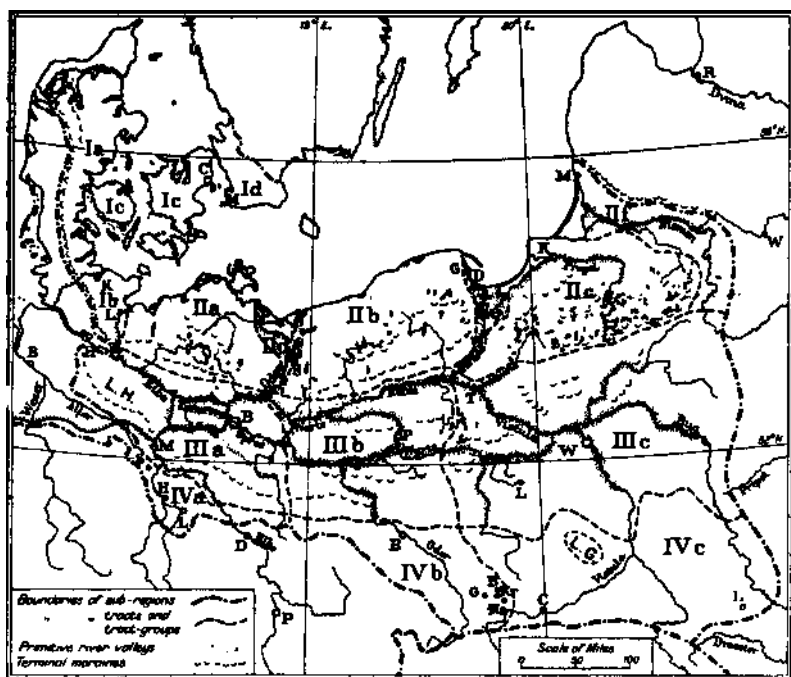


FIG. 33.—REGIONS OF THE SOUTH-WEST BALTIC LOWLANDS.

ways resemble the fertile plains in the south of the North Sea Lowlands. Moreover, adjoining the Central Uplands which form the southern limit of the South-West Baltic Lowlands are some coal deposits, though of less extent than those of the North Sea Lowlands.

The eastern limits of the South-West Baltic Lowlands have been drawn in Fig. 33 as follows : the northern belt of Baltic Plateaus ends where, on the north-eastern side of the lower Niemen valley, a line of terminal moraine (the " Baltic Border-moraine " of Lithuania) marks the beginning of a rather different type of country in the East Baltic area; the River Lowlands belt ends with the basin of the Vistula, beyond which are the great Pripet Marshes of East Poland and Russia ; the Interior Plains and Plateaus end at the water-parting between the Vistula and the Dniester, which drains to the Black Sea. Together these boundaries approximate to the eastern limit of the beech, and so correspond with the change to the Sub-boreal climate region.

The Baltic Entry-lands.—The terminal moraine which almost bisects the Jutish Peninsula forms a narrow belt of hilly country, a few hundred feet above sea-level, mainly covered with beech and oak trees. Behind this, on the eastern side, the boulder-clay country is low, sloping down to inlets of the Baltic Sea, which represent former glacial lakes, now "drowned" by a slight sinking of the whole area, or by an equivalent rising of the sea-level.

This change of level has also changed earlier river valleys into the three Baltic entries which now separate what was previously one area of almost uniform character; hence the present similarity of all these Baltic Entry-lands, marked I in Fig. 33, including Scania, the extreme southern tip of Scandinavia. Throughout the region beech woods alternate with the fields and meadows. The main aim of the farming is the keeping of cattle, pigs and poultry, and the consequent production and export of butter, bacon and eggs. The land is therefore utilized mainly for obtaining grain, roots, clover, grass and hay for the animals and to a much smaller extent for growing crops for human use, especially barley, oats and beet; closely associated with the agricultural production and keeping of animals are small industries of making sugar, brewing beer and dressing leather.

Along the north coast of Jutland the sand-dunes have been drifted as far as the point Skagens Horn, and the northern part of the peninsula is in parts sandy rather than clayey, but apart from this there is much similarity throughout the Baltic Entry-lands. Scania (Id) differs very markedly from the rest of Scandinavia, fundamentally because along its north-eastern boundary are a series of faults which have let down and preserved sedimentary rocks on the south-western side, while crystalline rocks of the Baltic Shield form most of the country on the north-eastern side. How this has influenced the farming is shown by the fact that on the south-western side 80 per cent, of the land is cultivated, while the proportion on the north-eastern side is less than 30 per cent. ; a population map shows a correspondingly sharp contrast. Climatic factors, too, play some part in bringing about the difference, for southern Scandinavia as a whole has the Sub-boreal type of climate, but in Scania the beech can thrive.

In addition to relatively favourable conditions of climate and soil, the Baltic Entry-lands, as the name implies, have a favour-

able commercial situation. This was more important in the past before railways, good roads, and canals diverted traffic from the seas, but there are still several ports at the eastern end of the Baltic. In the German part of the region (marked lb), Ltibeck is an " old-world " town, once the chief seat of the Hanseatic League dominating the trade of the Baltic lands ; it is now eclipsed by Kiel, a naval fortress at the end of the North-Baltic Sea Canal. On the Danish portion of the Jutish



FIG. 34.—VIEW ON THE ISLAND OF FUNEN.

[Danish Tourist Bureau.

Note.—The ground-moraine landscapes of Eastern Jutland and the Danish Islands have numerous low rises and small hollows, many of the latter being occupied by lakes or ponds ; by the coasts the " drowning " has converted these into small inlets. As in this view, the farms are commonly set among pastures and beech-woods ; in the foreground the foliage of a beech tree can be recognized.

Peninsula (marked la), there are only smaller ports, but on Zealand, the largest of the islands (marked le), is Copenhagen. It is situated on the Sound, the shortest route between the Kattegat and the Baltic, though its growth to a great city of more than three-quarters of a million inhabitants is due largely to the fact that it is the capital of Denmark. In Scania, Malmo is connected by train-ferry with Copenhagen ; it is the chief port of this part of Sweden, and in size is the third town of that State.

The Baltic Plateaus.—East of Lubeck, the Baltic coastlands become on the whole higher and form a series of plateaus

sometimes known by the name of the Baltic Heights, which alternate with low and broad river valleys. The Mecklenburg plateau (IIa) is followed by the Oder Valley, the Pomeranian plateau (IIb) by the Vistula valley, and the East Prussian plateau (Iie) by the Niemen valley. The highest parts of each plateau are covered by terminal moraines, rising to several hundreds of feet. These are to a considerable degree wooded, but as a legacy of the ice the drainage is in general poor, marshy areas abound and there are so many lakes that the regions are often referred to as the "lake plateaus." On the northern slopes, boulder-clay areas provide better soils, and agriculture yields crops of rye and potatoes, but the productivity is never high and decreases towards the east. On the southern slopes, outwash sands from the ice form but poor soils, and woods and pastures give a living to a scanty population. The low river valleys are naturally marshy and liable to flood, but where the alluvial plains are protected by dykes there is fertile ground, on which cereals, sugar-beet and other crops are grown, and animals are pastured.

The coasts vary in conformity with the lands behind them. Projecting from the Mecklenburg plateau are islands with low cliffs, as on Riigen, and parts of the coasts of the other plateaus are also cliff-edged. The valleys end in funnel-shaped estuaries in which the rivers have built deltas; sand drifted from the west has formed spits which almost shut in lagoons and, where the coast faces west, there are high sand-dunes.

These river and sea deposits hamper navigation, which also suffers from the formation of ice in winter, but ports have grown up at the mouths of the largest rivers. By the Oder is Stettin, which has some importance from the trade of Berlin, with which it is connected by canals.

At the end of the Vistula valley are two ports: Danzig is a German settlement which, situated by an old mouth of the river, has for centuries been the outlet for the trade of the Vistula basin; Gdynia, away from the river itself, is a new creation of Poland constructed to give that country an independent port at the end of the "Polish Corridor" which runs between East Prussia and the rest of Germany.

At the mouth of the smaller River Pregel is Konigsberg, a large German city; its development was in part due to trade from Russia, which came here in preference to the more easterly

ports because of the shorter time during which ice prevented navigation.

At the far east of the region is Kaunas (Kovno), the capital of Lithuania, where the Niemen, or Memel, River turns westward, and the port Memel is situated where the river leaves its lagoon.

The River Lowlands.—Not all this region marked **III** is low, for there are lines of terminal moraine forming belts of hilly country ; these are, however, neither so high nor so wooded as those farther north, and frequently form heath-land, e.g. the Liineberg Heath west of the Elbe (marked L.H. in Fig. 33). More extensive are the areas of ground moraine, generally covered by a relatively fertile loamy soil, on which corn, especially rye, sugar-beet and potatoes are grown.

The characteristic areas of the region, however, are the broad, primitive valleys. One series is just within the northern boundary of the region ; with the aid of canals it connects the Vistula above Thorn with the Netze and Warthe tributaries of the Oder, and a short reach of that river with the lower Elbe. The second important line of valleys runs along the middle of the region ; it joins the Bug tributary of the Vistula to the upper Warthe, and this river by the Spree to the Elbe. The Elbe above Magdeburg flows in another glacial valley, but below the town the river breaks off to the north ; its earlier valley is continued westward towards the Aller and is occupied by the new Mittelland Canal.

These and other glacial valleys have facilitated water communication, but they did not easily lend themselves to other use, for they are partly marshy and the natural vegetation-cover is commonly heath on the drier sands and dense thicket in the damper parts. But now considerable areas have been drained and dyked and transformed into fields and meadows.

Of the three areas comprising this River Lowlands region, that drained by the Elbe (marked **IIia**) is particularly important because Berlin has grown up within it. The rulers of the district around Berlin, the " Mark," during several centuries increased their power until they became Kings of Prussia and, at last, Emperors of Germany ; Berlin was the seat of their Government and is now the capital of the German State. Its position in the centre of the waterways is shown on the map, and when railways were constructed they were made to centre upon the city. Its development as an administrative and com-

mercial metropolis aided the establishment of many forms of industry, until it is now the largest manufacturing city of Germany. It is also the chief German centre of education and of many professions. As a consequence it has spread until it occupies an area of over 300 square miles and the city itself has a population of about 4½ million persons; it is thus the greatest city on the continent of Europe. Magdeburg is a large town which owes its growth mainly to its position on the Elbe.

The Oder Lowland (IIlb), has been less developed than the Elbe Lowland; it is a rather sparsely populated rural region, and has smaller towns. The most considerable of these is Poznan, formerly known by its German name, Posen.

In the Vistula Lowland (IIlc), with which part of the upper basin of the Warta is here included, the terminal moraines are less developed, and in addition to the wet river valleys, even the areas of ground moraine have large marshy spaces. There are other districts of woods and heaths, and in general the amount of cultivated land is less than in the more westerly lowlands. In the centre and on the Vistula is Warsaw, the capital of Poland, with about 1½ million inhabitants. The Polish Government, and before that the Russians, aided manufacturing in this region by customs barriers. Consequently, industries which here lack any special natural advantages are carried on in several towns, including Warsaw and the large manufacturing city of Lodz, which has more than half a million inhabitants; metal goods and machinery are made, but the greatest development has been in connexion with textiles, and especially cotton goods.

The Interior Plains and Plateaus.—It has already been suggested that this most southerly belt of the South-West Baltic Lowlands, with its less-marked glaciation and its greater fertility, may be compared with the "Fertile Plains" belt of the North Sea Lowlands.

This is certainly true of the area which is drained to the Elbe, and may be called the *Leipzig or Saxon embayment* (IVa), for it resembles the Cologne embayment in several respects. The sedimentary rocks are covered with loess in the southern part, and the region as a whole has intensive agriculture, in which the growing of industrial crops is important. Moreover, there are great deposits of lignite, extending from near Magdeburg southwards past Stassfurt, Halle and Leipzig, which supply power for local industries. These industries are aided, too, by

the occurrence of common and potassium salts in the districts adjoining Stassfurt and Halle, where there are great chemical works. At Leipzig there are varied manufactures which have grouped themselves around an older commercial settlement; this grew up because here an ancient east-west route avoiding the Saxon Uplands found a convenient crossing-place in the otherwise marshy valley of the River Elster, by which Leipzig stands. The city is also noted as a centre of printing and publishing. It has become one of the most important railway junctions of central Europe, and its population is now about three-quarters of a million people.

Farther east, the broad upper valley of the Oder forms the *Silesian Embayment* (IVb). While the south-eastern part of this hollow is covered with sandy and rather infertile glacial deposits, the lower north-western part has more clay and loess or loamy soils on which industrial and other crops are grown. On the Oder is the large city of Breslau, with over half a million inhabitants—another of the commercial centres which have arisen where land routes which skirt the uplands cross riverways leading to the lowlands and the seas.

At the south-eastern end is the Upper Silesian coal basin, of which part is in the Oder valley, and part drains to the Vistula. Coal is not actually mined in all parts of the basin, but iron, zinc and lead deposits are worked in the area ; as a consequence there are considerable metallurgical industries. The Upper Silesian coalfields are shared by three States, as shown in Figs. 78 and 80. In Germany there is a large industrial population in and around the towns of Beuthen, Hindenburg and Gleiwitz ; in Poland there are three smaller manufacturing areas, one at Krolewska Huta and Katowice, a second at Rybnik, and a third between Teschen (Cieszyn) and Moravska Ostrava ; in Czechoslovakia there is a much smaller district in and adjoining Moravska Ostrava.

The South Polish Plateaus.—This region (IVc), mainly drained by the Vistula, rises from the River Lowlands southward to the Carpathian Mountains. As a whole, it consists of a number of plateau-like areas, but the upper courses of the Vistula and its tributary, the San, flow through lower country, while north of this upper Vistula valley the land rises in the Lysa Gora (marked L.G.) to a height of almost 2,000 feet. This variety in the relief corresponds to a variety in structure, for the greater part of

the region is formed of limestones and other sedimentary strata of Secondary or Tertiary Age, much dissected by the rivers, but faulting of the earth's crust has resulted in the emergence of blocks of more ancient and more resistant rock in the Lysa Gora area. Surface conditions, too, vary considerably, for in parts glacial deposits cover the sedimentary strata, while in some areas, especially in the southern part, there is a thick mantle of loess in which streams have cut canon-like valleys.

With the variation in relief and soils, the fertility and the utilization of the land vary, but in general it is an agricultural region suited to the growth of grains and industrial crops, and noteworthy, as compared with the more northerly Baltic lands, for a relative importance of wheat production. The southern portion of this region forms part of Galicia, which extends also into the Carpathian Mountain region, and the famous salt-mines of Galicia are at Wieliczka, near Cracow (Krakow).

Cracow is situated where the Vistula was crossed by an old route following the northern side of the Carpathians, and another old commercial centre with a somewhat similar position is Lwow, or Lemberg. This latter city, however, is unusual in being situated on no large river; it is on the water-parting between the streams draining to the Baltic on the one hand and to the Black Sea on the other. Its significance is due to the fact that it is near the meeting-point of several natural regions, and therefore at the focus of routes by which products of different character are interchanged.

In this neighbourhood, we reach the limit of Temperate Europe, and therefore return to deal with the lands situated on the Atlantic side of the North Sea Lowlands.

QUESTIONS

1. Compare and contrast the south-west coasts of the Baltic Sea with the south-east coasts of the North Sea.
2. Show how the glaciation of the South-West Baltic Lowlands has influenced land-utilization in that region.
3. Give an account of the inland navigation system of North Germany, with reference to physical conditions and economic developments.
4. Write a systematic account of the geography of Denmark, relating the facts as closely as possible.
5. Make a comparative study of the situation and development of the three capitals : Berlin, Copenhagen, Warsaw.

NORTHERN FRANCE

The North French Lowland.—West of the North Sea Lowlands rises a belt of chalk country which reaches the Strait of Dover in Cap Blanc Nez, the counterpart of the cliffs of Dover. From this cape southward to the Central Plateau of France, and extending from the Central Uplands of Europe in the east to the Breton Peninsula in the west, is the North French Lowland (see Fig. 35). In its build this sub-region resembles the English Lowland: it is formed in the main of low plateaus, which are cut by river valleys, are sometimes edged by escarpments and sink in parts to low basins or marshy plains.

From the geological point of view, the North French Lowland occupies a great hollow known to geologists as the Paris Basin. Within the hollow the land is composed of strata lying one above another upon a platform of ancient rock which rises in the east to form the Ardenne and other parts of the Central Uplands of Europe, and in the west to form the Breton Peninsula, while on the southern side it is upthrust in the Central Plateau (see the section in Fig. 08, and note that the succession of the strata is set out in Appendix I). Broadly speaking, the lower sedimentary layers outcrop near the margins of the basin, while the uppermost ones appear in the central part.

The strata of the North French Lowland, like those of the English Lowland, differ markedly from one another in their composition, and thus give rise to differences in the relief, in the soils and in the utilization of the land; hence the structure largely determines the varying conditions within the region.

The North French Lowland has a more southerly and a more continental position than the English Lowland, and consequently its summers are warmer and its-winters rather colder, as may be seen by comparing the temperature figures for Paris and London in the table on p. 26. There is not much difference in this respect between the districts near the two sides of the Channel, but in the more southerly part of the French region the greater heat in summer becomes more marked and makes pos-

sible the growth of plants, particularly the vine, which cannot ripen their fruit under normal conditions in England. Such differences, allied to traditional differences between the English and French people in the modes of cultivation, lead to considerable contrasts in the appearance of the landscapes and the mode of life of the population in the two countries.

The Ile de France.—The central part of the North French Lowland (marked I in Fig. 35) lies around the capital, Paris, towards which the streams draining the area converge. Here, in past centuries, was the heart of what was then the Kingdom of France, its eastern side being protected by a cliff-like line of escarpments¹ which raised it, island-like, above the surrounding lowland ; hence this central region became known as the " Ile de France."

It is a group of tracts consisting of gently inclined table-lands, rising in the eastern escarpments to about 800 feet above sea-level, and in parts deeply cut by the valleys of the Seine and its tributaries.

The strata of which the lie de France is formed differ in composition, and as they are slightly tilted, they outcrop in various parts of the region and hence lead to differences which mark out the respective tracts. For example, south-west of the Seine is Beauce, which has characteristic features due to the subsoil being a layer of permeable limestone ; the country is a flat, monotonous and rather dry plateau, though a thin, loamy soil allows cultivation of great quantities of wheat. Usually water can be obtained only by boring deep wells ; these are therefore costly and not numerous, and around them the farm-houses are grouped in large villages, whence the treeless fields of the whole community spread out to considerable distances.

Between the Seine and the Marne is situated another wide and generally level tract, Brie, where the subsoil consists of a lower sheet of limestone of a siliceous, " millstone " type and includes clay, which prevents downward drainage. Consequently the surface is often wet, there are groups of trees, and the characteristic occupation is the keeping: of cattle and the production of milk and cheese ; with no difficulty in obtaining water, the farms are conveniently situated within their fields and the population is of the dispersed type.

¹ These escarpments, and also geological faults in other parts of France, are shown in Fig. 86 by symbols which are explained on the map in Fig. 44.

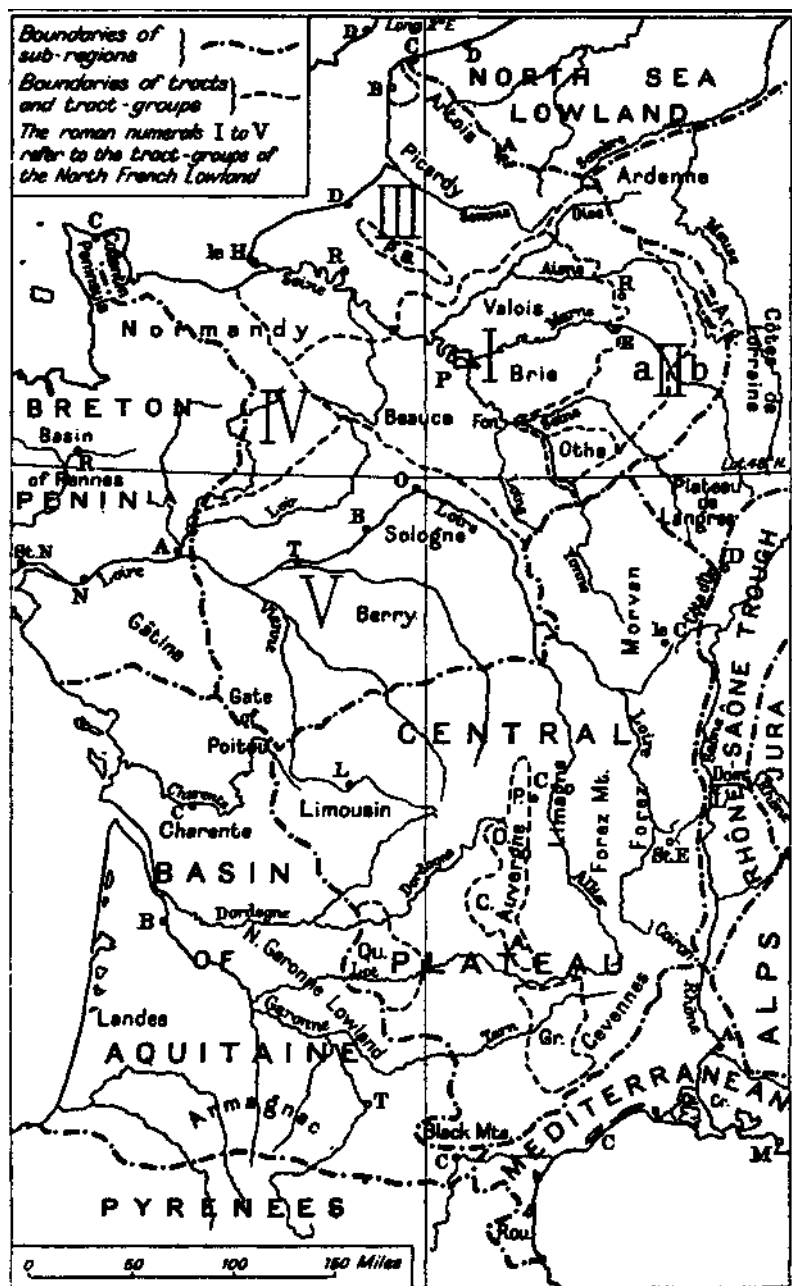


FIG. 35.—REGIONS OF CENTRAL FRANCE.

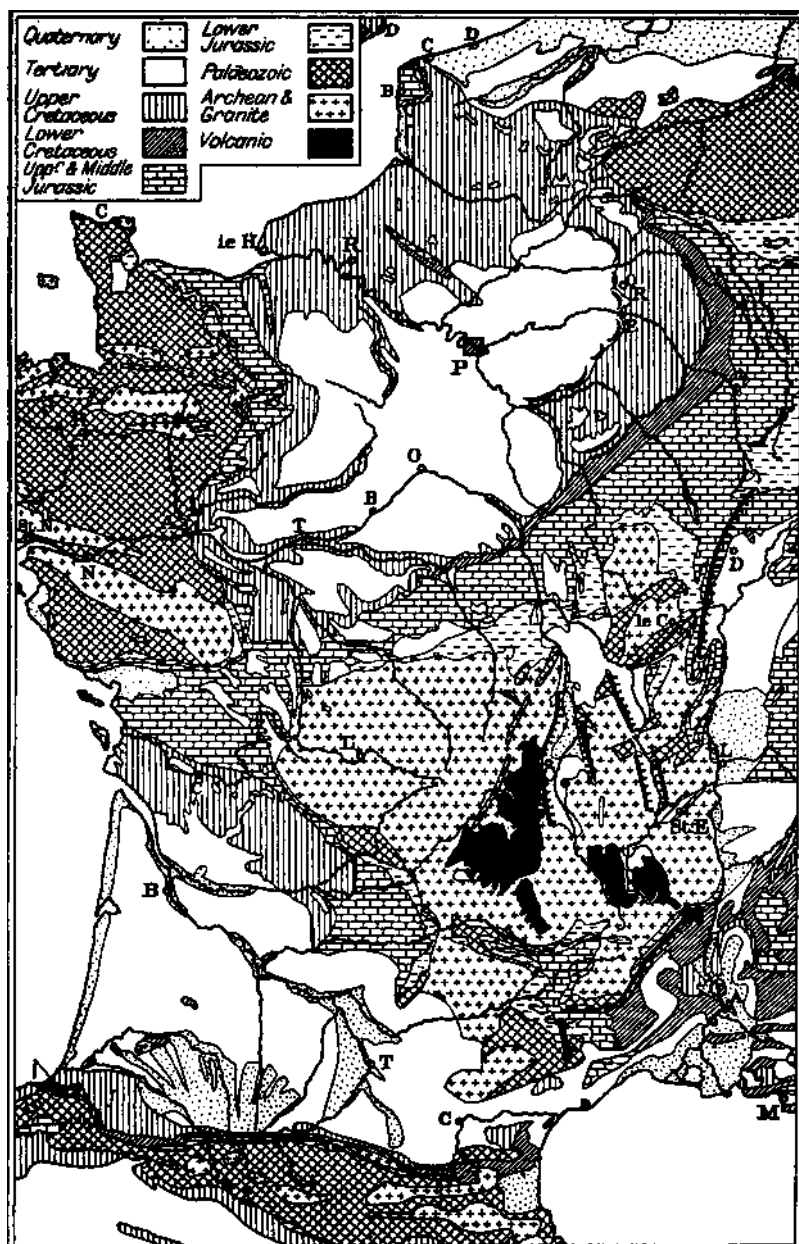


FIG. 36.—STRUCTURE OF CENTRAL FRANCE.

Between the Marne and the Oise is another tract, Valois, distinguished by the occurrence of a still lower stratum of limestone, generally covered with a fertile loam, but there are also patches of sand on which are woods. Elsewhere, too, in the lie de France wooded, sandy or clayey layers outcrop ; e.g. the forest of Fontainebleau (Fon.) is on a sandy stratum situated between the limestones of Beauce and Brie.

The plateaus are separated by broad and often marshy

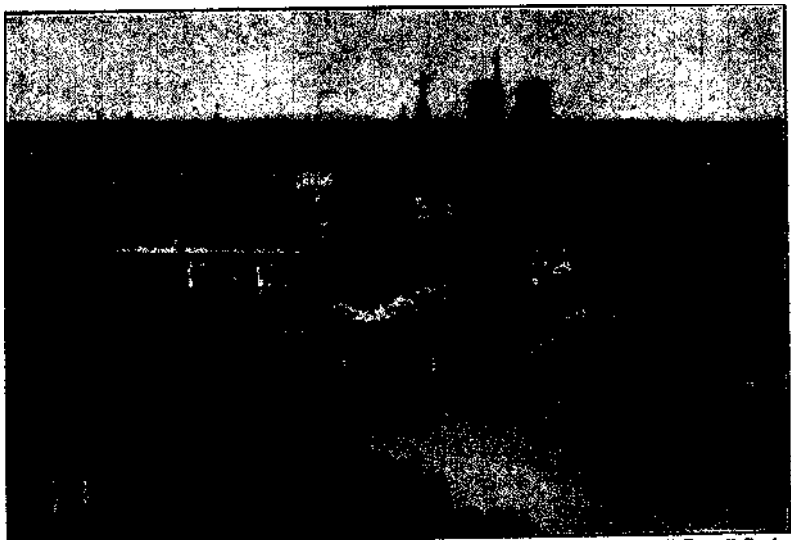


FIG. 37.—VIEW IN PARIS.

"Yoon," Paris.

Note.—The photograph was taken looking up-stream to the island in the Seine, the "He de la Cite," the nucleus of Paris; on the island are to be seen the towers of Notre-Dame. The view shows the shorter bridges spanning the Seine on either side of the island as compared with that across the undivided river; below this bridge are a few of the many barges which load and onload on the quays of Paris.

valleys, and in that of the Seine Paris grew up at a site where an island facilitated the bridging of the river. The position of Paris ensured its future importance : a north—south route here crossed another leading from east to west down the Marne and the lower Seine ; further, its central situation in the He de France early made it the natural seat of the kings of France, and with the development of the French territory it became the capital of the modern State.

As the seat of the Government and at a meeting-place of routes, it became a trading and residential centre, to which new roads were made and railways were built from all parts of France,

and indeed from all western Europe. Also, the River Seine is now navigable between the sea and the capital, and from the neighbourhood of Paris canals complete the natural communications of its tributaries : the Oise is joined to the North Sea Lowlands, the Marne to the Rhine valley, the Yonne to the Saône valley, and the Loing to the Loire valley. With this increase in its commercial significance and with the accompanying growth of its population, Paris was in a most favourable position for manufacturing and for the production of goods of almost all kinds; it is famous for articles of clothing or adornment for which skill and artistic taste are required. Paris is the artistic and intellectual, as well as the political, capital of France, and its great treasury of art, the Louvre, draws visitors from all parts of the world.

Paris now has a population of nearly three million persons, while the whole conurbation of which it is the centre has spread along the neighbouring valleys and on the adjoining plateau areas, absorbing many outlying towns, until the total population exceeds four millions.

The east-facing escarpment of the He de France has a peculiar importance, for on its lower slopes limestones with a covering of vegetable humus provide a suitable soil for the vine, and where there is a favourable exposure are the famous vineyards from which champagne wine is obtained. Also the Marne has here cut through the escarpment and formed a wide valley, into the opening of which the champagne vineyards extend. At this opening is the town of Epernay, and some miles to the north, at the foot of the escarpment, is Reims (Rheims); these two towns are the great wine centres of the district. At the base of the escarpment of Tertiary rocks, the chalk of the Upper Cretaceous comes to the surface, and at and near Epernay and Reims it has been hollowed out into great labyrinths of caverns ; here, where the underground temperatures remain even, the wine is matured.

The " Dry " and " Wet " Champagne Regions.—The term champagne as applied to wine comes from the name of the old French province, which included this vine-growing area. The province, however, extended far to the east, where it comprised the greater part of two markedly contrasted geographical regions; these have long borne the names Champagne pouilleuse and Champagne humide, indicating the beggarly and dry nature of the one **and** the wet condition of the other.

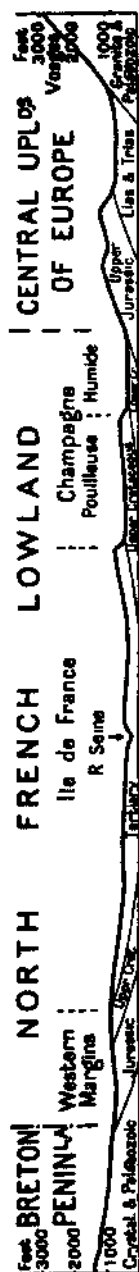


FIG. 38.—SECTION THROUGH NORTHERN FRANCE.

The contrast is due directly to the Secondary strata which rise from below the Tertiary escarpment of the He de France (see the section in Fig. 88). Immediately to the east the Upper Cretaceous chalk comes to the surface, forming at first a low belt of country, but then rising to the bare plateau of the "Dry" Champagne (IIa in Fig. 85); here there is little cultivation, and poor pasture lands on which sheep feed are the chief resource of a small and scattered population. At the northern and southern ends of this chalk plateau, coverings of Tertiary deposits give rise to more wooded landscapes; the southern area, that within the great westerly bend of the Seine, is the Forest of Othe.

Eastwards the chalk forms an escarpment, beneath which outcrop the Lower Cretaceous clays to which the character of the "Wet" Champagne (lib) is due. Although naturally forested and marshy, when drained its soils are capable of producing crops and rich pastures, and now it is a tract of agriculture and cattle rearing. This low Champagne region is bounded eastward by the wooded heights of the Argonne (Arg.) and by the more gradually rising uplands of the C6tes de Lorraine; these may be regarded as the beginning of the Central Uplands of Europe.

The Channel Plateaus.—From beneath the Tertiary layers of the He de France, the chalk emerges northward to form a series of plateaus (III in Fig. 85); these extend to the coast of the Channel, largely in the form of low cliffs, though where the coast faces westward between Dieppe and Boulogne the westerly winds have built up sand-dunes.

At the north-eastern end the chalk is bent up into the "swell" of Artois, which is a lower continuation of the Wealden Uplift of south-eastern England. Adjoining the channel the anticline is sufficiently great for the chalk top to be worn off,

as it has been in the Weald; the underlying strata, among which is a good deal of clay, have been exposed and worn down into a lower area around Boulogne known as the Bas Boulonnais. This low country is a relatively wet, cattle-rearing district, while the surrounding chalk regions of the Haut Boulonnais and the hilly Artois are drier.

This Artois plateau is not, however, poor country like the Champagne pouilleuse, for the chalk is largely covered by deposits of loam or loess with a fertile soil producing much wheat, fodder crops such as clover, colza, from which oil is obtained, and beetroot; after the harvests sheep are turned out to graze on the fields. Continuing the Artois tract to the south-west is Picardy, essentially similar in character; here the folds of the chalk, almost parallel to that of the Wealden-Artois anticline, give rise to an undulating country with the trends running south-east to north-west, and in the same direction the rivers drain to the Channel, the largest being the Somme. On the south-western border of Picardy, one of the anticlines is so marked that the chalk top has been worn away, and the resultant long and narrow Pays de Bray ("P.B." on the map) is a relatively low tract much like the Bas Boulonnais.

South-west of the Pays de Bray the chalk appears again in the low plateaus of Normandy; much of it is covered with "clay with flints," or, south of the lower Seine, with Tertiary deposits, often loamy in composition. While the plateau areas show much open cultivated country, the valleys have more trees and pasture; as a whole, Normandy is a province of varied productions and varied relief. The most marked features of the relief are seen in the valley of the Seine; here the river has been incised deeply into the plateau.

Near the head of the tide on the Seine is Rouen, and here is much interchange of goods from sea-going vessels to inland barges; here, too, was the lowest bridge-place on the river. Now Rouen has a greater amount of traffic than any other port of France. In and around the city are many factories in which cotton and other textiles are manufactured, while there are also other industries in the neighbourhood; Rouen is consequently one of the larger cities of France.

The coasts of the North French Lowland are on the whole not such as to facilitate maritime activities, but the easy crossing to England has given rise to the ferry ports of Boulogne, which

is also an important landing-place for fish, Dieppe and le Havre. The foreign trade of le Havre is very considerable ; it is the outport of Paris and Rouen, specially constructed to accommodate the large vessels which cannot proceed up the Seine ; it imports the cotton for Rouen and the other manufacturing towns of North France, and through it passes much of the foreign produce needed for Paris and for the North French Lowland in general.

In the *Western Margins* of the North French Lowland (marked IV), there is a gradual change to a more diversified region. Here the Cretaceous and Jurassic strata which rise to the surface are not so thick nor have they the same clearly contrasting characteristics as in the east, though limestones, sandstones and clay still bring variety to the country; the strata, however, rise in parts to greater elevations than are found elsewhere in the North French Lowland. Near the coast is the dry limestone plateau of Caen ; elsewhere fields alternate with heaths and woods, and the general appearance of the landscape suggests a transition to the adjoining Breton Peninsula.

The Middle Loire Basin.—The River Loire, between its exit from the Central Plateau and its lower course across the region of the Breton Peninsula, traverses and drains a broad and generally low area which continues the structure of the North French Lowland. This Middle Loire Basin is marked V on the regional map.

Here are all the strata found elsewhere in the North French Lowland region, but they are generally thinner and have narrower outcrops, and also they have been less upraised than in the more northern parts of France ; consequently they do not form wide plateaus, nor have they been etched out into such marked escarpments. Moreover, the Middle Loire Basin includes in the south a part of the belt of Jurassic limestones which, farther east, have been raised to form part of the north-eastern projection of the Central Plateau and also the C&tes de Lorraine (compare the regional and geological maps). Here in the Middle Loire Basin, on the western side of the Loire, the belt is lower and the limestones form the dry plains of Berry.

Although there are not marked differences in the relief of the Middle Loire Basin, its varied structure expresses itself in a diversity of scenery and productions, so that it is difficult to give a short summary of the characteristics of the region from

these points of view. But the generally low altitude and the more southerly situation of this part of the North French Lowland result in relatively high summer temperatures, and of these the people have taken advantage to grow great quantities of vines in the valley of the Loire and its southern tributaries.

Agriculture is the predominant occupation of the region, which as a whole is of moderate fertility. Cereals, especially wheat, are the main product; in addition, fodder for animals is grown, for on the better watered areas cattle are largely kept and sheep in drier parts, such as the open lands of Berry and also in the Soioigne, once marshy but now drained.

In past centuries the basin of the Loire was relatively a more important part of France than it is at present; Orleans at the nearest point to Paris served as a link between the metropolitan region and the centre of France, and from Orleans down the valley there is still to be seen a succession of finely built castles, e.g. at Blois, Tours, Saumur and Angers.

At its south-western end the basin of the Middle Loire narrows to the Gate of Poitou, which leads to south-western France.

The Breton Peninsula.—By comparison with the broad open fields of the North French Lowland, the Breton Peninsula is shady country, with small fields enclosed by hedges and with a good deal of tree growth. The distinction is largely due to the irregular relief of the land and to the abundant surface water, and these characters are themselves the result of the occurrence of older and impermeable rock and the heavier rainfall of the region. Hence the boundary between the North French Lowland and the Breton Peninsula is drawn where the impermeable rocks of Palaeozoic and Archaean age emerge from beneath the sedimentary strata already described, and project westward between the Channel to the north and the Bay of Biscay to the south. Since the greater part of this area formed the old province of Brittany, the name Breton Peninsula is here used, although the region includes the western part of others of the old provinces, notably Normandy and Maine. The peninsular position of the region gives it the equable and rainy climate which marks it out as part of the Atlantic Margins minor region of Temperate Europe. The contrast between the conditions at Brest and at Paris are shown by the figures on p. 26.

Moreover, the structure of the Breton Peninsula, one of the " Hercynian " uplands, distinguishes it from the neighbouring

regions of France and, together with the climate, makes it resemble the Devonian Peninsula of England in many respects.

The plateau was raised a relatively little distance above sea-level, and rivers have etched out the less resistant rocks, leaving the more resistant ones as ridges or bosses of moderate height. The direction of these elevations corresponds with that of the old mountain systems : in the north from west to east, and in the south a tendency to the south-east; consequently the present triangular-shaped region shows, at the Atlantic corner, parallel ranges near the north and south coasts with a narrow low belt between them, while on the continental side of the triangle there is a broader northern upland area forming the heights of Normandy and Maine, then a wide lowland through which the Loire enters the sea, and in the south the Gatine upland trending south-eastward before it disappears under the Gate of Poitou.

Uplands versus Lowlands.—The structure is the main cause of the differences between the uplands and the lowlands of the Breton Peninsula—one of the three great contrasts which the region offers to the observer.

The uplands, both those near the western extremity and those near the eastern margin, reach 1,000 feet and more above sea-level ; frequently they are in the form of long ridges composed of Archaean crystalline rocks, such as gneiss or quartzites, or of resistant sandstones ; in other cases they are broader and more rounded in form and composed of granite. On these rocks poor stony soils have developed, and the wind-swept, rainy uplands generally bear a heath-land type of vegetation ; in parts water collects in the hollows of the impermeable rocks and forms pools, while marsh plants grow in a peaty soil.

Between the uplands the lowlands have been worn down in the less-resistant slates or shales ; here clayey soils have been formed, and though naturally ill-drained and wet and once densely forested with oaks, they have proved capable of utilization. There are meadows on which many cattle are reared, largely for the production of milk and butter ; there are fields in which cereals and vegetables, especially potatoes, are grown ; there are orchards from which large amounts of apples are obtained, and in this part of France cider made from the apples takes the place of wine. The most extensive lowland area is the "Basin of Rennes," in the centre of the region, situated between

the generally higher elevations of the western extremity and the eastern margins.

The mineral resources of the region are very small, and apart from some iron in the north-east margin in Normandy, the chief products are granites and slates, quarried where they can be transported easily by water.

East versus West.—Because of the triangular shape of the Breton Peninsula, the narrow and projecting west is much more exposed to the influence of the sea than the broader east which adjoins the North French Lowland ; the former is wetter and more wind-swept, although more equable, while the latter has warmer and drier summers. Moreover, there is a greater extent of the clayey areas in the centre and east, and consequently the more valuable crops of wheat and oats are obtained in these parts, while buckwheat and rye are grown in the west.

Because of its remoteness from the rest of France, the people of the west have been more isolated, and this feature of their lives is increased by the method of farming: the peasants mostly live in scattered houses, surrounded by their patches of arable land, pasture, and vegetable and fruit garden, enclosed by hedges and trees, and connected with the outer world only by a muddy cart-track. Old ways and old ideas tend to persist, and Breton is still widely spoken.

Coast versus Interior.—The Celtic word " Armor " meant the -coastal belt, in opposition to " Archoat," the wooded country of the interior, and the life of the region has been greatly affected by the character of the coast itself.

The breaking up of the old massif led to the broad outlines of the present peninsula, but the numerous bays of moderate size are due to more recent changes of sea-level, involving the " drowning " of the earlier valleys ; in the far west the hollow between the northern and southern ridges has been deeply invaded by the sea, and the great bays of Brest and Douarnenez are the result. This irregularity of the coast has been accentuated by the wearing action of the stormy seas, which have fretted the shores, wearing them back into cliffs and detaching the outstanding parts of headlands to form rocky islets.

Such a coast, although at times dangerous to shipping, gives abundant harbourage, and fishing and trading have been encouraged. From the north coast fishermen go as far away as the Newfoundland and Iceland cod fisheries, and on the south

side tunny fishing and more especially sardine fishing is important ; everywhere there are fishing villages, and in the larger centres preserving and canning are important industries.

No other region of France has such a coast, and from the people of the Breton Peninsula a large part of the personnel of the French fleet is recruited ; moreover, Brest, with its position at the entrance to the Channel and its situation in a land-locked harbour with deep water, is a naval station of great importance.

The far west, however, is so remote from the rest of France that it has not an advantageous position for import and export. The north-east and the south-east parts of the coast on the other hand, have more commercial significance. At the end of the Cotentin Peninsula is Cherbourg, which is a port of call for liners from Southampton and the North Sea on their trans-Atlantic passages, as well as a naval station. More important is the trade from the Loire estuary : Nantes is the old-established port of the Loire Basin, situated where roads from either side converged at the lowest bridge-place on the river. When larger vessels were built, Nantes could not be reached by them, and St. Nazaire became its deep-water outpost; still more recently, engineering works have forced the waters of the Loire to scour the channel, and once again Nantes can receive liner traffic. Now both ports share the trade and subsidiary industries, including shipbuilding.

The coastal belt of the Breton Peninsula has another advantage over the interior in that its mild winter climate and its facilities for rapid export have enabled it to develop a great production of early potatoes, cauliflowers, artichokes and peas. Agriculture is helped in yet another way by proximity to the coast, for the soils have been greatly enriched by manures obtained from seaweed gathered at low water, and also from banks of sand formed of shells, which give valuable material for plant food.

With this variety of natural opportunities of getting a living, the population along the Breton coasts is much greater than that in the interior, and indeed is greater than that of most of France, with the exception of the manufacturing areas of the north-east and the districts near the great cities.

(Questions are given at the end of the next chapter.)

SOUTHERN AND CENTRAL FRANCE

The Aquitaine Basin.—The latitude of south-western France accounts for its higher temperatures both in summer and in winter, as compared with those of the Paris region (see the figures for Bordeaux on p. 26), and the direct exposure to the Atlantic winds accounts for heavier rainfall. These conditions make possible a widespread cultivation of maize, which becomes more important than wheat as a cereal crop in the south, and there is a wider extension of vine-growing in the Aquitaine Basin even than in the Middle Loire Basin. On the adjoining Central Plateau and the Pyrenees fall heavy rains, and from these the rivers bring down great quantities of water, particularly to the Garonne, which is in consequence subject to great floods. Moreover, the bottom of the great trough between the two highland areas has been largely filled in with material brought down in the past, and alluvium is still being deposited in the valley of the Garonne and is rapidly filling up the Gironde, the common estuary of the Garonne and the Dordogne. The Garonne is not navigable above Bordeaux, except for small boats, and large liners have to use outports near the mouth of the Gironde if they serve this region at all.

Indeed, in spite of the long coast-line, the natural conditions do not favour maritime activities, for in this angle of the Bay of Biscay the currents sweeping southward have accumulated sand, which has been heaped up by the prevailing westerly winds into an almost continuous belt of high dunes. These are known as the *Great Dunes of Gascony* and are shown on the geological map as among the Quaternary deposits. The belt of sand has enclosed a number of lagoons, all except one now being completely shut off from the sea.

Moreover, behind these coastal barriers is the tract of the *Landes*, consisting of great flat plains of wind-blown sand, below the surface of which iron has cemented the sand into an impermeable pan. The region was therefore a marshy heath-land with innumerable pools ; in these, mosquitoes bred and carried

malaria among the few people who kept sheep on poor pastures.

Now, however, the inland drift of the sand has been checked by planting grasses and trees on the dunes, and the drainage has been improved by breaking through the pan and by cutting dykes ; then, some thousands of square miles were planted with

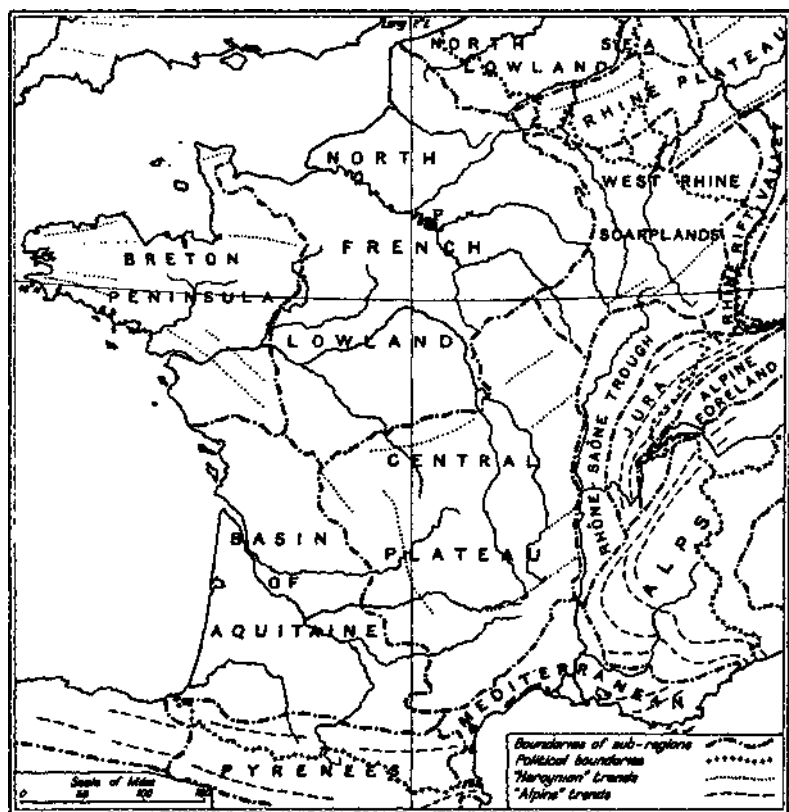


FIG. 39.—REGIONS AND STRUCTURAL TRENDS OF FRANCE.

the maritime pine, which yields timber, resin and turpentine,, while improvements in pasturing have allowed many more sheep and also cattle to be reared on the Landes.

The other tracts of the Aquitaine Basin are much more productive. The country which adjoins the Gate of Poitou is called the *Charente Region*, for it is drained by the River Charente to the Bay of Biscay. The soils are fertile, producing

wheat and maize, and along the whole course of the middle and lower Charente there are vineyards; from the wine a great deal of brandy is obtained—a famous kind is that known as Cognac, from the town in the centre of the district.

The *Garonne Valley* is another important vine-growing region. " Bordeaux wines " is the general name given to the wines made in the lower part of the area, but far up the courses of the river and its tributaries there are also extensive vineyards ; some of the more choice wines are exported, but by far the greatest amount is consumed in the country. In general, the Garonne valley is the most productive and the most populated part of Aquitaine. Wheat and fruit trees are grown throughout the area, and on the wide plains of Toulouse, below that city, maize and early vegetables are important productions ; tobacco is also grown in some parts of the Garonne valley.

Bordeaux is the port of the whole Basin, with about a quarter of a million inhabitants. Toulouse is not quite as large ; it is the trading centre of the upper part of the region, and is a focus of routes up the valleys of the Pyrenees and through the Gate of Carcassonne to the Mediterranean region of France.

Between the Garonne valley and the Central Plateau is a region which may be called the *North Garonne Lowland*. Its characteristic features are due to the subsoil being largely formed by Tertiary deposits known as " mollasse "—sandy and clayey accumulations worn down from the Pyrenees during and after the upraising of those mountains ; it was spread out over almost all the Basin, although now covered by later deposits on the Pyrenean side of the main valley. The region has a rather monotonous appearance, for on the mollasse have developed gently undulating plains, remarkably uniform except for the river valleys that have been cut into them. Wheat and fruit, especially plums, and fodder for cattle, characterize the agriculture.

Between the great curve of the Garonne valley and the Landes is an almost semicircular region rising gradually to the Pyrenees ; the name of the central district, *Armagnac*, may be adopted as a convenient label for the whole region. Here an immense alluvial fan has been formed of material brought down from the mountains : first the mollasse, then later Tertiary gravels, sands and clays, and on top of all Quaternary sediments.

Into this broad " cone " the rivers have cut valleys spreading out fan-like and draining either to the Garonne or to the angle

of the Bay of Biscay. In their upper parts these valleys are deeply cut into the plateau of the higher country where heathlands pasture sheep during their annual passage between wintering on the lowlands and spending the summer in the mountains. In the lower parts the valleys are wider and the climate is warmer and drier; here maize is widely grown, fruit trees and the vine become increasingly important as the region becomes lower, and Armagnac brandy is one of the well-known exports of the district.

Thus the Basin of Aquitaine, taken as a whole, is a sub-region of predominantly agricultural character and of a markedly southerly type; with a lack of mineral wealth and almost shut in by mountains and a difficult coast, it has had very little industrial or commercial development, and in consequence its population is not great and is mainly scattered in isolated farms or in villages and small towns.

Between the Pyrenees and the Central Plateau is the broad Gate of Carcassonne, whose fortified walls and castle still bear witness to its strategic importance in past centuries.

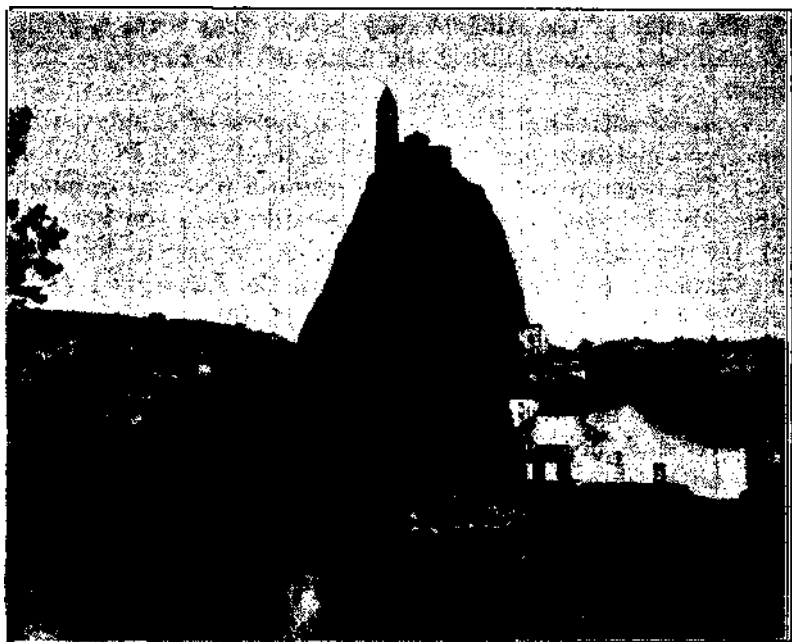
The adjoining region of the Pyrenees has a greater extension in Spain than in France, and will be dealt with in the chapter on the Iberian Peninsula.

The Central Plateau.—Although this region, frequently called the Massif Central by French geographers, appears on a relief map as an upland with few breaks in its continuity, it includes areas of extraordinarily contrasting character. Even where the surface shows little change in altitude, the appearance of the country and the mode of life of the people may change suddenly with the occurrence of a different bed-rock; hence, the geological structure is the key to the geography.

In this Hercynian Upland, the structure is complicated, for the "Armorican" foldings, with a north-west to south-east direction, approach the "Variscan" foldings, which run from south-west to north-east.

Moreover, in the upraised massif of the Central Plateau, marginal areas of Secondary sedimentary strata were incorporated. These areas can be seen by comparing the limits of the region as shown in Fig. 85 with the occurrence of the various strata as shown in Fig. 86; of special interest are the masses of Jurassic limestone in the regions of the south and south-west marked "Gr." and "Qu." on the regional map.

Another most significant feature of the Central Plateau is the existence of many great faults. Of these, one series forms the steep eastern margin of the region where it overlooks the Rhone-Saone trough.¹ Consequently, while in general the Central Plateau rises gradually from the west, its eastern boundary is almost mountain-like, and its high south-eastern edge, reaching about 4,000 or 5,000 feet, is known as the Cevennes.



(French Railways—National Tourist Office.)

FIG. 40.—VIEW AT LE PUY.

Note.—"Puy" is a common name for a summit in the Central Plateau, and it has been adopted as the name of the town "Le Puy" in the volcanic region west of the Upper Loire. North of the town rises the volcanic rock named "Rocher d'Aiguille," shown in the view; it is nearly 300 feet high, and on the top is a chapel built in the tenth century.

Another series of faults has produced two marked valleys in which flow the upper Loire and its tributary the Allier. That of the Allier is called the Limagne; it is a rift valley between faults running in a general north-to-south direction, and in it have been preserved Tertiary deposits and material worn down from the surrounding upland. The corresponding valley of the Loire takes the form of two down-faulted basins, also filled in

¹ In the geological map in Fig. 86 all these faults could not be shown without obscuring other features.

by Tertiary deposits ; the southern is known as the Forez Basin. The narrow upland left between these valleys of the Allier and the Loire is called the Forez Mountains.

Still another important element in the structure of the Central Plateau is associated with these dislocations, for through such cracks volcanic material was forced out and accumulated on the other rocks. In this region such recent volcanic rocks are found in great amount near the head-stream of the Loire, and on the western edge of the Allier Valley, where they form a distinct geographical region bearing the name of the Auvergne Mountains.

We may therefore distinguish five types of country which together constitute the greater part of the Central Plateau.

(1) The western crystalline and granitic plateau, frequently called the Limousin, which rises gradually from the lowlands ; (2) the upraised limestone plateaus of the south, known as the Causses ; (3) the volcanic region of the Auvergne ; (4) the faulted valleys of the Allier and Loire ; (5) the high eastern margin of complicated structure, including the Cevennes in the southern part and certain coalfields in the northern part. To these may be added two projecting spurs, the broad Morvan in the north and the Black Mountain in the south. These regional units differ from one another considerably in structure, altitude and position, and consequently in climate and utilization.

Limousin.—Where this plateau rises from the North French and Aquitaine Lowlands it is about 1,000 feet above sea-level, and it slopes gradually upwards towards a higher eastern part, frequently known as the Plateau de Millevaches, which gains an elevation of nearly 8,000 feet.

The lower western area has an equable, and on the whole warm, climate with a moderate rainfall, and its crystalline rocks have weathered to soils which have been improved by long manuring and by bringing chalk up from the neighbouring lowlands. There are arable lands, on which wheat and buckwheat are grown, but most characteristic are meadows, generally irrigated and cut for hay twice in the year, and plantations of edible chestnut trees. The farming is concerned mainly with cattle-rearing, and the chestnut trees yield both timber and also the nuts which form an important part of the people's food.

On the higher eastern part of the plateau the climate is colder and more cloudy; there are heavy rains and in the winter

frequent snowfalls. On the rounded heights are granitic tors, also hollows filled with waterlogged sands ; heaths abound, and there are woods of oak and beech. There is little cultivation, though some rye is grown, and cattle are bred to be sent to lower areas for fattening and sale.

The settlements in the Limousin are generally small; Limoges, on a tributary of the Loire, is the natural centre and market town of the lower plateau, and at this town are pottery and porcelain works having the advantage of kaolin from granite quarried in the neighbourhood.

The Auvergne.—This region, named after an old French province, consists of four main tracts, all volcanic, but of different origin, appearance and use.

In the north, overlooking the Limagne, is a relatively narrow belt marked P. on the regional map. This is formed of a considerable number of relatively recent cones, known as " Puy " ; the best known is the Puy de Dôme. Though the volcanoes are extinct, their forms are still fairly well preserved, and on some of the lava fertile soils have developed. At their general elevation of nearly 3,000 to 5,000 feet, however, these lands have a comparatively severe climate and the heavy precipitation commonly takes the form of snow. Hence only such hardy crops as potatoes and rye can be produced, and, as on the neighbouring plateau, pastoral work is the main resource of the scanty population.

Farther south the belt widens to the mass of Mont Dore (D.), formed by the eruption of material from many neighbouring vents ; here the volcanic accumulation reaches its greatest elevation, over 6,000 feet. Farther south again is the widest area, the Cantal (C), once a volcano of still greater elevation than the Mont Dore mass, but of older date and now worn down to a rather less height. On these mountains the snow may lie for half the year, but their sides are deeply eroded, and in the lower parts of the valleys there are good soils and abundant water, and here fields, fruit trees and villages are found.

The " tail " of the Auvergne is the Aubrac (A.), an enormous stretch of bleak lava flows, of little value except as a summer pasture for cattle from farther south.

The Allier and Loire Valleys.—The two great head-streams of the Loire system derive their waters from a region where the melting of the winter snows frequently coincides with heavy

rains ; hence they are both subject to enormous floods in spring, in striking contrast with very low water in the usually dry summer. Moreover, at all seasons they are liable to great rises, for upon the surrounding highlands rain-water is not absorbed by the impermeable rocks, but rushes rapidly down the steep slopes into the two great valleys.

In Tertiary times these depressions were occupied by lakes, now drained, and upon the deposits of that period much alluvium has since been spread. The low altitude of the resulting plains, only about 1,000 feet above sea-level, gives them a relatively warm climate which at midsummer may indeed be hot, and the bordering uplands give them shelter. Consequently, where the soils are favourable, they are extremely productive and have attracted relatively dense populations into the heart of the Central Plateau. The Limagne is exceptionally fertile, for the proximity of the volcanic region long ago caused ash to descend upon it, and since then debris of mixed composition has provided material for the development of rich soils. Upon these soils wheat, various fodder crops and sugar-beet are grown, and the numerous villages are almost hidden by great orchards of pear trees, walnut trees and even apricot and peach trees, while vines are grown on the lower slopes of the valley sides.

Towns have grown up, the largest being Clermont-Ferrand on the edge of the valley almost underneath the Puy de Dome ; here have developed manufactures, aided to some extent by a small local coal-supply, but depending almost entirely upon imported material. The central position in France of Clermont-Ferrand would seem largely offset by its situation within highland barriers, but it has risen to considerable importance in connexion with the motor-car industry and there are great rubber factories and also engineering works of various kinds.

The valley of the Loire is less productive, for the crystalline rocks above it have furnished sandy material which renders the Forez and other basins less productive than the Limagne; wheat and potatoes are the chief crops. There is a cotton-spinning industry in the Roanne basin below the Forez, but no industrial development comparable with that of the Allier valley.

The Causses.—The name is derived from an old south French word for limestone, and the permeability of the rocks is the

fundamental factor in the characteristics of the regions. There are two main areas, the Grandes Causses (Gr. on the regional map), situated chiefly in the upper basin of the Tarn, and the Causses of Quercy (Qu.), cut by the middle courses of the Lot and Dordogne.

The Grandes Causses are limestone plateaus at elevations of between 2,500 and 3,500 feet above sea-level; they are separated



[E.N.A.]

FIG. 41.—VIEW ON THE RIVER TARN.

Note.—This shows part of the gorge cut into the limestone of the Grandes Causses. At one place the river-level is more than 1,500 feet below that of the neighbouring plateau. The limestone walls sometimes overhang the stream, where they represent the subterranean tunnels and caverns of an earlier stage of development.

from each other by the deep valleys of the Tarn, its tributaries, and other rivers draining either to the Atlantic or to the Mediterranean. Although the rainfall on these heights is great, the surface is usually dry and rocky; there is little soil except in the hollows or the valleys, and generally vegetation is very sparse and sometimes practically non-existent. The water sinks into the limestone, and collects in cracks, which are widened by solution and corrosion till underground channels

are developed, widening in parts to caverns. In course of time the tunnels become very deep and their roofs may give way; the rivers are then exposed at the bottom of narrow canons in some cases hundreds of feet in depth.

These valleys effectively separate the Causses from each other, and greatly impede communication, which, moreover, is often impossible in the valleys themselves. Surface streams upon the plateau are rare and sometimes suddenly disappear in swallow-holes, perhaps emerging in a canon-like valley far away. Landscapes like that of the Causses are said to be of the " Karst " type, the name being derived from the similar Karst upland near the head of the Adriatic Sea.

With the lack of vegetation, the only considerable resource is the grazing of sheep on the poor pastures, and from the ewes' milk " Roquefort " cheese is made. Conditions of life are hard, especially in times of drought, when water may have to be carried great distances from the larger streams. Necessarily, the population of the Grandes Causses is extremely scanty and, settlements are limited mainly to parts of the valleys where soil has accumulated and water can be obtained.

The Causses of Quercy are essentially similar, but they are of much less elevation, being little more than 1,000 feet above sea-level. Hence the valleys are less deeply cut, and the climate is less extreme ; consequently the pastures are better, life is not so difficult and the population is rather greater.

The Black Mountain and Morvan Spurs.—In the extreme south the Central Plateau almost meets the Pyrenees in the spur of the Black Mountain, a crystalline mass which derived its name from the dark forests still covering it in part.

In the extreme north is the Morvan, whose highest part is of more complicated structure, but of generally similar appearance ; from this it bears the Celtic name Morvan, which meant Dark Mountain. Around this height upraised sedimentary rocks, largely of Lias clay and Jurassic limestone, form a transition both to the North French Lowland and also to the Plateau of Langres, which continues the high ground to the C6tes de Lorraine and the Central Uplands of Europe.

The Eastern Margins.—Here is an area of great complexity which in one part or another includes all the types of country found in the Central Plateau. In the south the Cevennes, deeply scored by rivers running rapidly to the lower Rh6ne

or the Mediterranean, descend from heights of over 5,000 feet and show a zonal arrangement of vegetation as they reach lower altitudes and have higher temperatures : pastures on the heights give place to beech forest, and this yields to great plantations of chestnut trees before the mountains pass into low foothills and plains of "Mediterranean" character. On the edge of the Cevennes, faulting has let down and preserved the small coal basin of Ales, or AJais, and farther to the north-east a projecting spur of volcanic basalt, the Coiron, brings the plateau close to the Alps.

More important coal basins are found on the Central Plateau between the Loire valley and the Rh6ne-Saone Corridor. The direction of the Variscan folding is shown on the geological map by belts of Palaeozoic rock running from south-west to north-east, and in these are productive Coal Measures ; moreover, the rocks have been worn down into hollows which facilitate communications between the Loire and Rhone river basins. There are three such coalfields, and of these the central one has the advantage of neighbouring iron ore ; here are the great armament and other iron and steel works at le Creusot. The southern one is the basin of St. Etienne ; its valley of over 30 miles in length has been described as a "long and infernal street" in which metallurgical industries of all kinds, glass-making and the manufacture of silk and artificial silk goods are carried on. From this coalfield coal is sent to Lyons, where it is used in power-plants when the water-power upon which they normally depend fails during the dry seasons.

Reviewing the characteristics of the Central Plateau, it will now be realized that its geological history has welded into close proximity very different types of country ; consequently it is not a simple sub-region, like the North French Lowland, in which there is much uniformity, but a composite sub-region with little more than its elevated situation in the heart of France as a common characteristic.

The Rh6ne-Saone Trough.—This great hollow is the result of the Alpine disturbances which produced both the folded ranges of the Jura and the Alps on the eastern side and also the faultings which separate it from the Central Plateau and its continuation, the Plateau of Langres, on the western side. At the northern end of the Sa6ne trough are strata of Secondary age, but the

greater part of the hollow is floored by marls and other Tertiary deposits, and glacial material was brought down in great amount where the Rhone enters from the Alpine highlands.

The soils in the hollow are therefore varied, but where they are fertile the region is very productive, for the climate is favourable to cultivation. Because of the almost enclosed situation of this relatively low region, the temperatures approach the "continental" type, as is shown by the figures given for Lyons on p. 26: the July mean of 70° F. and the annual maximum of 95° F. are markedly high as compared with the January mean of 36° F., and the annual minimum of 10° F.; no other part of north-western Europe shows such extremes. The rain is abundant, due to the proximity of the great highlands.

The northern and central part of the broad Saône valley is a fertile country, with great stretches of wheat and maize, sugar-beet, hops and fodder crops for dairy cattle. Especially productive is the zone at the foot of the western hills, part of which goes by the name of the Cote d'Or; all along these slopes are vineyards and orchards of cherry, peach and other fruit trees. The wines are known by the general name of "Burgundy," from the old province of which this zone formed part.

The area of the Dombes (marked "Dom." on the regional map) in the angle east of the Saône and north of the Rhône is very different, for here the morainic material is spread out in broad, terrace-like formation, and on these levels there are impermeable clays. Consequently there is naturally bad drainage, and this area is the least populated of the whole region.

Farther south the trough narrows to the "Rhône corridor." Here fertility is again considerable, and vineyards stretch along its borders, while besides fields of maize there are great plantations of mulberry trees grown for the food of silk-worms; in this way the agriculture is related to the silk industry carried on in a number of small centres, in addition to the great works in and close to Lyons.

The greater part of the silk required for the industry in Lyons, however, has to be imported from abroad; moreover, though the machines are mainly driven by electricity derived from water-power from the Rhône itself and the neighbouring Alps, the chief advantage for the industry lies in the position of the

city in relation to distant sources of raw material and distant markets for the finished goods. Great quantities of silk are brought from the Mediterranean countries and the Far East through Marseilles ; for the disposal of manufactured silk and other goods, the Saône valley gives relatively easy routes in two directions : the first is north-westward to the Paris Basin and the Channel ports by way of Dijon and the railways over the Plateau of Langres, and the other is north-eastward to the Rhine Lands and the North Sea ports by way of Belfort in the Burgundian Gate between the Vosges and Jura Uplands.

With other routes, such as the St. Etienne valley westward and the Rhône valley eastward, Lyons has a most marked nodal position, and it is not surprising that it has developed into a very important commercial centre. Naturally, to the same city have been attracted a number of other industries, including the production of chemicals and machinery. With its population of over half a million, Lyons is the third city of France.

The River Rhône is practically unnavigable, for the masses of water which it receives from the heavy rains on the surrounding uplands and from the melting snows of the Alps make it liable to floods, which occur at various times in different parts of its middle and lower course, and its current is usually too swift for boats to go upstream; it is the valley, not the river, which is so important for commerce.

Mediterranean France.—The traveller proceeding southward through the Rhone corridor, after passing the narrow gap between the Coiron and the western-most Alpine chains (again see Fig. 35), observes a different landscape, for before reaching Avignon above the Rhône delta, he sees extensive olive-yards as well as vineyards and orchards of fruit trees, and as a striking contrast thorny shrubs with bare, stony soil visible between them. The south-eastern corner of France belongs to a different major natural region of Europe.

Yet as it is on the northern margin of the Mediterranean, its climatic conditions differ somewhat from those farther south (refer to the figures for Marseilles on p. 26). In particular, the winter temperatures are lower than is common for places near the sea-level, and the annual minimum is exceptionally low. This is due to the cold "Mistral" which arises when depressions pass along the Mediterranean basin and draw in,

from the chilled Central Plateau, air which descends the Rh6ne valley in bitter blasts. As a consequence, the growing of oranges and lemons is restricted to such parts as the extreme east of the French coast away from the Rh6ne valley.

The varying conditions of climate, relief, soils and opportunities for trade lead to considerable differences in the areas which together constitute the Mediterranean sub-region of France.

Constituent Areas: (i) *Bas Languedoc*.—The western part of Mediterranean France is formed mainly of the lower part of the old province of Languedoc ; it comprises three tracts : (a) Inland is a hilly area largely formed of limestones, on which there are plantations of vines, olive and mulberry trees, though large parts are poor garrigues used only for winter pasturing of sheep sent up to the Central Plateau in summer, (b) Nearer the sea are alluvial plains devoted, to an unusual extent, to vineyards yielding almost half the total amount of wine of France, though its value is not proportionally so great. Such a " one-crop " form of production has its dangers, and this region has suffered greatly from the phylloxera disease of the vines, and also from periods of low prices for wine, (c) The coast is being straightened by material washed from the Rhone delta by the counter-clockwise currents of the Mediterranean Sea ; dunes enclose brackish lagoons, from the waters of which salt is obtained by evaporation. The old port of Aigues Mortes at the edge of the delta is now inland and Cette (Sete), farther west, has an artificial harbour.

(ii) *The Rhone Valley and Delta*.—The formation of deltas is facilitated by the almost tideless nature of the Mediterranean Sea, and the delta of the Rh6ne occupies a considerable area. Near Aries, the river divides into two branches ; between these is the Camargue, the " wet delta," in which drainage is now making pasturage possible, while to the east is the Crau, the " dry delta/" formed largely of pebbly deposits brought down from the Alps by the Durance. Here irrigation is necessary, and with protection from the Mistral by wind-breaks, there are winter pastures for sheep from the Alps, and some cultivation.

The greatest significance of the lower Rh6ne valley is in affording an easy route connecting northern Europe with the Mediterranean Lands and, behind them, the Far East. This

route has been important for more than 2,000 years ; the towns of the Rh6ne valley, such as Avignon, Ntmes and Aries, still have in their buildings the evidence of Roman occupation : fortresses, arenas, temples and aqueducts, and the great commercial city Marseilles is of even earlier origin, for it began as the site of a Greek colony.

Marseilles is not actually in the Rh6ne valley, but is placed by a bay at the side of the delta which is safe from the silting action of the currents, and the harbour has the advantage of deep water. The bay is open, however, and artificial shelter has had to be provided, while to cope with the traffic a great canal has been tunnelled through the ridge north of the bay into a lagoon adjoining the delta. The Rh6ne itself is not navigable, and only a small canal leads by the side of the river to Aries.

Traffic has therefore to go northward from Marseilles by rail, and the greatest amount of the imports is destined to serve the needs of the people and the industries of the Rh6ne valley itself; most of the trade of Marseilles, indeed, is between south-eastern France and the French Colonial possessions in North Africa and southern Asia. From north-western Europe, however, there is much passenger traffic, which takes advantage of the quick railway route to the Mediterranean as compared with the long sea journey *via* the Bay of Biscay and the Strait of Gibraltar.

Round the port of Marseilles industries have developed, particularly those requiring imported material, such as the making of soap, margarine and chemicals, and the refining of sugar ; the population of Marseilles is now over three-quarters of a million, and it is therefore the second city of France.

(iii) *Basse Provence*.—The old French province, Provence, extended from the Alps down to the rocky coast, and that part which is within Mediterranean France is largely upland. In this easterly part of Mediterranean France, the Alps to the north give more protection from cold winds, and the pleasant, indented coast has proved attractive to visitors seeking warmth and sunshine ; this is the beginning of the Riviera coast, which is further dealt with in the chapter on the Italian lands. The same favourable climatic situation which has led to the growth of large and fashionable resorts such as Nice and Cannes has also favoured a large-scale cultivation of flowers for export and for the making of scent.

In an almost land-locked bay has been established the great arsenal and naval port of Toulon, by which shipbuilding yards have been constructed; its situation on the direct routes between France and her overseas possessions makes it, politically and strategically, an important feature of Mediterranean France.

QUESTIONS ON CHAPTERS VIII AND IX

1. Consider on broad lines the similarities and dissimilarities between the lowlands of South-eastern England and those of North-eastern France.

2. Discuss to what extent the geological structure, apart from other geographical factors, has determined the characteristics of the North French Lowland.

3. Give a reasoned account of the distribution of the main occupations of the people in North-eastern France (including the part in the North Sea Lowlands region).

4. Examine the situations of the larger towns of North-eastern France, and classify these situations in relation to the physical geography.

5. Examine (*a*) the common characteristics, and (*b*) the internal differences, of the Breton Peninsula.

6. "The Breton Peninsula of France resembles the Devonian Peninsula of England." How far is this true?

7. Contrast the lowlands of South-western France with those of North-eastern France, and account for the differences.

8. Write systematic notes on the wheat and wine production of France.

9. State, and briefly describe, the differences in the landscape to be observed on a journey from the Saone valley near Dijon to the Mediterranean Sea.

10. Examine the statement: "The Central Plateau has little more than its elevated position in the heart of France as a common characteristic."

11. Write an essay on the ports of France.

12. Test the truth of the dictum that river basins are not natural units, by reference to the rivers of France.

CHAPTER X

THE CENTRAL UPLANDS

THE complexity of this part of Temperate Europe is due to the "Alpine" disturbances which, north of the Alps themselves, produced (1) the long, upraised belt of the Alpine Foreland; (2) the folded ridges of the Jura; (3) the upthrust Hercynian massifs of the Harz Mountains (marked "H"), the Rhine Plateau

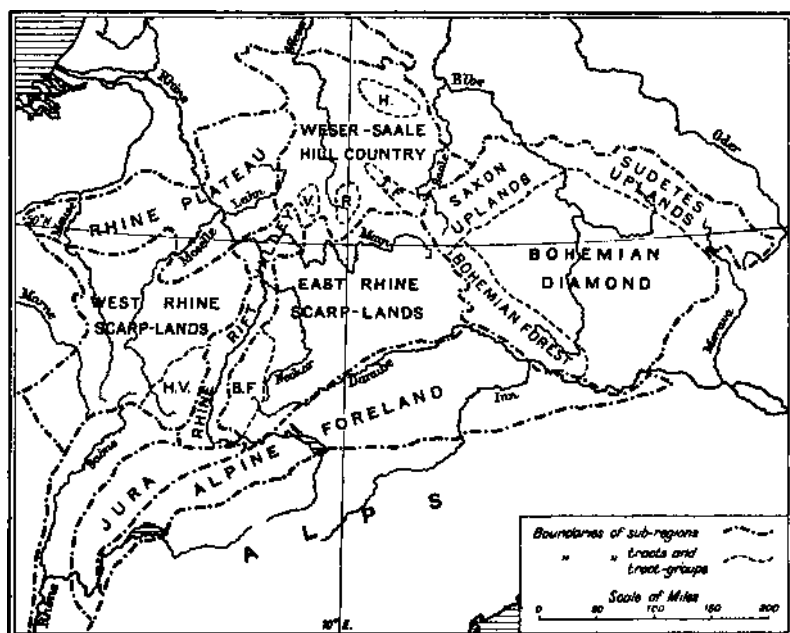


FIG. 42.—REGIONS OF THE CENTRAL UPLANDS OF EUROPE.

through which that river runs between Bingen and Bonn, the Thuringian Forest ("T.F."), the High Vosges, the Black Forest, and the Bohemian "Diamond" and its margins, the Bohemian Forest, the Saxon Uplands and the Sudetes Uplands; (4) the tilted areas of sedimentary strata between the Hercynian fragments, viz. the East Rhine Scarp-lands, the West Rhine Scarp-lands, and the Weser-Saale Hill-country; (5) the sub-

sided Rift-valley of the Rhine; (6) volcanic masses such as the Vogelsberg and the Rhon ("V" and "R").

These structural units, either singly or in a group, form the sub-regions which we will now consider in turn.

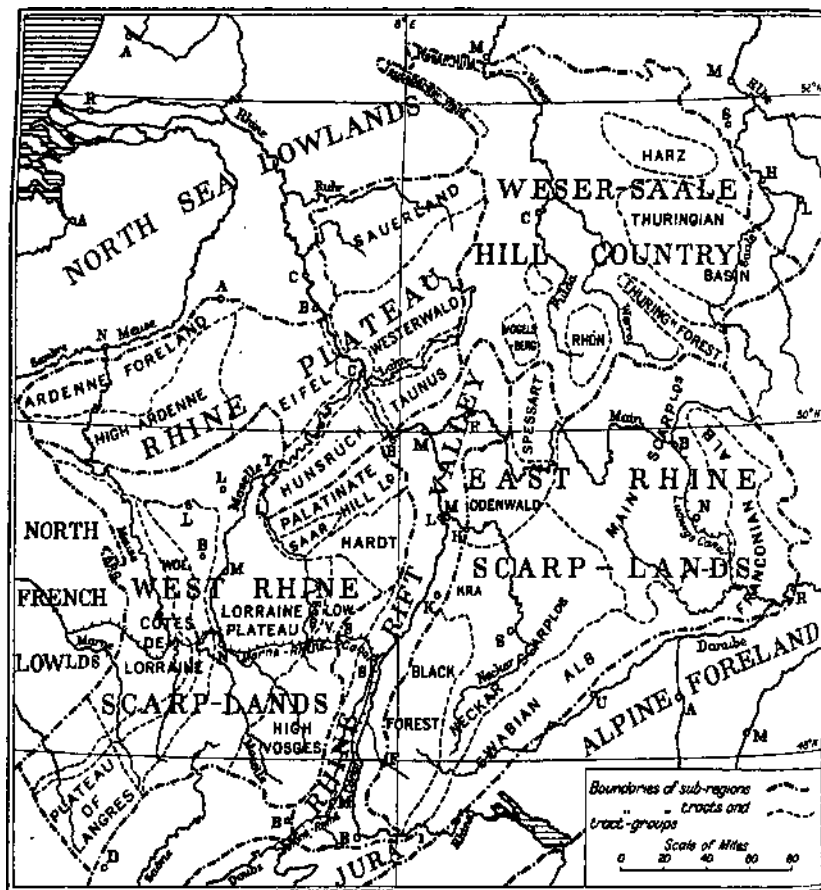


FIG. 43.—REGIONS OF THE RHINE UPLANDS.

Note.—Ludwig's canal is now replaced by the Rhine-Main-Danube canal.

The Rhine Plateau.—This massif is mainly composed of resistant slates, sandstones and quartzites, and in the north of less-resistant limestones, of Palaeozoic Age (refer to Figs. 48 and 44). It has been more or less faulted on all sides, and upraised most markedly on the south-eastern side, where its

gentle meanders, and its tributaries, the Moselle (named Mosel in Germany) on the west and the Lahn on the east, had similar courses. All these streams have continued to cut their valleys into the massif, and their meanders have become incised into the upland. Hence they have very winding courses, and the steep sides of the narrow valleys face in turn towards almost all directions as they overlook the meanders of the rivers.

North of the Moselle and Lahn valleys, the uplands are partly formed of volcanic rock in the Eifel and the Westerwald areas. In the Eifel, a mass of basalt rises to well over 2,000 feet, and there are small volcanic cones and lakes giving variety to scenery which attracts tourists.

Because of its elevation the Rhine Plateau has a markedly different climate from that of the adjoining North Sea Lowlands. The temperatures are lower, the precipitation is greater and the winds are frequently stronger; consequently the winters are severe, heavy snowstorms occur and a snow cover which is commonly some feet deep may last for weeks. The melted snows and rain cannot drain through the impermeable rock of the plateau, and the surface is often wet; many of the wide hollows are marshy or peat bogs. Large areas of the upland and the ridges bear deciduous forests or plantations of conifers, though lower parts of the plateau have been turned into cattle pastures, and some of the land has been ploughed for the hardier cereals, oats and rye, or dug for potatoes, while on the limestone areas of the northern margin even some wheat and beet are cultivated. On the whole, however, the region has not proved remunerative to farming.

In some parts of the north, industries were long ago based upon the occurrence of ores, mainly of iron, worked by fuel from the forests and water from the rapid streams near the edge of the upland. To some extent these industries have survived, importing coal from the adjoining coalfields of Germany and Belgium, but as a whole the plateau areas support few people.

In the deeply cut valleys of the Rhine, Mosel and Lahn, however, conditions are very different. The warmer and sheltered situation allows cultivated fields and rich meadows where the rivers have left fertile deposits beside their meanders, and there are orchards and vines on the slopes which face the sun. The Mosel valley is particularly renowned for the wine which is the main product of that region, and in this and in the

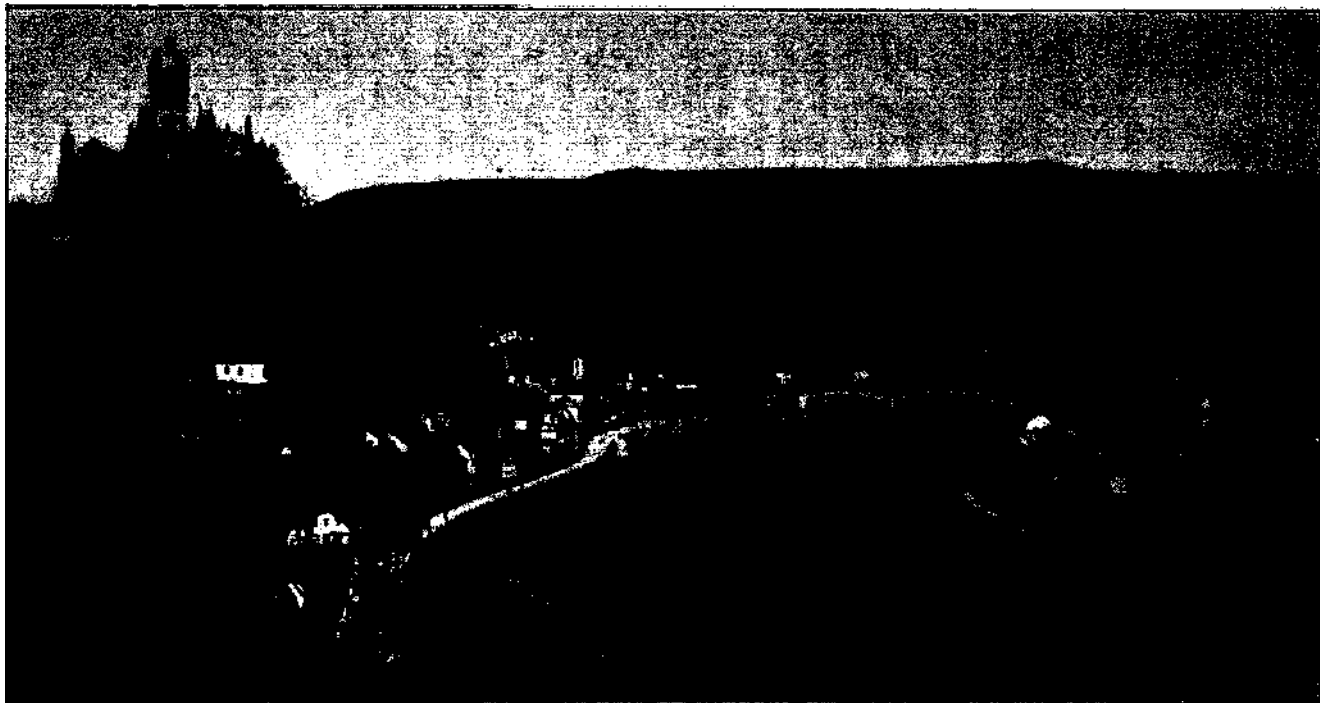


FIG. 45.—VIEW ON THE MOSEL.

German State Railway.

Note.—The flat top of the Rhine plateau is clearly shown ; on the outer side of the incised meander of the Mosel there is practically no lowland, and the road has had to be built up at the river's edge, but on the inner side a small flood-plain has been formed. The castle of Oochem crowns the height remaining between two side valleys; where the larger one (beyond the castle) enters the main valley the town of Cochem has grown up, and the Mosel has been bridged. The view is taken approximately from the south, and the warm south-facing slopes appear light where they have been cleared for vineyards; the darker patches are the woods still remaining on the upper levels, and even on the lower north-facing slopes, as shown on the extreme right. Field cultivation appears only on the small flood-plain area.

other larger valleys **are a** number of small towns depending upon the local trade which uses both the rivers and the roads along their banks.

The Rhine valley is of the greatest importance as a route for commerce, for with this exception the plateau bars the way between north and south. River steamers, railways and motor-cars carry a great deal of traffic through the valley, but there is no large river port in the region ; Coblenz, in a widening of the valley and at the confluence of the Moselle and Rhine, is an ancient town with a famous cathedral, but it has not grown into a great modern commercial city.

The Rhine Rift-valley.—An almost complete contrast to the Rhine Plateau is shown in this down-faulted trough, for it has a drier and sunnier climate, wide areas of fertile land and large cities on or near the river banks. Within the valley itself, differences are mainly due to the various strata which have been relatively recently deposited in the great hollow or on its margins, and we may note four types of constituent areas, working back in our description from those most recently formed to those of earlier origin.

The Flood-plain of the Rhine.—This is shown in the map in Fig. 46 and the section in Fig. 47. It is situated immediately by the river, and would still be subject to inundation were it not for the embanking which, together with the straightening of the stream, has been carried out during the past century.

(i) Above Basel (Bale) the river is too rapid for navigation (though improvements are projected), and has cut a relatively deep and narrow valley. Basel is at the head of navigation on the Rhine and has some trade on that account, but its greatest importance is due to its position at a gap between the upland areas where routes from the north lead towards passes across the Alps. Because of its nodal position it has become one of the main entries to Switzerland, and with a population of about 200,000 people it is the second city of that country.

(ii) Below Basel the river enters the broad valley, and as far as the neighbourhood of Karlsruhe the stream deposits more material than it removes. Enormous amounts of gravels and sands are brought down from the Alps, particularly during great summer floods, and near the stream the water-level is always near the surface, which is therefore frequently wet; even after improvements there remain extensive "moors" and alder-

woods, and the chief use of the flood-plain is for pasture. Strasbourg, a few miles up the 111 tributary, is a centre of inland waterways, for most of the lower Rhine traffic stops here, and between the 111 and the Rhine the Rh6ne-Rhine Canal goes up the valley to cross the watershed west of Basel to southern France ; another waterway, the Marne-Rhine Canal, leaves the 111 at Strasbourg to cross the West Rhine Scarp-lands into northern France.

(iii) North of Karlsruhe the Rhine meanders through a flood-plain which is drier and more capable of utilization than farther up-stream. Moreover, the more regular regime and the greater depth of the river allow navigation of larger boats, traffic is greater and there are busier river-ports. The greatest of these is Mannheim, at the head of navigation for large barges, and here and at Ludwigshaven, its twin-port across the river, are considerable industries; together these cities have a population of nearly 400,000 people.

Where the Rhine turns under the edge of the Taunus, it receives its tributary the Main, and at the junction is Mainz, another river-port and industrial centre.

The Rhine Terrace-lands.—On either side of the flood-plain rise the terrace-lands, formed of older deposits of sands and gravels now situated above 20 feet above the river. They are dry and generally infertile, and in parts there are still great pine-woods. At some points, however, cities have grown up: Mulhouse, in the extreme south where the 111 and the Rh6ne-Rhine Canal enter this region, has important textile industries, and so has Colmar, close to the 111 farther down its course ; between the two towns mines are driven through the surface to reach potash and other salts in the deeper strata of the valley, and the chemicals obtained from these salts aid chemical and dye works connected with the textile industries of the towns.

On the right-bank terrace is Karlsruhe, where a mediaeval castle, guarding routes along and across the valley, aided the growth of a town which has now become a modern commercial and industrial city.

The Foothills and Marginal Plateaus.—Behind these past and present river deposits rise areas formed of sedimentary rock of Tertiary or even older date. The faulting which produced the rift was complicated, and there are large areas which have been let down half-way, as it were, and lie between the lowest parts

EUROPE: THE REGIONS

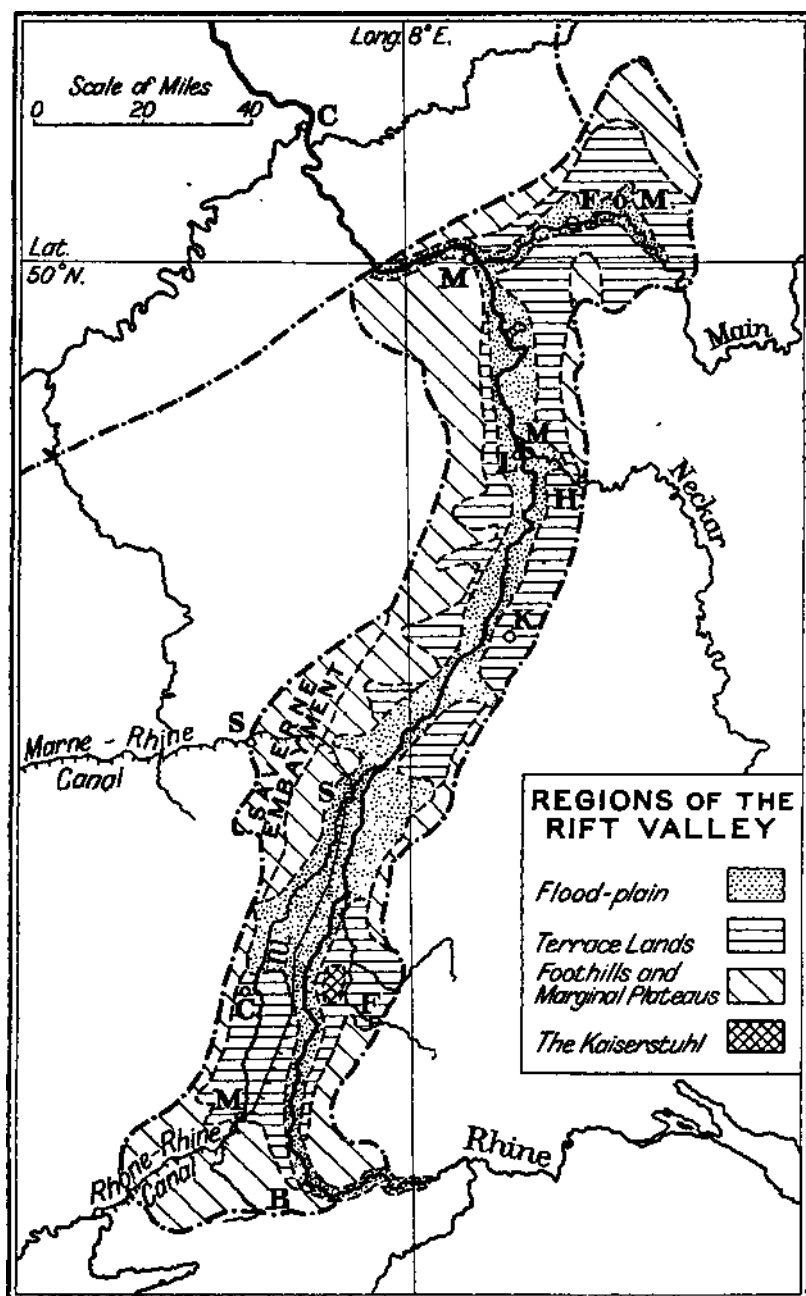


FIG. 46.—REGIONS OF THE RHINE RIFT-VALLEY.

of the valley and the scarp-lands beyond it. Such an area is the Saverne embayment, west of Strasbourg; it is named after a small town in a side valley through which passes the Marne-Rhine Canal, as well as railway and road.

The Rift-valley in general has a relatively low rainfall and much sunshine, and because of its southerly latitude as well as its low and sheltered position it is the warmest part of central Europe; its summers may indeed be called hot. Moreover, almost all the foothills and marginal plateau areas were covered with a mantle of loess in the post-glacial period.

Consequently these marginal areas of the Rift-valley are exceptionally fertile. They yield wheat and maize; fruits, including peaches, apricots and even almonds; industrial crops of chicory, beet and tobacco; in addition, there are vineyards

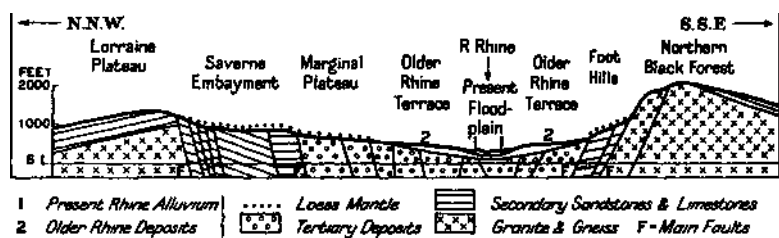


FIG. 47.—SECTION THROUGH THE RHINE RIFT-VALLEY.

which make this the most important wine-producing region of central Europe.

Hence there is a considerable population even in the rural districts, and there are also a number of important cities, particularly where routes enter the valley, e.g. Freiburg and Heidelberg; Frankfurt-on-Main is at an important nodal position at the north-eastern corner of the Rift-valley where traffic from north to south crosses the Main; it is the chief commercial, financial and industrial centre in the south-west part of Germany.

The Kaiserstuhl.—Overlooking the Rhine near Freiburg stands a small, fairly flat-topped plateau rising about 1,000 feet; it is the remains of a great volcanic mass of Tertiary date, called the Kaiserstuhl—the Emperor's Chair. The lava has weathered to fertile soil, and even the steep slopes are terraced for vines.

Thus the Rhine Rift-valley, as shown in Fig. 21, is a lowland sub-region within the Central Uplands.

East Rhine Scarp-lands.—It appears that as a result of the Alpine thrust towards the north-west the whole area now comprising the Rhine Rift-valley and its bordering East and West Scarp-lands was bent up into a dome-like form, the highest part being over the present site of the Rift, and the strata dipping down on either side.

The central strip of the dome foundered and formed the great valley, but the bordering uplands remained ; their tilted strata on either side are therefore of similar structure and dip away from the Rift in each case. The section in Fig. 48 shows this arrangement, and the broken lines suggest how the layers once continued to join over the central area. As the dome-like uplift was highest over the southern part of the Rift-valley, the bordering scarp-lands are here highest, and here all the sedimentary strata have been worn away, leaving granites and gneiss to form the uplands of the Black Forest and the Vosges Mountains. Farther to the east and west respectively the sandstones and limestones remain, but have been worn into scarp-lands whose steeper sides look inward while the more gentle slopes dip outwards.

The two wings of this formation differ, however, in several respects, and we will first describe the East Rhine Scarp-lands.

The Black Forest—In addition to the main eastward tilt of the strata of the scarp-lands, there has been a downward warping north of the Black Forest, and consequently the granites and gneiss of the highest part of that area dip down beneath a cover of Bunter sandstone which forms the surface of the lower and northern part of the Black Forest.

The granitic masses in the south have weathered into rounded heights, such as the Feldberg, which reaches nearly five thousand feet. The rainfall is, of course, considerable, and as the tree-line is at about 4,000 feet, the highest parts tend to be moors, heaths or rough grazing-grounds ; cattle are sent up to them when the snow melts in May and remain till about October, and the chief product from these summer pastures is cheese.

Lower than these highest parts in the south-west, and covering much of the sandstone area of the rest of the region, are great forests of spruce and fir, to the distant appearance of which the name Black Forest is due. Although in the valleys there

is some cultivation of oats, rye and potatoes, and there has been some plantation of cherry and edible chestnut trees, the main resource of the Black Forest is the timber, either exported as such or used as the material for the carved products of domestic industry or as fuel for glass-making. In summer many tourists visit the region, but on the whole it is very scantily populated.

Odenwald and Spessart—North of the Black Forest, the Bunter sandstone dips down below the limestones and marls which form the surface of the scarp-lands east of Karlsruhe, but it rises again still farther north and north-east; here, because of its relatively greater resistance and granitic outcrops, it forms the uplands of the Odenwald and Spessart. These are rather like the Black Forest on a small scale, but they do not rise above the tree-line, the forest-cover consists mainly of oak and beech and there are wider areas of cultivation, although most of the

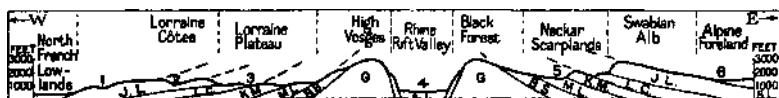


FIG. 48.—SECTION THROUGH RHINE SCARP-LANDS.

Note.—The section is drawn from west to east, south of the latitude of Strasbourg, to Tülm on the Danube. The figures 1, 2, 3, 4, 5 and 6, indicate the valleys of the Marne, Meuse, Mosel, Rhine, Neckar and Danube. The strata are indicated by the following initials: A.T. = Alluvium and Tertiary deposits in the Rhine valley; J.L. = Jurassic Limestone with interbedded Clays; L.O. = Lias Olays with some Limestones, etc.; K.M. = Keuper Marls and Sands; M.L. = Muschelkalk Limestone; B.S. = Bunter Sandstones; G. = Granite, Gneiss, etc., of the Vosges and Black Forest.

country is mainly dependent upon forestry. They are essentially one region, though separated by the valley of the Main, which cuts right across the upland, while the Neckar similarly cuts through the southern part of the Odenwald,

The Neckar-Main Scarp-lands.—The upper courses of these rivers drain country which they have etched out of the layers of Muschelkalk limestone, Keuper sandstones and marls, and Lias clays, marls and weak limestones. In general, the marls and limestones have been worn down to plateaus at an elevation of about 1,000 feet, above which the more resistant sandstones stand with scarps rising another 500 or 700 feet. The climate varies according to altitude, and the lower lands grow wheat and fruit, even the vine in the valleys; in the inner part of the Main basin the best hops in the world are claimed to grow. The higher sandstone scarp-lands, however, are less fertile; they bear extensive woodlands with both deciduous and coniferous trees.

The Swabian and Franconian Alb.—The easternmost part of the scarp-lands is formed by the massive strata of resistant Jurassic limestone which overlook the Neckar-Main area from heights reaching over 8,000 feet above sea-level in the western or Swabian part and rather less in the eastern or Franconian part. The word "Alb" has the same meaning as "Alp," i.e. summer pasture, and the higher parts of this region, bare and bleak, still deserve the name, though where the region is lower towards the Danube farming is more remunerative. Yet as a whole this region is relatively unproductive, and the population is scanty.

In the north, the Franconian Alb is faulted down eastward, and between it and the Bohemian Massif is an extension of the Main region.

Routes and Cities.—The lower parts of the Neckar-Main Scarp-lands have a considerable population dependent upon agriculture, and there are several large cities on routes which lead through the region. One such line of communication cuts across the south-west portion from Karlsruhe in the Rift-valley, through the Kraichgau ("Kra." in Fig. 43), the hollow between the Black Forest and Odenwald, crosses the Neckar by Stuttgart and continues towards Ulm, the head of navigation on the Danube; Stuttgart is now a city of over 400,000 inhabitants.

The other important route is in the east of the region: it comes from northern Germany by the head-streams of the Weser to the upper course of the Main, which it crosses at Bamberg. Then it proceeds southwards underneath the heights of the Franconian Alb as far as Nurnberg (Nuremberg), and thence three routes diverge. One goes south-east by a small valley through the escarpment to the Danube above Regensburg, and by this route the small "Ludwig's Canal" joined the Main system to the Danubian system of waterways; its course is now followed by the new and important Rhine-Main-Danube Canal, which allows through traffic by water across the whole of Germany from the north-west to the south-east.

Two other routes lead more directly southward from Nuremberg through valleys of the Alb, to cross the Danube to Munich and Augsburg respectively; thence they enter the Alpine region, make use of the Brenner Pass, and so reach Venice and the Mediterranean. From the time when traffic used these routes

to bring spices, silks and precious stones and metals from the East, the cities on these roads have been famous ; in Nuremberg is found some of the finest architecture of the Middle Ages, together with modern business houses and factories, for it is now an industrial centre with 400,000 people.

The West Rhine Scarp-lands.—This sub-region differs from its eastern counterpart in two important respects. In the first place, it is farther from the Alps, and consequently the Jurassic limestone strata have not been uplifted to any great height; indeed, they dip westward into the great structural basin centred upon Paris.

In the second place, the build is complicated where the region impinges upon the southern tip of the Rhine Plateau ; here, overlooked by the Hunsrück, is an area which makes a transition between the plateau and the scarp-lands. Like the plateau, it is formed by a mass of ancient and relatively resistant rock, but it has not been uplifted to the same extent, and its dissection has resulted in a hilly rather than a high plateau type of country ; it may be called the *Palatinate Hill-land and the Saar Basin*. This region is economically important because in its south-western part, the Saar Basin, are preserved Coal Measures which have given rise to the Saar coalfield. With the aid of this coal, iron ores from the Lorraine deposits farther west are worked and an iron and steel industry has developed.

The remaining parts of the West Rhine Scarp-lands show a broad resemblance to those east of the Rift-valley.

The Vosges Mountains are similar to the Black Forest, particularly in the higher portions, but the east-facing slopes, in Alsace, are relatively dry and sunny and have more cultivation ; also in the lower parts of the valleys, both on this eastern Alsatian side and also on the western, or Lorraine side, are villages and small towns where a small, old-established woollen and linen industry has persisted and led to a more important cotton industry, aided by the water-power of the rapid streams.

North of the mountainous *High Vosges* is the hollow of the *Low Vosges*, still partly forested, while farther north and north-east rises the *Hardt Upland* corresponding to the Odenwald, though without granitic outcrops.

The *Lorraine Plateau* is situated west of the Vosges, the Hardt and the Saar Basin. Here are the same rocks as in the Neckar-Main Scarp-lands, with Muschelkalk giving good soils for

cereal growing, Keuper marls having rich pastures and Lias clays more difficult to work.

These strata in France, however, are at a generally lower elevation than those in Germany, and have not been worn into such marked relief, though the Lias clays have been cut into a rather deep valley belt by the Moselle and its tributaries, the rivers which drain nearly all the Lorraine Plateau.

This valley belt, cut into the Lias clay by the Moselle, lies under the scarp of the Jurassic limestone region which is situated immediately to the west (see Fig. 44), and at the junction of the Lias and Jurassic strata are rocks in which occur iron ore known as minette. The minette ore is mined around the town of Nancy, in and near the Moselle valley, and iron and steel works have grown up in this neighbourhood.

Farther north, on the edge of the Moselle valley, is the fortress of Metz, important because Lorraine has for long been debatable ground between France and Germany.

The Jurassic limestone region which is situated to the west is perhaps most conveniently termed the *Cotes de Lorraine*, for in the east where it is highest the edges of its scarp overlooking the Moselle are known as the *Cotes de Moselle*, and farther west it is again deeply cut by the Meuse, and the resultant hill-slopes are called the *Cotes de Meuse*; overlooking this Meuse valley is the fortress of Verdun. In the south part of the limestone belt the drainage is not to the Rhine, but to the Seine, whose tributaries, especially the Marne, have also cut deep valleys.

The rainfall is fairly heavy on the higher parts of the limestone plateau, which, like the Ardenne, is on the side of the Central Uplands facing the Atlantic winds. The highest areas are much wooded, while the rest of the plateau is rather poor agricultural-country.

The whole region is not an unbroken plateau, for between the upper and lower limestones are clays which outcrop in a belt running longitudinally; this clay-belt has been worn to a relative hollow, and part of it, known as the Woevre (Woe. in Fig. 43), is naturally marshy and even yet has small lakes.

The minette iron ore which is situated at the base of the Jurassic strata is reached in two districts by mining through the rocks which form the edge of the escarpment; one is in the "Briey basin," north-west of Metz, whence the ore is sent

in part to Germany for working, and the other is in the " Longwy basin " at the northern part of the scarp. Here the Jurassic escarpment faces north and almost coincides with the boundary between France on the one side and Luxembourg and Belgium on the other. The iron ore is utilized in all three countries (see Fig. 79 in Chapter XIX); it is of most value to France and Luxembourg and forms an important part of the basis of the economic life of the latter small State.

The western margin of the limestone belt rises fairly definitely from the clays of the North French Lowland which succeeds it to the west, but in one part there is, as it were, a bastion of uplands projecting from the main area. This is the Argonne Forest region, where an admixture of sand with the clay has enabled the stratum to resist erosion, and wooded heights of about 1,000 feet mark the sharpest contrast between the Central Uplands and the North French Lowland.

South of the Marne the limestone belt rises to an area whose escarpment forms the high Plateau of Langres ; this links the Central Uplands of Europe to the Central Plateau of France.

The Weser-Saale Hill Country.—Most of this area is drained by the upper Weser and its tributaries, and much of the rest by the Saale tributary of the Elbe ; for this reason, and because it is very uneven in its relief, a convenient name is the Weser-Saale Hill Country.

The Harz.—One of the most striking features as seen on a relief map is the upstanding mass of the Harz Mountains. This is a typical horst, markedly fault-edged on the north-west, south-west and north-east sides, though its surface descends more gradually towards the south-east. The " Upper Harz " in the north-west reaches over 3,500 feet and is almost completely covered with dark masses of spruce forest, but the " Lower Harz " in the south-east has deciduous woods and also many clearings for agriculture and small settlements. A little mining of copper is almost the only survival of past varied and important mineral industries.

In the *Harz Foreland*, to the north-east and south-east of the massif, potash salts are obtained, which aid chemical works such as those at Stassfurt situated in the neighbouring lowlands near the Elbe ; also, just within the upland region south of Brunswick, there are deposits of high-grade iron ore which have recently been utilized.

The Thuringian Forest.—Very similar to the Harz is the Thuringian Forest; here the main faults which bound it run in a north-west to south-east direction and give it a long and relatively narrow shape with a fairly flat top, reaching over **3,000** feet.

The Weser Hills and Teutoburger Wald.—Almost the same general direction is shown by the two lines of hill country which project north-westward far into the North Sea Lowlands. They are formed of sedimentary rocks of Secondary Age, folded and faulted, but only to a moderate elevation, and the "Wald" or "Forest" has mostly given place to farming.

The Rhon and Vogelsberg.—In the south of the Weser Hill Country rise two great volcanic masses, the Rhon and the Vogelsberg; since they reach elevations of about 3,000 feet, their higher parts are moorland or forest. Other wooded volcanic heights lie on either side of the Fulda tributary of the Weser.

The Fulda Valley offers a useful means of communication from the Rhine Rift-valley to the North German Plain, and this relatively low and fertile country is rather like that of the valleys of the Main and Neckar.

The Thuringian Basin.—Farther east, between the Harz and the Thuringian Forest, is an important area, drained by the Saale. It is formed of the same strata as the Rhine Scarp-lands, bent downward into a syncline forming an oval-shaped basin between the surrounding heights. The outcropping strata have been etched out by the tributaries of the Saale to form a series of low scarps, and the basin as a whole resembles the Neckar-Main Scarp-lands on a smaller scale; it is a well-developed region of productive agriculture.

The Bohemian Massif.—The area drained mainly by the upper Elbe river system may be thought of as largely formed of ancient rock, including granite, gneiss and schists, faulted in two main directions: south-east to north-west, and south-west to north-east (see Fig. 50). Along the faults, blocks have been raised or lowered to produce four main regions:

(i) A central area, sometimes known as the "Bohemian Diamond," of moderate elevation on its south-east side, but lowered towards the north; here it is bounded by the uplifted edges of (ii) the Sudetes Uplands on the north-east, and (iii) the Saxon Uplands on the north-west, while another faulted and

raised area, (iv) the Bohemian and Bavarian Forest Uplands, is the boundary on the south-west.¹

The Bohemian Diamond.—The southern part of this central region is a plateau of resistant rock ; undulating country rises to rounded heights, where it forms the water-parting (shown by a dotted line on the regional map) between the Elbe (known in Czechoslovakia as the Labe), which drains Bohemia, and the Morava, which flows southward to the Danube and drains Moravia.

Most of this Bohemian-Moravian Plateau area is drained by the Vltava tributary of the Labe ; it has generally rather poor soils and its agriculture is not very productive. The main development is in the neighbourhood of the River Berounka, which enters the Vltava just above Prague (Praha), the capital of Czechoslovakia. Here the folding of the carboniferous strata has preserved Coal Measures which are mined in several places from near Pilsen (Plzen) to near Prague, and iron and graphite are also obtained in the neighbourhood. Aided by these mineral resources, industries have grown up : at Pilsen iron and steel goods, glass and pottery are produced, and beer is brewed, and at Prague the range of productions includes these commodities, besides chemicals and various textiles.

Prague is also an important trading and financial city ; situated at the head of navigation on the Elbe-Vltava river system, it was the chief market and the seat of Government of the old Kingdom of Bohemia, and it has become the capital of the modern State of Czechoslovakia, and now has nearly a million inhabitants.

Although Prague is almost in the centre of Bohemia, it is (like many cities) at the meeting of two types of country, for here the Vltava descends from the plateau to the North Bohemian Trough. In this northern corner of the Diamond, the ancient rocks dip down and are covered by sedimentary or alluvial deposits, save where there have been out-pourings of volcanic material under the edges of the great faults which separate the Trough from the Saxon and Sudetes Uplands.

Consequently, apart from such volcanic heights, the North

¹ In Germany, the term " Sudetenlander," i.e. Sudetes-lands, has been applied to a much wider area than the Sudetes Uplands ; indeed, the whole of Bohemia, Moravia and Silesia has been included in the term, and the German-speaking people who now live in Bohemia and Moravia are still commonly referred to as Sudetendeutsch, i.e. Sudeten Germans.

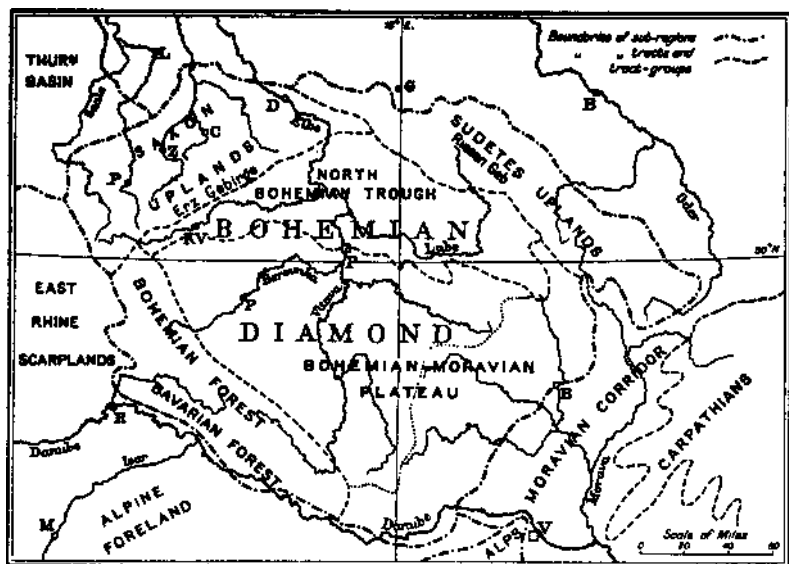


FIG. 49.—REGIONS OF THE BOHEMIAN MASSIF.

Bohemian Trough is lower and warmer than the Bohemian Plateau, its rocks have weathered to fertile soils, and the valleys of the Labe and Eger (or Ohre), which drain it on east and west respectively, are fertile and well populated; beet production and sugar refining are considerable in the Labe area, and fruit and vine growing noteworthy in the Eger valley.

The faulting of the north-western edge has resulted in mineral springs around which have grown up health resorts, such as Karlsbad. Deposits of brown coal or lignite are worked in the Eger valley, and these have aided the carrying on of varied forms of industry, while at the base of the Sudetes Uplands there is cotton manufacturing. Hence there are a number of towns, and because of its agriculture, mining, industries and trade, the North Bohemian Trough is a densely populated region.

The Bohemian and Bavarian Forest Uplands.—The mass of gneiss, granite and schist which forms the south-western part of the Massif has been dislocated along faults, running generally from south-east to north-west. In its south-eastern part, however, it is warped rather than broken, and rises more gradually from the Bohemian Plateau, forming rounded heights of about 4,500 feet above sea-level. The higher parts are almost completely clothed with firs and other coniferous trees, but

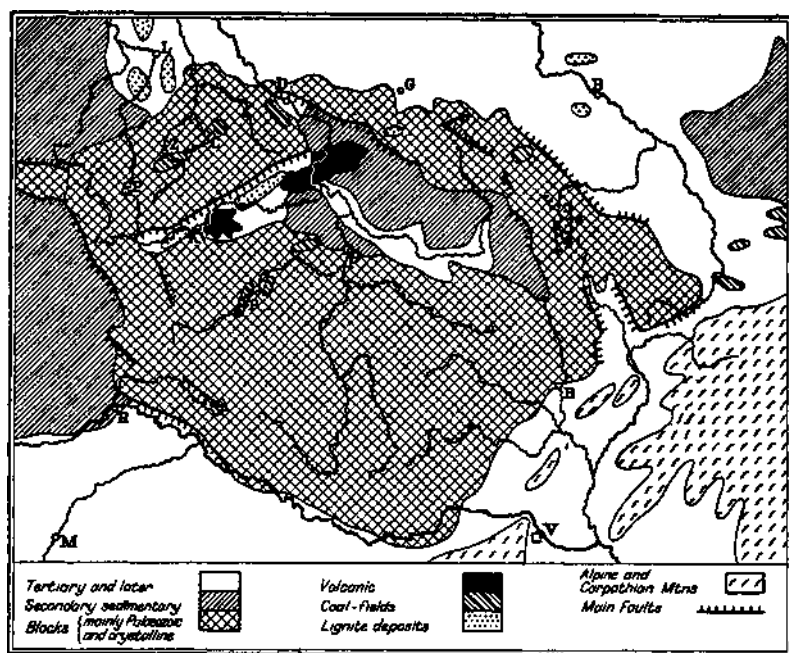


FIG. 50.—STRUCTURE OF THE BOHEMIAN MASSIF.

there are great moors and peat bogs in the broad hollows. A rift-valley separates the smaller Bavarian Forest from the greater Bohemian Forest, and there is thus a double, and almost uninhabited, barrier to communication between the Alpine Foreland and the Bohemian Diamond. In the north-west, the Bohemian Forest is less high, contains small areas of sedimentary rock, which offer more opportunity of settlement, and is more easily crossed.

The Sudetes Uplands.—These have broadly similar structure, relief and vegetation, but have been still more dislocated; consequently, in addition to high areas of crystalline rock, such as the Riesen Gebirge (Giant Mountains) which rise above the tree-line to over 5,000 feet, there are a number of rift-valleys and basins of lower elevation in which sedimentary strata have been preserved. These are farming areas, and also there are two districts which have fuel deposits: one is at the northern edge, south-west of Gorlitz, where lignite is found and utilized to produce power transmitted to the manufacturing districts of Saxony and to the northern plains; the other is the small



FIG. 51.—VIEW IN PRAGUE.

[Czechoslovak Legation,

Note.—The central building is the " Powder Tower," once part of the fortifications enclosing the city; with the growth of Prague, the tower has been surrounded by the modern buildings which form such a striking contrast.

Lower Silesian coalfield south-west of Breslau. In earlier times mineral ores were obtained in the Sudetes Uplands, and there are still small manufacturing districts in which textiles are now the chief products.

At its south-eastern end this upland region forms the most easterly bastion of the Central Uplands ; beyond this the ancient rocks dip below younger deposits in the Moravian corridor.

The Saxon Uplands.—At its north-western end the block of the Sudetes Uplands is separated from that of the Saxon Uplands by an area in which faulting has let down and preserved a mass of sandstone which projects north-westward from the North Bohemian Trough towards Dresden. This sandstone is easily eroded and has been cut into a series of cañon-like valleys by the Elbe and its tributaries. Communication between the Bohemian lands and Germany is carried on by the Elbe, and at the northern end of the gorge of the river has grown up Dresden, a great city of nearly three-quarters of a million people. It has also advantages in developing industries because of the mineral resources of the adjoining Saxon Uplands.

From the northern plain this massif rises gradually southward to the faulted edge which is called the Erz Gebirge (Ore Mountains) because of the occurrence of ores of silver, lead, copper and other minerals (refer back to the section in Fig. 4). These were once mined and led to a relatively close settlement of what was then a forested upland. Now the ores are in large part exhausted (though in a valley of the southern slope a recent development has been the working of radium-producing ores) and the forests which supplied timber for raw material and fuel have been destroyed. Other resources, however, have been utilized : the streams were harnessed first for direct power and later for obtaining electrical energy, and Coal Measures were found in basins extending along a belt of " Variscan " graining some distance up the slope ; consequently in the neighbourhood of this belt several large towns arose, including Plauen, Zwickau and Chemnitz. Little coal now remains in this Saxony coalfield, and the greater part of the electric power on which the industries mainly depend is derived from coal, lignite and water-power outside the area. Clearly, geographical inertia has played an important rôle here and enabled the early metal, wood and textile working to continue, and also transferred inertia has greatly widened the range of production. Moreover, beside

the large-scale manufacturing of the towns, smaller-scale industry has survived in villages and even in the houses of the workers. Consequently, except on the highest parts, the Saxon Uplands region is one of the most densely populated areas of Germany, and indeed of all Europe.

The Jura.—The southern end of the Rhine rift-valley is almost closed by the Jura Upland ; between this and the Black Forest is only the narrow valley of the Rhine above Basel, but between it and the Vosges Mountains is the wider Burgundian Gate, or Gap of Belfort, as it is called from the fortress-town which guards this entry between the Rhine-lands and the Rh6ne-Sa6ne basin.

It is from the Jura Upland that geologists gave to strata appearing here the name of "Jurassic," and geologists frequently illustrate their terms "anticline" and "syncline" from the marked foldings which the limestones have here experienced on

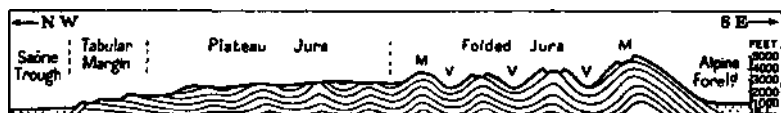


FIG. 52.—DIAGRAMMATIC SECTION THROUGH THE JURA UPLANDS.

the side nearer the Alps, and right across the region in the south (see Figs. 52 and 53). In this region of the "Folded Jura" the structural anticlines correspond with the mountain ridges and the synclines with the longitudinal valleys between them. In Fig. 52 a typical ridge, or "mont," is indicated by M, and a typical longitudinal valley or "val," by V.

The central part of the uplands, however, is of plateau form and is known as the "Plateau Jura." Here the foldings are less marked, and in the past the higher parts of the anticlines were worn down in a process of peneplanation. In the extreme north and north-west are the "Tabular Margins," where the strata have remained little disturbed except when they break down into the valleys of the Rhine and the Sa6ne. The map in Fig. 53 therefore shows three distinct constituent areas of the Jura sub-region.

The Folded Jura.—Considerable parts of the mountain ranges are over 8,000 feet above sea-level, the highest reaching more than 5,000 feet. With heavy precipitation, much of the region

is covered with forests of spruce and silver fir, though above 4,000 feet there are only summer pastures. Forestry and the keeping of cattle are therefore the most widely spread occupations, and Gruyere cheese is a well-known product. In the deep, longitudinal valleys are farming settlements, and for centuries domestic industries have been carried on during the winter. A development of these is the making of watches and clocks; the manufacture is now aided by electricity obtained from the water-power of the streams and is in part organized in large factories; consequently some of the villages have grown into towns, the largest of which is la Chaux-de-Fonds.

Beside these long and fairly wide valleys there are others, the "cluses," which have been worn transversely across the ridges. The cluses are typical narrow limestone cuttings, sometimes with almost vertical sides, and are important as giving a means by which communications are carried on across the great barrier of the Jura Mountains.

The Plateau Jura.—With a general elevation of 2,000-3,000 feet and a dry and infertile soil, this region resembles the Franconian and Swabian Alb; it is mainly a rather bleak pasture-land. In parts, however, glacial deposits from the Alpine ice-sheet give a welcome admixture to the limestone, and woods and the cultivation of barley and oats affords variety to an otherwise monotonous landscape and some additional resources to a scantily populated country.

The Tabular Margins.—This lower area is much more productive and relatively well populated. Indeed, the central part of the north-western margin is such a vine-growing district that it is known as the "Vignoble," while the northern area bordering on the Burgundian Gate and the Rhine valley has industrial development, especially of watch and clock making and of silk manufactures. Besançon, near the exit of the Doubs from this region, is the chief centre of the French horological industry.

The Alpine Foreland.—The Alpine Foreland extends as a unity for about 500 miles in front of the whole northern margin of the Alps, most of it at an elevation of between 1,000 and 2,500 feet above sea-level. Here, between the upraised limestone strata on the north-west, the block of the Bohemian Massif on the north-east and the Alps on the south is a relative hollow,

filled in to a great depth by Tertiary deposits, the "Mollasse," largely sandstones with marls and shales, formed of material worn away from the Alpine strata.

The surface deposits too are mainly of Alpine origin, but of much more recent date, for during the earlier part of the Ice Age, all except the extreme northern angle of the Foreland was covered by the ice and its deposits; the last advance of the ice-sheet, however, with its greater influence on present-day geography, affected only a relatively narrow area nearer to the Alpine margin (see the map in Fig. 53). In post-glacial times the Tertiary sediments of the unglaciated northern angle were largely covered with fertile loess.

The relatively high altitude of the Alpine Foreland is an unfavourable factor, and only the south-western half can be compared with the warmer parts of central Europe. At Geneva, temperatures are very similar to those in the Rhine rift-valley, but at Munich they are almost the same as those of the extreme north-east of Germany (see the table on p. 26). Rainfall is everywhere relatively heavy, reaching about 60 inches on the Alpine margin.

Taking into account climate, relief and surface conditions, we may observe the following constituent regions of the Alpine Foreland: (i) the warmer, south-western portion, which may be termed the *Rhine-Rhone Plateau*, since it is drained by those two rivers; (ii) the *Bavarian Foothills*, the area which was glaciated in the last advance of the ice and now drains to the Danube; (iii) the *Bavarian Plateau*, farther north and earlier glaciated; (iv) the *Northern Danubian Plains* in the angle of that river, and largely loess-covered.

The Rhine-Rhone Plateau is in French territory south-west of Lake Geneva, and is German north-east of Lake Constance, but its greater part constitutes the "Swiss Midland," as the Swiss geographers call this most populated and productive section of their country. Most of the area shows the characteristic morainic scenery with low hills, and its valleys have been fairly deeply cut by post-glacial streams. The hollows once occupied by the terminal tongues of glaciers which emerged from the valleys of the Rhine and Rhone are now filled with the waters of Lakes Constance and Geneva. In the long, narrow trough under the edge of the Jura an earlier glacial extension became filled partly by lakes, e.g. Lake Neuchatel, and partly by the

marshes of the River Aar, now largely reclaimed for farming. The variety in the land-forms and in the soil conditions gives rise to an alternation of fields, meadows and woods, all carefully utilized and supporting a considerable population ; the irrigated meadows give predominance to pastoral work, and on this Foreland Plateau (not in the Alpine valleys) is the main production of the Swiss dairying industry. In favourable situations, e.g. on the south-facing shores of Lakes Geneva and Neuchatel and in the river valleys, wheat and fruit, including the vine, are cultivated.

Moreover, commerce and a considerable amount of industrial work are carried on at nodal points where two sets of routes intersect. In one set are the transverse lines of communication which skirt or cross the Jura to reach the passes through the Alps ; across these run routes along the plateau from southern France to the Rhine and Danubian countries. Geneva is situated at an obvious " gateway " into Switzerland, and in this favourable position it has become the centre of the Swiss manufacture and trade in watches and clocks ; moreover, it has international importance as the seat of the League of Nations, with its many activities in which representatives of most of the nations of the world co-operate. Bern (Berne) in the centre of the Swiss Midland is conveniently placed as the capital; it is situated by the River Aar and on the direct railway route northward from the Simplon Pass. Zurich is at the end of Lake Zurich, which half-blocks the plateau, and through this city passes the route from the St. Gotthard Pass to the Rhine rift-valley; it is regarded as the " intellectual capital " of Switzerland, and has a technical college specially famous for its electrical engineering, for the Swiss have done much to advance science in connexion with the development of the water-power of their country. Both in Zurich and in the smaller towns and villages in the district, water-power is greatly used to carry on the manufacture of silk and other fabrics, chocolate and other foods-tuffs, as well as many forms of metal goods, including machinery.

The Bavarian Foothills.—The irregular relief of this region is due to its covering by the last extension of the Alpine ice-cap,

lakes in the sites of past glaciers, though moors and peat-bogs are common. There are rather poor growths of pine over considerable expanses of the region, the fairly heavy rainfall aids pastoral work rather than cultivation, and on the scanty resources only a small population can obtain a living. At its eastern extremity the region extends into Austria ; here Salzburg, the " salt burgh," situated where the Salzach leaves the Alps, is famous as the birthplace of Mozart, and its concerts attract visitors from many countries.

The Bavarian Plateau.—Not much better favoured than the foothills region is this plateau, which though mainly in the province of Bavaria extends into Wurttemberg on the west and Austria on the east. Here the older morainic material is largely covered by the out-wash gravels and sands from the last ice-sheet. The surface has been cut by glacial and post-glacial streams into a series of terraces, and in the valleys the Alpine-fed rivers bring summer floods and prevent the utilization of the land. On the higher parts there are wide beech forests, and others of pines, spruce and firs. Moors are now being reclaimed for pasture or crops for cattle, but there is little cereal cultivation, mainly of barley for brewing or of rye. Most of the settlements are small and widely scattered, except for two great cities on important routes referred to earlier in this chapter. Augsburg was a Roman settlement on the Lech ; it became great by the trade with Italy, and has still fine buildings dating from that time. Munich is situated where the route crossed the Isar between marsh to the north and forest to the south, and intersected an old " salt road " from Salzburg to Augsburg. Munich has been called the capital of south Germany, for in past centuries it was the seat of the rulers of Bavaria and is still the possessor of museums, picture galleries, opera houses and a great university. In recent times it has developed into the chief commercial city of this part of Europe, and with imported coal and with water-power from the Alps and the Isar numerous industries have grown up, brewing being particularly noted ; it has a population of about three-quarters of a million.

The Northern Danubian Plains.—Here on the almost horizontal, loess-covered sediments of sands and marls, good soils have developed, and the region is favoured by the warmer climate, due to its lower altitude. Cereals, particularly wheat, are an important production, and hops are largely grown ; everywhere

there is cattle-rearing, and the farming supports a moderately dense population.

It may be pointed out that the River Danube, which runs near the northern margin of this region, established its course before the present surface of the country had been developed, and consequently in some parts the river flows through the sediments of this plains region and has a wide and often marshy valley, while in other parts the river is in the adjoining regions of more resistant rocks and has cut a valley which is always narrower and is sometimes almost a gorge ; here, as so often, a river flows athwart the natural regions of the present stage of the earth's evolution.

QUESTIONS

1. Contrast, in as much detail as possible, the upland areas with the river valleys of the Rhine Plateau.

2. " The Rift-Valley of the Rhine is a geographical unit area." How can this statement be reconciled with the differing characteristics of the country comprised within this valley ?

3. Write an essay on the Rhine as an artery of economic life.

4. Describe the country traversed by the Marne-Rhine canal, and assess the value of this canal.

5. Estimate the economic importance of the areas comprising the " Bohemian Diamond " within the Bohemian Forest, Saxon and Sudetes Uplands.

6. Account for the fact that Saxony is one of the most densely populated areas of Europe.

7. Make a regional study of the Jura Uplands.

8. Write comparative notes on the situation and development of any three cities in Southern Germany.

9. Describe and account for the economic development of the Swiss portion of the Alpine Foreland.

CHAPTER XI

THE ALPINE LANDS

General Characteristics.—With a length of some 700 miles, the great curve of the Alpine region extends from the Mediterranean Sea across the southern part of all central Europe, and it adjoins regions which are of different physical character and inhabited by people of varying types. Hence its valleys have been penetrated and occupied by men of several nationalities, and the Alpine Lands are now shared by several States : France, Switzerland, Germany, Italy and Yugoslavia.

Structure.—As was explained in Chapter I, the Alps constitute the highest and most extensive system of folded mountains of Europe. Here the strata were thrust north-westward and northward against the massifs of the Central Plateau of France and the uplands of central Europe until nappes were piled on one another to a height of miles above the present mountains ; strata which had their roots in the southern part of the Alpine region were even pushed across to the northern side (refer back to Fig. 5).

The lower rocks were metamorphosed into crystalline form, and where the upheavals were greatest, that is, along the middle part of the great curve, the overlying sedimentary strata were worn away. Consequently the rocks of the central zone of the " High Alps " (compare Figs. 5 and 53) are mainly of crystalline structure, while the lower margins, or " Pre-Alps," are formed largely either of limestone of Secondary Age, or of the Tertiary sands, marls and clays known as Flysch. The southern zone of sedimentary rocks is missing, however, in part of the western Alps where the crystalline rocks descend steeply to the western side of the North Italian Plain.

In the central zone, besides the metamorphosed and crystalline nappes are areas of older rocks, including masses which are like those of central Europe and show the earlier Hercynian folding. Also in the disturbances in the Alpine region igneous rocks such as porphyry were produced, though recent volcanic outpourings have no important part in the build of this region. These

contrasted elements in the structure considerably influence the present-day geography.

Relief.—In the Alps, however, altitudes are so great that differences of relief are even more important than those of the rock material, and perhaps the best way to appreciate the form of the relief is to study the pattern of the river valleys. Near the outer, i.e. the western and northern, margin of the great curve of the region is a series of almost continuous longitudinal valleys, which accompany the junction between the High Alps and the Pre-Alps along much of its extent (see Fig. 53). This line is well marked in the case of the valley of the River Isère, above Grenoble, and of its tributary the Drac, which meets it at that town ; to the north-east, after a break, it is again clearly seen in the back-to-back valleys of the upper Rhone and the Vorder Rhine ; after another break it is continued by the longitudinal section of the Inn above and below Innsbruck, and by the longitudinal courses of the Salzach and the Enns. Most of these rivers have their origin in the High Alps, and all of them turn from a longitudinal course outward and cut the North-western and North-eastern Pre-Alps into sections which have their own local names. Some of the valleys, too, have such marked individuality and importance that they have long been regarded as regional units and given special names ; e.g. the longitudinal part of the Isère valley is known as the Gresivaudan, and that of the Salzach as the Pinzgau.

Near the inner margin of the Alps which overlooks the North Italian Plain, marked longitudinal valleys are found only in the eastern part. Here are two series, each of less extent than those of the outer margin. One set forms the northern part of the Italian lake region, where, in the Val Tellina, the River Adda flows westward to join Lake Como, whilst farther east are the shorter longitudinal valleys of the Brenta and Piave. The other set lies farther north-east and is within the Eastern High Alps ; it is formed of the Val Pusteria, which is drained both westward by the Isarco to the Adige river system, and eastward by the Drava ; where the Drava leaves the High Alps to cross the Eastern Marginal Pre-Alps, it flows through a broad and deep depression known as the Klagenfurt basin.

While all these series of longitudinal valleys aid movement between different parts of the Alpine region, several transverse valleys are of great importance as permitting communication

across the mountain barrier. In the west, from the Italian plain near Turin, the valley of the Dora Riparia leads to the Mont Cenis Pass, and thence to the Arc tributary of the Isère, while the valley of the Dora Baltea leads by the Little St. Bernard Pass to the Upper Isère and by the Great St. Bernard Pass to the Rh6ne. From Lake Maggiore there is access by the Toce valley to the Simplon Pass, and thence to the Rh6ne, and by the Ticino valley to the St. Gotthard Pass, and thence to the Reuss. From Lake Como a northward route leads over the Splügen Pass to the Hinter Rhine. In the Eastern Alps beyond the Splügen, the most marked transverse route is up the Adige valley as far as Bolzano, thence continuing northward up the Isarco tributary to the Brenner Pass, and across this to a tributary of the Inn, which meets the main river at Innsbruck.

In the broad mass of the Eastern Alps there are also several large oblique valley-lines, with a general south-west to north-east direction—for example, the upper Inn flows through the Engadine valley. In the Eastern Margins part of the Pre-Alps the upper Mur flows from south-west to north-east till it turns at Bruck, while beyond this town the same line is followed, though in the reverse direction, by its tributary the Murz; beyond the Murz the line continues across the Semmering Pass to the Leitha tributary of the Danube.

The reasons for the courses of the Alpine valleys can be explained only in part by the present differences of the rock composition; especially in the High Alps their origin may lie too far back in the geological history for its discovery. The form of the valleys, however, and much of their human significance are due to relatively recent glaciation, of which some account will be given later.

Climate and Vegetation.—It is evident that the deeply cut valleys must have climatic conditions very different from those of the intervening highland masses, and these again differ from one another because of their relative elevations; the greater part of the marginal Pre-Alps, for example, is clothed with forests or pastures, while in the central High Alps wide areas rise above the tree line and even to the levels of perpetual snow.

There is, indeed, in the Alpine region a zonal arrangement of climates. The culminating heights which rise above about 10,000 feet form the *snow zone*, and bear no vegetation. The mountain slopes which are below this level, but above 5,000 or

6,000 feet, are in the *alp zone*, snow covered for more than half the year, and with such a short period when vegetable growth is possible that trees cannot exist; low herbaceous plants grow in great abundance, however, flowering brightly in the earlier part of the summer and constituting the valuable alpine pastures.

Below this level the higher valleys and the upper slopes of the lower ones are in the *forest zone*, which extends downwards to about 2,500 or 3,000 feet; in the higher parts of the forest zone only conifers are found, the spruce and larch being common, but at the lower levels there are mixed growths of coniferous and deciduous trees, the beech often giving a lighter colour to the woods in the west, and the oak being more plentiful in the east. Deforestation has, however, taken place over considerable areas, and the trees have given place to pastures.

The lowest valleys which have been cut below about 2,500 feet are in the *cultivation zone*; here fruit trees have been planted and cereals and vegetables are grown. At these lower levels account must be taken of another factor than altitude, for the Alpine Lands have such a wide extent that the different parts adjoin regions with markedly different climates; hence from these contrasting regions, winds of different character penetrate into the valleys and modify their climatic conditions.

With these differences of climate and vegetation necessarily correspond differences in the ways of life of the inhabitants.

Regional Divisions.—Thus, determining the general character of the various parts of the Alpine region are five main factors: the altitude; the composition of the rocks; the situation; the climate; and the utilization by man of the natural resources. Taking all these into account, the constituent sub-regions have been demarcated as shown in Fig. 53, and will now be briefly described in turn.

The High Alps.—By contrast with the marginal Pre-Alps, all this medial belt is "high," but the culminating area is the Central Alpine sub-region between the Splügen Pass marking off the Eastern High Alps and the valley of the Dora Riparia beyond which are the Southern High Alps.

The Central High Alps.—The two factors of great elevation and generally crystalline structure determine much of the character of this region, yet here, as throughout the Alpine Lands, it is the valleys, often floored with recent deposits, that count for most in the human geography* The forms and the

resources of these valleys, and also the scenery of the mountains, owe much to the glaciation of the Ice Age. Deep corries, or cirques, with steep walls, were worn out of the uppermost parts of the pre-existing valleys, and by the development of these cirques mountain masses were cut back into irregular sharp-edged



[French Railways—National Tourist Office.]

FIG. 54.—VIEW OF THE MER DE GLACE.

Sote.—The Mer de Glace is the name given to the lowest part of the glacier which descends north-eastward from the extensive massif of Mt. Blanc ; in this part the tongue of ice occupies a valley to a width of half a mile, and a length of four miles. Above the part shown in the picture the icefield is much wider, and covers the slopes of the massif which rises to the peak of Mt. Blanc, about six miles to the right of the view here shown.

ridges, and the ridges were reduced to jagged pyramids, " horns " or even " needles." The valleys were scoured into troughs of U-shaped section, and in parts were deepened to basins separated by rock-bars or by morainic deposits ; main valleys were worn more deeply than were the side valleys, which were left " hanging " after the ice had disappeared and the form of the valley bottoms had become visible. Much of the magnificent

scenery of the mountains and of the varied charm of the valleys, enhanced by small lakes in many of the basins, is due to past glaciation.

On the greatest heights the Ice Age has remained into the present: on vast snowfields the ice still forms and works its way as glaciers downward into many of the higher valleys. Thus the culminating point of the whole Alpine Highland, the peak of Mont Blanc, towers to over 15,700 feet, and from the icefield of the north-east side of its huge massif the "Mer de Glace" works down to the upper Rhone valley (see Fig. 54).

Few climbers scale the great heights; but to see these, and to enjoy the beauties of the whole region, many thousands of tourists annually visit the High Alps. They are accommodated in hotels built in the upper parts of the valleys, and in the lower parts small towns have arisen which directly or indirectly depend upon the "tourist industry."

Because the Central High Alps are situated between the Mediterranean Lands and north-western Europe, and because here the highland barrier is narrowest, great trade-routes have for many centuries taken advantage of the passes deepened and smoothed by the ice. The modern railways, however, though they use the same valleys, have avoided the steepest climbs by tunnelling beneath the water-partings near the passes.

Thus the most direct railway route is that which goes northward up the Toce valley, but instead of crossing the Simplon Pass, over which the road has to climb to 6,600 feet, tunnels beneath the adjoining ridge for $12\frac{1}{4}$ miles, and rises only to 2,300 feet; this route, after descending into the Rhone valley, further shortens the distance by traversing the Bernese Alps through the Lotschberg tunnel, 9 miles long, to Berne (refer back to Fig. 20). Almost rivalling this crossing in importance, the St. Gotthard route has a shorter tunnel of nearly 10 miles long, but climbs to about 3,800 feet, the road over the pass being nearly 7,000 feet above sea-level. The third of the railways over the Central High Alps has less traffic, for it leads only from the Italian Plain to the middle Rhone valley; it is the Mt. Cenis route and has the additional handicap of a greater climb: the tunnel summit is about 4,400 feet, and the pass, some miles away, is at 6,800 feet.

The railways now use the water-power which is abundantly afforded by the streams fed by the heavy precipitation and melt-

ing snows. Where glaciation has caused a break in the normal smoothed valley profile, as at the exit of the hanging valleys or at the rock-bars in the course of the larger streams, power plants have been erected for the production of electricity; cables transmit the current for use within the Alpine region and, to an even greater extent, for transmission to the neighbouring regions of France, Switzerland, Germany and Italy.

While the transverse Alpine valleys leading to the passes are of great importance as lines of communication, the broader longitudinal valleys are the more suited to human occupation. In the Central High Alps, however, only those of the upper Rhone and the Vorder Rhine have any considerable amount of cultivation or settlement of any size ; most of the valleys are of the higher kind, in which the people live in small villages and are mainly dependent upon pastoral work.

The mode of life of the people is influenced to an extraordinary degree by the altitude of their environment. Their houses are necessarily built in the lower parts of the valleys, where alone the cold of winter can be supported, and where small patches of ground can yield crops, mainly of quickly ripening barley and vegetables, such as potatoes and beans. These village settlements are generally on the " sunny side " of the valleys, for little light and heat fall upon the " shadow side."

The main resource of the people is their herds of cattle, and smaller numbers of sheep and goats. These animals must be fed upon the higher pastures, and consequently systems of transhumance, i.e. seasonal migrations of animals and man, have developed, the particular times and methods varying according to local conditions. A common practice is that in early summer almost the whole population, with the beasts, leave the village and go up to the meadows of the summer alp, the most productive frequently being irrigated glacial terraces.

On these pastures are what appear to be other villages ; they are groups of small summer chalets, which shelter both people and animals. Here is made the cheese which is sent down the valleys for use in winter, or for export; here, too, quantities of hay are gathered for the winter feed of the cattle. As the summer advances, the animals are taken to the high pastures, where they are allowed to graze, accompanied by women or children, while the men reap the hay meadows or the cultivated fields in the lower parts of the valleys. With the coming of winter, the

return migration takes place : the alps are abandoned and the villages are repopulated ; for several months the beasts are shut in their byres and the people largely restricted to their houses.

The winter is a time of almost complete isolation, and until recently, even in summer these interior valleys were largely out of touch with the rest of the world.

Although in the Central High Alps water-power is abundant,



[Swiss Federal Railways.

FIG. 55.—VIEW OF AN ALPINE PASTURE.

Note.—The richer pastures are those, below the "alp zone," made by clearing the forest growth ; this view shows such a pasture area with trees remaining around it. It is on an exceptionally steep slope used, not for grazing, but for growing hay, which is carried down in nets and stored in barns for winter fodder.

minerals are scarce, and in the secluded valleys there has been very little industrial development. Exceptions occur in the Dora Baltea valley and in the valley of the Romanche tributary of the Drac, where there are metallurgical and chemical works based mainly upon the utilization of the local water-power, while anthracite is obtained from a short distance ; also in the relatively broad longitudinal valley of the upper Rhone there are some industrial establishments.

Taken as a whole, however, the Central High Alpine region is one where the natural resources, apart from the attraction

which the scenery has for visitors, can support very few people.

The Southern High Alps.—The structure of this region is similar to that of the Central High Alps, but the altitudes are less, there are no areas of perpetual snow, and the scenery is less attractive ; the climate is drier and the pastures and forests are poorer. Although the passes are lower, they are off the main currents for traffic, and the region is less populated.

The Eastern High Alps.—While in general the characteristic features of the Central High Alps are continued on the eastern side of the Splügen dividing-line, there are certain changes to be observed, which become more marked as the region is traced farther eastwards. There is less precipitation and the altitudes are not as great; consequently there are smaller glaciers to-day and the land-forms show less action of ice in the past.

Moreover, the Alpine barrier does not here lie so directly athwart the great trade-routes as farther west. Hence, in spite of a number of broad valleys and low passes, the Eastern High Alps are crossed only by one route of capital importance, viz. that of the Brenner Pass, which is so low (4,500 feet) that the railway crosses it without a tunnel.

Another feature of the eastern part of the High Alps is that crystalline rocks do not form so large a proportion of the region, and considerable areas are composed of limestone. In some parts, the almost vertical cliffs which frequently characterize high limestone districts provide scenery rivalling that of the glaciated mountains ; this is exemplified most strikingly in the Dolomites area, situated east of the Adige valley below Bolzano (Bozen). Here, upon a great platform of porphyritic rock, forming upland pastures, lie masses of dolomite (magnesian limestone) which reach even into the zone of perpetual snow ; what specially distinguishes them is the way in which they have weathered into the most fantastic shapes of groups of pinnacles, described even as "cathedral-like," and the brilliant colour given to parts of them by veins of minerals.

As in the more westerly parts of the High Alps, mineralization has not in general much economic significance. The deposits of most importance are in the extreme north-east; here the iron ore has given its name to the Eisenerz Alps between the Enns and the Mur. Industrial development has not proceeded so far in the east as in the west, and in the High Alps region the

water-power has been less utilized ; the greatest plants are those in the Isarco (or Eisack) valley, near Bolzano, which produce electric current for use in textile and other industries in the Adige valley, and to a greater extent for transmission to the Italian Plain. Forestry and pastoral work are the main occupations of the High Alps, and these support an even smaller population in the east than in the west.

The Pre-Alps.—Lower altitude is the one characteristic common to all the Pre-Alp sub-regions ; differences in situation, structure, climate and human occupation are the other factors which have determined their respective natures.

The North-Eastern Pre-Alps.—On its inner side this sub-region includes the series of longitudinal valleys of the Inn, Salzach and Enns, north of which rise massive limestone heights, except where slaty rocks take their place north of the Salzach. This limestone belt consists of wide plateaus, often of the karst type, broken by the broad transverse valleys of the main rivers and the narrow and sometimes gorge-like cuttings of the smaller streams. The outer marginal strip is formed of Flysch, with lesser heights and more open valleys. As the climate of the valleys is similar to that of the Alpine Foreland, to which they open, cultivation is less favoured than pastoral work ; this and forestry are the main resources of the region. Copper is mined in the neighbourhood of the Salzach, and in several parts salt is obtained and water-power is utilized, but there has not been much industrial development. Trade follows the line of the longitudinal valleys, which are connected by the Arlberg Pass with the Rhine valley ; traffic from the Brenner Pass crosses this line at Innsbruck, whence it has several outlets to central Europe.

The North-Western Pre-Alps.—Very similar as regards land-forms and structure are the North-western Pre-Alps, but their aspect gives them a milder climate, and their lower lands therefore have better possibilities of cultivation, the broad valley of the Gresivaudan producing wheat and maize, vine and fruit trees ; pastoral work, too, has become very important. Glaciation has had a considerable influence on the region, and the scenery and lakes in several of the valleys, particularly in Switzerland, have been a factor in the development of many pleasure resorts. The industrialization of the Swiss Plateau and the adjoining part of France has stimulated the utilization

of the water-power and an associated development of manufactures, the latter being greatest in the valleys of the Isère and Drac, on either side of Grenoble. This town is a centre of metallurgical and chemical industries, of cement making, and of glove manufacture ; with nearly 100,000 inhabitants, it is by far the largest town in the Alpine region. The trans-Alpine routes already described, together with the longitudinal valleys, give easy access to all parts of the North-Western Pre-Alps, and help to make it the most densely populated sub-region of the Alps.

The Mediterranean Alps.—This term fitly describes all the Pre-Alpine region drained either directly to the Mediterranean Sea, or by the Durance and smaller tributaries which flow to the lower Rhône in "Mediterranean" France, for the characteristic which distinguishes it from the other marginal Alpine areas is a normal condition of summer drought; this is due to markedly less rainfall combined with the considerable summer heat. The forest-cover is almost lacking, garrigues appear, and there are even areas practically bare of vegetation. Deep canons appear in the limestone districts, and the scenery has a savage aspect uncommon in the Alps. The human geography, too, is exceptional, for, although pastoral work is the main resource, it is concerned with the keeping of sheep instead of cattle. In particularly favoured spots are cultivated vines, almond trees and even olive trees. Relatively very little traffic passes through the region and the total productivity of the land is small; consequently the population is scanty. The site of the settlements illustrates the distinctive character of the region, for they are frequently on the shady side of the valleys to avoid the great heat of the sun in summer.

At the eastern extremity, the immediate coast of the Mediterranean Sea, commonly known as the "Riviera," may conveniently be regarded as a separate sub-region ; its characteristics resemble those of the adjoining coasts of Mediterranean France and the Northern Apennines.

The Piedmont Pre-Alps.—As in the High Alps north of the Dora Riparia, so here the more resistant rocks, in part crystalline, descend directly to the North Italian Plain and longitudinal valleys do not appear. The altitudes are not great, and the uplands have been reduced to a series of ridges separated by the deep valleys of the streams which cross the Piedmont belt to converge upon the plains south of Turin. These valleys prolong

many of the characteristics of the plain into the mountain region, and the people have worked their way into them, continuing their mode of life as far as possible. The water-power of the streams is utilized for the use of Turin and Genoa, and in general the life of the region is closely associated with that of the lower lands of North Italy.

The Italian Lake Region.—After a break from the Dora Riparia to near Lake Maggiore, the Pre-Alps are resumed in the region which may be called the Italian Lake Region from the fact that in it lie a number of large and small lakes, occupying almost a network of transverse and longitudinal valleys. Indeed, the lakes, in the formation of which glaciation has played a large part, were once both more extensive as well as more numerous than they are now, and old lake-bottoms afford valuable areas of pasture or cultivation. The structure is complicated, for crystalline and sedimentary rocks are both found, but the distinguishing character of the region is the co-existence of the valleys and of a climate which combines adequate rain with warmth due to the southerly position and aspect. The climate of the region as a whole is not "Mediterranean," in spite of the fact that the olive grows in favoured spots ; more typical are the plantations of vines in the valleys and on the lake-side terraces, and edible chestnut trees on the lower slopes of the mountains, while the higher parts are largely covered with woods of deciduous trees, especially the beech, or with alpine pastures. The care of the vine and fruit trees and the rearing of cattle are the dominant occupations over most of the region ; in the vicinity of the lakes is a considerable tourist industry ; water-power is utilized at a number of places and the manufacture of textiles has extended into several of the valleys. It should be noted, too, that the three most important routes across the High Alps have their southern entrances in this region. In the richness of its natural endowment and the relative density of its population the Italian Lake sub-region may be compared with its north-western counterpart.

The South-Eastern Pre-Alps.—Here limestone ridges and plateaus are the characteristic features, and this region forms a transition to the karst uplands of the Balkan Peninsula north-east of the Adriatic Sea. Yet though the ground is frequently dry, there is quite a heavy rainfall, and forests alternate with poor pastures. Quicksilver is obtained from Idria, but in

general the region is little developed, and its population is small

- *The Eastern Margins.*—The crystalline structures of the Eastern High Alps become lower in the Eastern Pre-Alps and are cut by the valleys of the Mur, Drava and Sava ; in parts of these valleys, and notably in the Klagenfurt basin, are sedimentary deposits of Tertiary date. The forests of the uplands give timber for the making of paper and other wood products, while pastoral work and farming of the central European type are carried on in the valleys. The iron of the Eisenerz area is used in metallurgical works in the valleys of the Murz and of the upper Mur, where in the Tertiary strata lignite is found ; lead is mined near the Klagenfurt basin, and here, too, are metal works. Communications are relatively easy, and with Vienna on the one side and Trieste on the other, there is a fair amount of through traffic ; hence, with fairly varied resources, the valleys of this sub-region are moderately well populated.

QUESTIONS

1. Give an account of the structure as related to the relief of the Alps.
2. Draw a sketch-map showing the principal Alpine valleys. Comment upon their distribution, and group them into types according to their situation and arrangement.
3. Explain how glaciation has affected (a) the scenery, and (b) the utilization, of the Alps.
4. Show where and why industrial development has penetrated the Alps.
5. Describe the railway routes crossing the High Alps.
6. What reasons may justify the name " Mediterranean " being applied to part of the south-western Alpine Lands ? How may this area be demarcated ?
7. Write an essay on " Pastoral Life in the Alps."
8. Describe the characteristics of the " Italian Lake Region " of the Alpine Lands.
9. Contrast, and account for the differences between, the North-western and South-Eastern Pre-Alps.

THE DANUBIAN LANDS

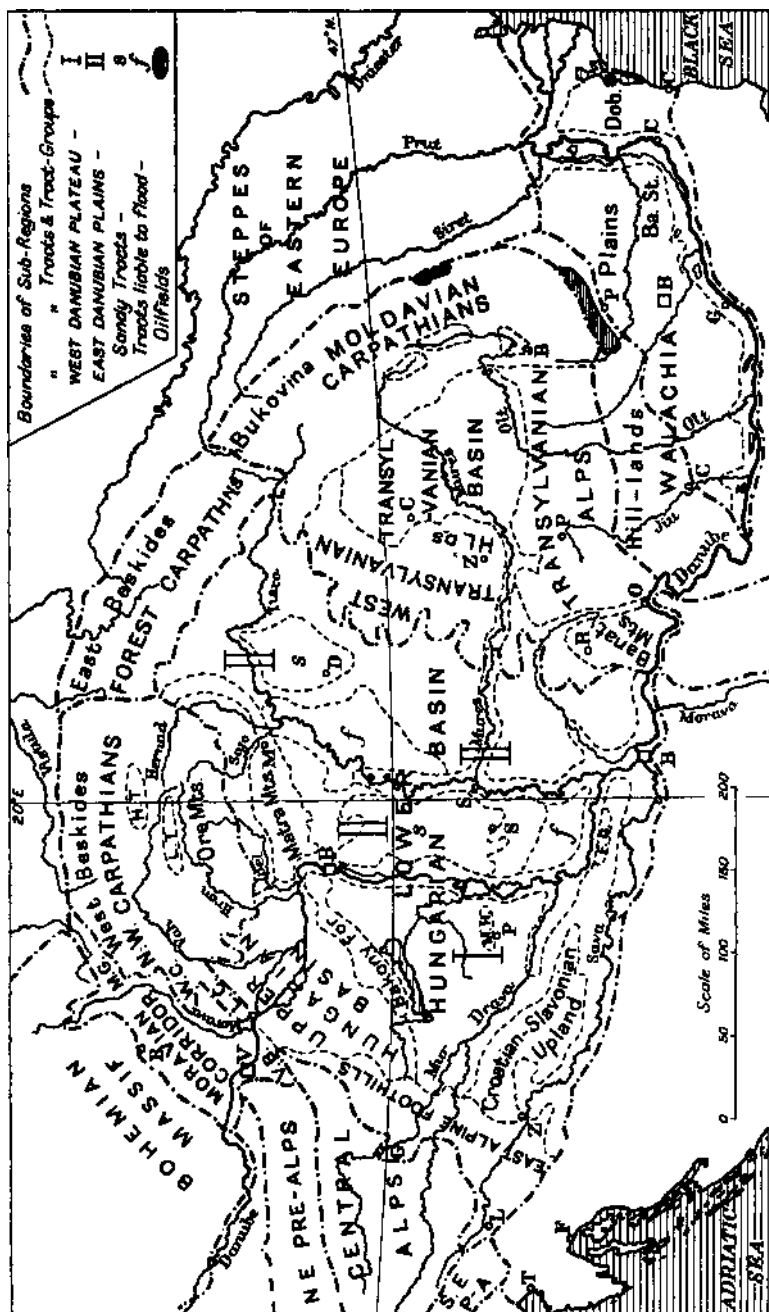
Position and Relief.—At their eastern extremities the Alpine Mountains appear to spread out towards the north-east and the south-east; the North-Eastern Pre-Alps are continued, across the Vienna Basin, into the north-western ranges of the Carpathians, while the South-Eastern Pre-Alps pass directly into the mountains of the Balkan Peninsula.

Between these diverging mountains the Central Alpine structures break down eastward first into a region of hill-country, which may be termed the East Alpine Foothills (see Fig. 56), and then into two great subsidence areas, the Upper Hungarian Basin and the Lower Hungarian Basin.

These Middle Danubian Lowlands are interrupted by higher "islands," such as the Bakony Forest and, continuing the same north-easterly direction across the Danube, the Matra and other mountains, while farther south are the Mecsek Heights ("M.H." in Fig. 56), and the uplands in the Croatian and Slavonian districts between the Drava and Sava. It is convenient to refer collectively to these areas as the Middle Danubian Uplands; they have a complicated structure and in general represent masses of older rock projecting through the relatively recent deposits laid down in the subsidence basins.

The great highlands and uplands of the Carpathian System form three sub-regions: (1) the wide mass of the North-Western Carpathians, of which the outermost ranges are known as the Western Beskides; (2) the much narrower Eastern Beskides or Forest Carpathians; (3) the almost triangular mass of the South-Eastern Carpathians comprising the Moldavian Carpathians on the eastern side, the Transylvanian Alps and Banat Mountains on the southern side, and the West Transylvanian Highlands, including the Bihor (or Bihar) Mountains, on the western side, while between these three highland masses lies the upland Basin of Transylvania.

Finally, the Hill-lands and Plains of Walachia represent a



filled-in subsidence basin between the Transylvanian Alps and the low plateau of Bulgaria south of the lower Danube.

Climate.—The statistics for Budapest given on p. 26 indicate that in this part of Temperate Europe there are hot summers and rather cold winters, while the rainfall is moderate in amount. But the climate, of course, varies within the region, and while Budapest, because of its almost central position and its situation between upland and lowland, has average figures, the highlands have much colder and wetter conditions and the lowlands are generally warmer and drier.

In the eastern part of the lowlands of the Lower Hungarian Basin there is a lack of rain, especially felt in the hot summer ; here aridity shows itself by the occurrence of steppe-like country, known as the Pussta, and even districts of sand-dunes.

To the south and east of the Transylvanian Alps is another area where the rainfall becomes less than is common in central Europe. The Walachian Hill-lands are fairly well watered and may be grouped with the eastern part of the Balkan Peninsula to form the "Drier South-eastern Lowlands" sub-region of Temperate Europe, marked "10" in Fig. 21.

The climate of the Plains of Walachia, however, as shown by the figures for Bucharest on p. 26, is definitely of the steppe-land type, and therefore this part of the Danubian Lands lies beyond the geographical region of Temperate Europe, and in several respects is an extension of eastern Europe.

The Carpathian System.—We will begin the regional description by dealing with the highlands, and will consider first the *North-Western Carpathians*. Here there is a series of curved highland zones which lie, as it were, one within the other, and are separated by valleys or high basins, in which recent deposits have been laid down. Thus there are the outer and almost concentric curved chains of the Beskides, continued south-westwards by the White Carpathians ; south of the Beskides there is the highland mass of the High Tatra, which, at an altitude of about 8,700 feet, includes the culminating point of the whole Carpathian System ; separated from this highland by the upper valley of the Vah is the Low Tatra, which, in spite of its name, reaches about 6,700 feet ; separated from the Low Tatra by the upper valley of the Hron are lower masses, known as the Slovakian (also known as Hungarian) Ore Mountains. The Vah and Hron flow first westward and then

southward to join the Danube, while back-to-back with their upper courses are the Hornad (Hernad) and Sajo (Slana) which flow first eastward and then southward to join the Tisza (Tisa).

As regards structure, the outer zone of the White Carpathians and the Beskides are composed of the Flysch strata of shales, sandstones, etc., while the High and Low Tatra, the Little Carpathians, which extend south-westward to the Danube at Bratislava (Pressburg), and part of the Ore Mountains are



[Czechoslovak Legation.

FIG. 57.—VIEW OF A CARPATHIAN PASTURE.

Note.—This is a view in the High Tatra region ; in the foreground is a flock of sheep—on the level ground of an old lake-basin.

formed mainly of crystalline rock ; the remaining parts of the Ore Mountains are of volcanic origin (see Fig. 58).

The Beskides, modelled from the Flysch rocks of relatively weak resistance, have rather smooth forms ; they are forested with beech and firs, and almost the only resource they offer is their timber.

The crystalline areas have bolder outlines ; the High Tatra in particular has wild scenery, for here, and to a less extent on the Low Tatra, glaciation has produced the same striking land-forms as those of the High Alps. Forests of firs clothe nearly all the slopes as far as the tree-line at about 5,000 feet, above

which rise almost bare crests and summits ; alpine pastures **are** rare. On the Tatra Mountains a forest economy is again predominant, and only in the valleys and the high basins is there any considerable population. In these valleys and basins most of the people get their living by cattle- and sheep-rearing and subsidiary agriculture, with small domestic industries, such as spinning and weaving, the manufacture of glass and metal-working. The last occupation is due to the occurrence of silver ores in the volcanic area of the Ore Mountains, while more ancient rocks yield iron, manganese and copper.

The Forest Carpathians are much narrower, for it appears that the great subsidence which has occurred in this part of the Tisza basin has left little of the highland but the Flysch chains of the Eastern Beskides, except that on the edge of the depression, i.e. on the inner side of the mountains, are certain volcanic masses. The parallel ranges are well named the Forest Carpathians, for woods almost completely cover them, and forestry is almost the only occupation ; but on the slopes and in the valleys of the volcanic areas there is more cultivation, and even some vine-growing. In the upper valleys of the Tisza and its tributaries live the greater part of the people of Ruthenia, the easternmost part of Czechoslovakia.

The South-Eastern Carpathians,—The Flysch belt of the Beskides is continued first in the mountains of the Bukovina, i.e. Beech-land ; farther south the Flysch continues in the outer part of the Moldavian Carpathians, and even just around the great westerly bend of the system where it borders the Walachian Hill-lands. Behind the Flysch chains there are crystalline and volcanic areas, and an important characteristic of the region is the existence of basins of considerable altitude and wide extent in the uppermost courses of the Mures (Maros) and Olt (Aluta).

While the mountain areas have but a scanty population, which depends mainly on the beech and fir forests, the basins have a very considerable number of inhabitants who cultivate meadows and grow forage crops for their cattle, and in the lower basin of Brasov the town of that name is surrounded by a fertile district in which corn and sugar-beet are obtained.

On the outer margin of the Moldavian Carpathians is one of the Rumanian oilfields (see Fig. 56).

The Transylvanian Basin.—In this great hollow Tertiary deposits of clays and sands, with layers of gypsum and salt,

were formed. The whole region has been cut up into a land of very irregular relief by the Mures and other tributaries of the Tisza, and by the Olt, which cuts through the Transylvanian Alps to the lower Danube.

The higher lands, frequently formed of sandstone, bear woods of beech and other deciduous trees. The lower areas, however, are usually treeless, and consist of arable lands or pastures, on which large numbers of cattle, sheep, swine and horses are reared. The valleys are the most productive areas; some of them have terraces mantled by loess, and on such lands great harvests of wheat and of maize are gathered, while on sunny slopes fruit trees and the vine are cultivated. There are a considerable number of small towns, and the largest, Cluj, has about 100,000 inhabitants.

The Transylvanian Alps.—On the southern side the upland basin is shut in by the broad highland mass of the Transylvanian Alps. Although involved in the "alpine" folds, its structure is in the main that of a great massif of crystalline rock, whose higher parts are in the form of plateaus.

On the southern side of the Transylvanian Alps is the depression now occupied by the Walachian Hill-lands and Plains, and at one period in the geological history rivers from basins in the highland descended so steeply to this depression that they rapidly eroded their valleys and formed great gorges, including those of the Jiu and Olt. The Olt, indeed, cut back its valley till it captured that part of the course which is within the Transylvanian Basin. By such valleys through the highland barrier, railways join Transylvania with the lower south-western lands of Rumania.

Only the greatest elevations of the Transylvanian Alps show jagged outlines due to glaciation, and lower are broad, undulating plateaus which bear alpine pastures; to these large numbers of sheep migrate in summer from Walachia. Below the alpine pastures is the zone of forests of pines and beech, and in the lower and wider parts of the valleys, near the margins of the highland, chestnut trees and the vine are grown.

Near the western end of the Transylvanian Alps is the upper valley of the Jiu and the basin of Petrosani, floored by Tertiary deposits from which lignite is obtained.

A rift-valley separates the Transylvanian Alps from the Banat Mountains, and through this valley, north of Orsova, runs the

railway which connects central Europe with the lower Danubian lands (refer back to Fig. 20).

The Banat Mountains contain a variety of structures : there are ores of iron, copper and other valuable metals and deposits of anthracite. Hence, metallurgical industries have developed at Resita, and here are the greatest iron and steel works of Rumania, where armaments and railway equipment are made.

South of the Banat Mountains there is no real break between these highlands and their southward continuation across the Danube to the Balkan Mountains. The mountain barrier is cut by the Danube only by a series of gorges, which stretch downstream for about 60 miles till Orsova is reached ; below that town are the rocks and rapids of the Iron Gate, where a side-canal has had to be cut to allow the passage of the small number of river craft which pass from the middle to the lower courses of the river.

The West Transylvanian Highlands.—North-west of the Transylvanian Alps is the valley of the Mures (Maros), a rather wide corridor, fertile and well populated. On the farther side of this valley rises the confused area of highlands and uplands, to which the only convenient general name seems to be the West Transylvanian Highlands. Here the rounded granitic Bihor Mountains reach about 6,000 feet. Igneous rocks and volcanic activity are associated with mineral deposits in two or three places, and small industries have developed at Zlatna. For the rest, the scattered population depends on forestry and farming.

East Alpine Foothills and Middle Danubian Uplands.—*The East Alpine Foothills.*—The crystalline rocks of the Alps sink down eastwards and are covered by limestones, sands and clays, in which rivers have carved their valleys and formed a very irregular relief. The forests which cover the ridges consist mainly of beech, and on the lower slopes chestnuts have been planted. The valleys are utilized for agriculture ; and fruit and vines are grown. Where the Mur enters this region is the town of Graz, a market for the exchange of the products of the Alps and the lower lands, and a centre of manufacturing which, with the trade, supports a population of 200,000 persons in and around the town.

On the southern margin the Sava issues from the Alps, and here is the town of Lyublyana ; at this point the route of the Sava valley is crossed by that from the head of the Adriatic Sea.

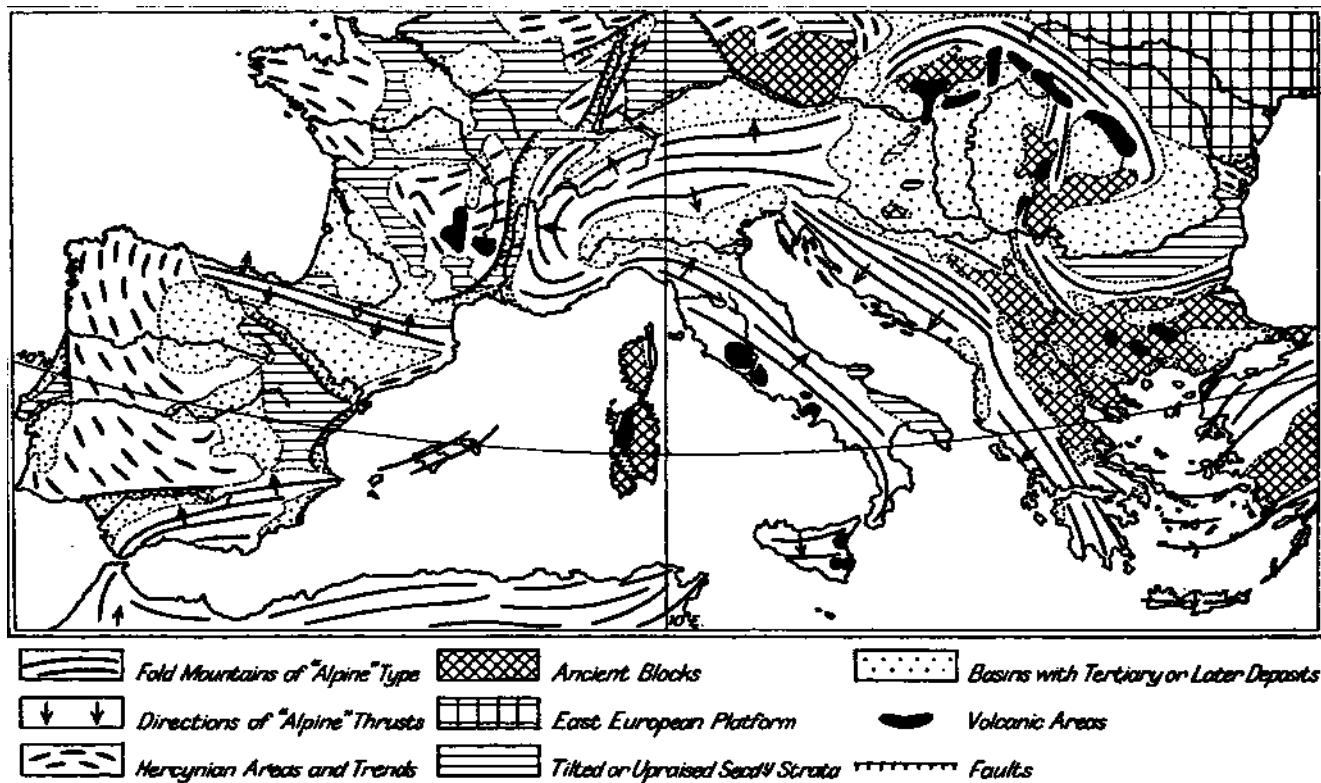


FIG. 58.—STRUCTURE OF SOUTHERN EUROPE.

The Middle Danubian Uplands.—Between the Drava and Sava the Croatian-Slavonian Upland from the Alpine margin stretches south-east; its highest parts are formed of upthrust masses of crystalline rock and are mainly wooded; the lower slopes have orchards and vineyards. From the lowlands north of the Drava rises a small massif, the Mecsek Heights, which also bears woods and vineyards, but the relatively old rock of which it is composed has some deposits of coal; these are of particular value to the State of Hungary, in which there is a lack of minerals, and under the faulted edge of the upland has grown up Pecs, one of the few industrial towns of Hungary.

The Bakony Forest is a somewhat similar upland, whose long, faulted south-eastern edge descends steeply to the depression in which waters of the shallow Lake Balaton have accumulated. Other smaller hill-areas continue the line of the Bakony Forest to the north-east, until there rises a volcanic mass, through which the Danube has cut a picturesque gorge just before the river turns from its easterly to its southerly course above Budapest.

Beyond the Danube gorge the upland continues gaining in width and elevation, and in the volcanic mass of the Matra Mountains it reaches about 3,500 feet. On the northern side of these uplands lignite is found. Farther to the north-east, where the River Sajó breaks through the volcanic belt, more lignite is found, and also some iron-ore deposits, by which are situated large ironworks. The Matra Mountains and the volcanic belt shut in, on the north-west, a long fertile basin between them and the North-western Carpathians; this hollow is drained by the Rivers Ipel and Sajó to the Danube and Tisza respectively. Its north-eastern end affords a route up the valley of the Hernád, a tributary of the Sajó; in this valley is the industrial centre Kassa (Kosice).

The Middle Danubian Lowlands.—*The Moravian Corridor.*—The name Moravian Gate is applied to the narrow hollow between the Sudetes Upland and the Western Beskides, while to the south-west, between the Bohemian Massif in general and the broken line of ridges which link the Alps with the Carpathians, extends a longer and broader lowland area; this is drained to the Danube by the Morava and its tributaries, and it may conveniently be called the Moravian Corridor. An

extension of the corridor across the Danube is known as the Vienna Basin, since that city is situated on its edge.

Much of the broad corridor is floored by deposits of Tertiary age, on part of which loess has been laid down, and in general it is a fertile region with a wide variety of products. It is not by any means a uniform country, for from the lowland rise lines of wooded, sandstone hills, while as other exceptional features there are the marshy valleys of the Danube below Vienna and of the lower Morava.

The break between the Alpine and Carpathian Highlands is of the greatest commercial significance, for it gives an easy route for traffic to accompany the Danube from its upper to its middle course, and to link central to south-eastern Europe. Where the river skirts the north-eastern extremity of the great Alpine barrier is Vienna, situated at the meeting-place of this north-west to south-east route with another at right angles, viz. from the Adriatic Sea and northern Italy through the Moravian Gate to the Baltic lands and north-eastern Europe.

Vienna was the capital, and was situated almost in the centre, of the great Austrian Empire ; when the Empire broke up in the War of 1914-18 Vienna remained the capital, though almost on the frontier, of the much smaller State of Austria, until in 1938 this was incorporated into the German Reich.

When it was the residence of powerful rulers, Vienna became a centre of science and the arts, particularly of music ; as a seat of Government and a meeting-place of routes it attracted commerce and industry. Thus before the War of 1914-18 its population was over 2 million persons. The small new State of Austria, however, did not require, nor could it support, such a large capital as the old Empire, and now the city is only the administrative centre of the Austrian province of Germany ; the population has declined and is now less than 2 millions.

In the Moravian part of the Corridor there are several large towns, notably along the north-western margin, where there are trading centres on the routes into Bohemia and through the Moravian Gate. The largest of these towns is Brno, with about a quarter of a million inhabitants. Here, as well as in other towns along this border of the Bohemian Massif, are industries aided by coal both from the Upper Silesian coal basins and also from those of the Massif.

The Upper Hungarian Basin.—This region almost corre-

sponds to the lowland drained to the Danube between two gorges; the upper is that where the river cuts through the south-western extremity of the Little Carpathians above Bratislava, and the lower is that where it breaks through the barrier of the volcanic uplands above Budapest. In this broad subsidence basin have been laid down from Tertiary times onwards varied deposits, mainly of sands and clays, and including loess ; on these are grown wheat, maize, sugar-beet and fodder crops. Where the side-streams meet the Danube, however, there is a great accumulation of sand and mud, which is liable to flooding, and of which only a part has been utilized. The Danube itself divides into three main channels, enclosing a great " island " which has gradually been reclaimed, mainly for keeping cattle and horses and to some extent for cultivation of grain and vegetables.

The Lower Hungarian Basin.—Apart from the emergent uplands already dealt with, tracts of three main types are found in the great basin drained by the Danube between the gorge above Budapest and the narrows which end in the Iron Gate : (i) the West Danubian Plateau, of moderate relief and with a climate of central European type ; (ii) the wide East Danubian Plains, in general of less-marked relief and of more arid character ; (iii) between and interrupting these regions, the broad and naturally swampy valleys of the Danube and of the lower courses of the Drava, Sava, Tisza, Mures and other smaller rivers.

Just below the gorge where the Danube enters the Lower Hungarian Basin is Budapest, the capital of Hungary. It consists of two parts : Buda is on the high, right bank of the Danube, where the heights come to the river's bank and give a favourable site for an old fortress ; Pest is on the low, left bank, and was a market-place for the products of the Danubian Plains. Budapest has spread out widely, having grown particularly with the reclamation and improvement of the plains and the construction of railways which collect much of their produce at this centre ; the whole conurbation numbers about 12 millions of inhabitants, in spite of the check due to the partition of Hungary.

The West Danubian Plateau is mainly undulating country, rather similar in its build, soils, climate and productions to the Upper Hungarian Basin on the other side of the Bakony Forest. In the southern portion, however, the summers become hotter,

and in some parts growing of maize and melons becomes characteristic, while in other areas drought may be frequently experienced. Where the Sava enters the Lower Hungarian Basin from the East Alpine Foothills is Zagreb; it is on the route which connects the Danubian lands with the Adriatic ports of Fiume and Susak.

The East Danubian Plains.—This is the region of which the greater part is sometimes known as the Alföld, while the southeastern area adjoining the Banat Mountains is called the Banat Lowland. In climate, scenery and the type of land-utilization the East Danubian Plains are transitional to the steppes of southern Russia.

The temperatures tend to extremes, particularly felt when violent winds, blowing without hindrance across the great plains, bring snowstorms in winter and burning heat in summer.

Only on the margins of the region where there is more rain, and in those districts where the soils collect or conserve more moisture, is the water-supply sufficient for tree life; hence over the central areas stretch the open, treeless plains of the Pussta.

Although on the Carpathian borders many streams have cut their valleys, and although the great rivers have clearly marked flood-plains, over much of the country the relief has been smoothed by a thick mantle of fertile loess. From the point of view of the farming resources, however, this area has been reduced by the liability to flooding in certain districts, particularly near the north-western part of the course of the Tisza and between the lowest reach of the Tisza and the Danube (see Fig. 56). Moreover, at a past period sand was formed and blown into dunes which covered much of the area between the Danube and the Tisza and the country in the angle formed by the northernmost part of the course of the Tisza. Now that the climate is not so arid, vegetation has grown upon the sand and checked the movement of the dunes, but they are still the characteristic features of much of those two specified areas.

The fertile loess plains have now become great fields of wheat and maize, but after the harvests are reaped, the stubble-fields again give to the country its steppe-land appearance. Maize is the common food of the people and is fed also to enormous numbers of poultry and pigs; wheat was sown as the main crop on the large estates of the wealthy landowners, and grown for export. Cattle, sheep and horses are widely reared, but they

are now generally fed more upon sown grasses or other crops than upon natural pastures.

The loess lowlands which are liable to flood have been in part protected by dyking and draining, but where the rivers may still spread out over the country, only pastoral work can be carried on.

The sandy regions have also been considerably developed, but the absence of streams in these regions has made this work largely dependent upon the construction of deep wells.

Scattered over the great plains are a number of large towns, or perhaps one might say huge over-grown villages, for although their populations in several cases number about 100,000 persons, they sprawl loosely over wide areas ; a large proportion of their inhabitants are the farming families who work the surrounding lands, or are shopkeepers or merchants dealing in the products or the requirements of the farming folk. Some of these towns, however, are also the railway junctions and serve a wider area. The largest of such settlements are Subotica and Debrecen.

The Rivers and Flood-plains.—The Danube and its tributaries flow with complicated meanders or side-channels through broad valleys, normally marshy and frequently flooded, set with great thickets of reeds and clumps of alders and willows. In parts of the basin canals have been constructed across the plain to facilitate drainage, and some of these, like the larger rivers, are, or should be, navigable. But systematic control of the waterways is necessary to keep the courses clear, especially in the later part of the dry summers, and to prevent flooding when the melted snows from the surrounding highlands add greatly to the volume of water in spring. This work would require a unified control of the whole of the basin, but when, in 1918, Hungary was divided up, the river control was disorganized and traffic in general declined.

Budapest, however, carries on a good deal of trade by water, and Szeged, near the junction of the Tisza and the Mures, is the second largest town of Hungary. Belgrade (Beograd), at the junction of the Sava and Danube, is essentially a border city of the Balkan Peninsula.

The Lower Danubian Lands.—The surface conditions give the basis for a threefold division of these lower Danubian lands : (i) Walachian Hill-lands adjoining the Transylvanian Alps ; (ii) the Walachian Plains, widening towards the east and including the Dobrogea across the Danube in the angle between the

lowest part of its valley and the delta; (iii) the broad valley and the delta of the Danube,

The Walachian Hill-lands.—This area is relatively well watered and has been fairly deeply dissected by the streams from the Transylvanian Alps ; consequently there is a marked difference between the ridges, to a considerable extent still forested with oaks and other deciduous trees, and the valleys utilized for cultivation and settlement. In these valleys there are alluvial terraces, on which cereals are grown, while vines and fruit trees cover the slopes.

An important oilfield is worked in the hill-lands adjoining the Transylvanian Alps north of Ploesti; at this town, as well as elsewhere on the field, are great refineries, and pipe-lines convey the oil for export to the port of Constanta (Constantza) on the Black Sea, and for home use to the river-port of Giurgiu on the Danube, and to the capital, Bucharest.

The Walachian Plains.—Here a scanty rainfall makes itself manifest, and this area, together with the Dobrogea across the lower Danube, must be regarded as a distinct sub-region and grouped with the Steppe-lands of eastern Europe.

Except in the rather shallow valleys in which recent alluvium has been laid down and where cultivation has assumed varied forms, the wide plains are generally covered with loess and have a monotonous appearance.

The better-watered areas are very productive and support many people, who grow wheat and maize for their own consumption, and oats and fodder crops for the sheep, cattle and horses, which they keep in considerable numbers. Other parts are relatively barren, and in the east is a region still known as the Baragan Steppe ; indeed, there are districts bordering the larger valleys where the wind has blown the finer river sand across the plains and formed miniature deserts.

Almost in the middle of the plains region is the capital of Rumania, Bucharest (Bucuresti), from which roads radiate in all directions ; it has become the commercial as well as the political centre of the country, and its population is well over half a million persons.

The Dobrogea.—This is a low plateau formed of a block of ancient rock whose surface is partly covered by loess ; the porous soil increases the aridity due to low rainfall, and the natural condition is that of steppe-land. Although an increasing area

is cultivated or used for pasture, it supports few people, and the only town of any size is the port of Constanta.

The Danube Valley and Delta.— A complete contrast to such districts is afforded by the broad valley in which the Danube meanders and in parts forms a network of channels. In spring much of the region may be flooded.

Lakes, marshes and floods render the wide valley a serious obstacle to traffic, and only one railway crosses the Danube in the whole of its lower course ; this is at Cernavoda, on the line between Bucharest and Constanta.

In its northward reach the lower Danube valley widens considerably, and after receiving the Seret and Prut, the river turns eastward and forms a great delta as it deposits its load of mud in the Black Sea. The delta is shut off from the sea by a sand-spit through which the northernmost of the three main channels discharges the greater part of the river water. The middle channel has been straightened and used for navigation, and the chief ports are Galati (Galatz) and Braila, at the head of the delta. These ports export mainly wood from the Carpathians and grain from the plains of Rumania, but are closed by ice for several weeks in the winter.

Owing to the obstacles to navigation in several parts of its course, the Danube has less importance as a highway of communication than its great length might suggest, its value being further diminished by the fact that it flows, not westwards from central Europe to the open ocean, but eastwards to an almost enclosed sea.

QUESTIONS

1. Give a brief account of the relief and the associated structure of the Carpathian Highlands.

2. Show how the physical geography of the North-western Carpathians (including the Ore Mountains) is related to the means of communication and the occupations of the people of this region.

3. Describe the Moravian Corridor (including the Moravian Gate and the Vienna Basin) from the points of view of its internal conditions and its relations with other regions.

4. Make a systematic study of the physical and economic conditions of the Transylvanian Basin.

5. Give an account of the climate, and show how it is related to the farming, of the Upper Hungarian Basin.

6. Compare and contrast the West Danubian Plateau with the East Danubian Plains.

THE BALKAN PENINSULA

THE Balkan Peninsula appears to be such a tangle of mountains and valleys that before giving a description of its constituent regions, it will be convenient to examine its relief and routes, and refer also to its climate and vegetation, in general.

Relief and Routes.—If the geological structure is ignored, a map showing only elevation of the land would suggest that the South-eastern Pre-Alps are continued behind the Adriatic Coast. Three regions may here be distinguished : the irregular coastlands of Dalmatia ; the high plateaus of Karst formation, including the Dinaric Alps ; the mountains and valleys, inhabited by Croats and Serbs, which drain eastward to the Sava and Morava tributaries of the Danube (see Fig. 59). From the Karst Plateau region only one river of any size, the Neretva (Narenta), drains westward. The only important routes from the interior to the coast are where the mountain barrier is narrowest, in the extreme north-west; here are the ports of Trieste, Fiume and Susak.

Farther south, the coast changes its direction : Albania approaches the " heel " of Italy, and at the Strait of Otranto the entrance to the Adriatic is almost closed. Behind the coast lie the Albanian Lowlands, and behind this region is an almost chaotic group of mountains, valleys and basins, situated partly in Albania and partly in Macedonia, the latter being a rather vaguely defined area politically divided between Yugoslavia and Greece. Through Macedonia the valley of the River Vardar runs almost back-to-back with that of the Morava, and the two valleys together form the main route between central Europe and the Ægean Sea at the port of Salonika or Thessalonike (refer back to Fig. 20).

A partial submergence of the whole area around the Ægean Sea has caused the drowning of all the lowlands, while the surrounding ranges become lower and break up into peninsulas and islands, such as Krete and Rhodes (Rodi); on the farther side of the Ægean Sea they again appear as mountains in Asia Minor (see Fig. 58).

Returning to the north of the Balkan Peninsula, we note that the Banat Mountains curve round into the Balkan Mountains (or Stara Planina), and between these and the Danube is a rather low plateau region. South of the Balkan Mountains rises the great mass of the Rodopi (Rhodope) Mountain region, the highest of the Balkan Peninsula, reaching about **10,000** feet.

Between the Balkan and Rodopi Mountains are two important basins, the higher and smaller being that of Sofia, and the lower and more extensive that of Plovdiv (Philippopolis); through the latter runs the River Maritsa, which then turns southward through the Edirne (Adrianople) Basin to reach the *Ægean*. These three basins form parts of the mainland route between Europe and the Near East, for the "Orient Express" line (again refer to Fig. 20) leaves the Danubian lands at Beograd, goes up the Morava valley to Nis (Nish) and thence south-east by the tributary Nishava; it next crosses the water-parting into the Sofia Basin, and then another water-parting to the Maritsa valley, which it follows through the Plovdiv Basin and into the Edirne Basin; finally it passes into the Marmara region and reaches Istanbul (Constantinople), the historic meeting-place of West and East.

In a past geological age there was here a continuous land-bridge between Europe and Asia, but the subsidence of the whole region transformed what were then river-valleys into the present straits of the Bosphorus and the Dardanelles, which join the Black Sea to the Sea of Marmara and the *Ægean*.

North of the Marmara region are the lands which look out, as it were, to the Black Sea, and have climatic similarities with the other regions on the European shores of this sea. Also, there is the fertile valley of the upper River Tunja, which lies sheltered and confined between the Balkan Mountains and a narrow offshoot called the Anti-Balkan range. The River Tunja does not, however, continue its eastward course from this valley to the Black Sea, but turns abruptly southward to join the Maritsa.

Climate and Vegetation.—The broad bulk and the generally considerable elevation of the northern part of the Balkan Peninsula have the effect of prolonging the "temperate" climate conditions far into southern latitudes; only those regions of **the** south and west which are directly influenced by the

Adriatic, Ionian and Ægean Seas have the characteristic Mediterranean climate.

The temperate type of climate is exemplified in the meteoro-

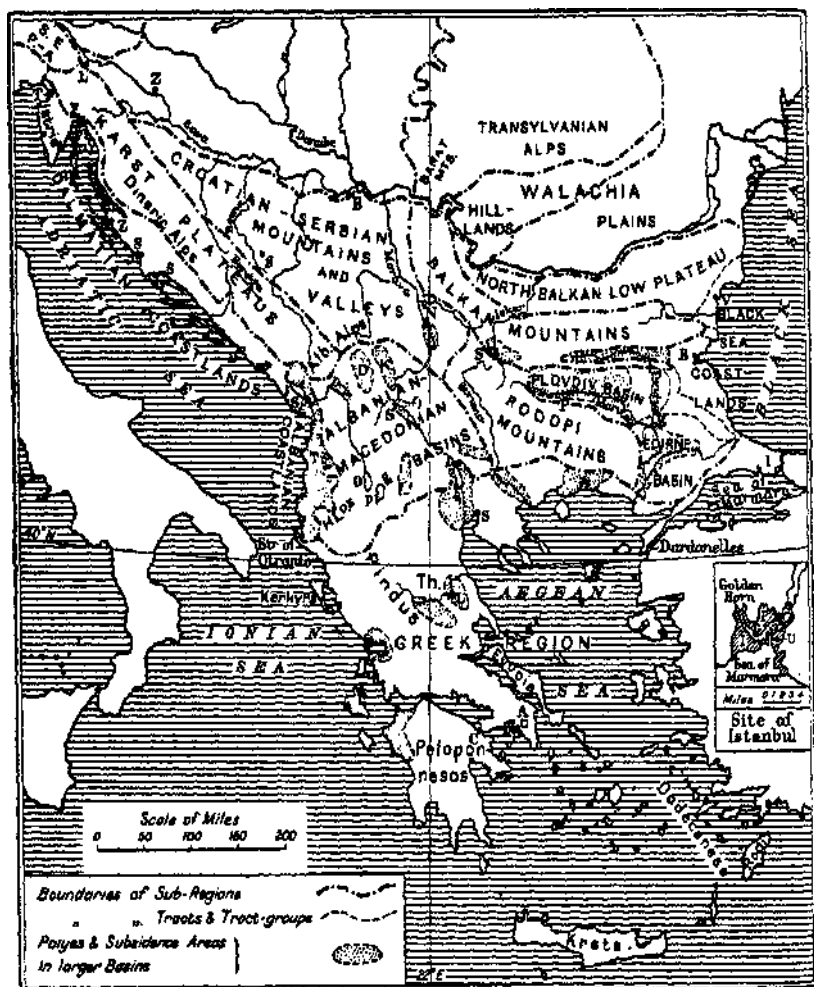


FIG. 59.-REGIONS OF THE BALKAN PENINSULA.

logical records for Sofia. Here, in the heart of the peninsula, and in an enclosed basin 1,800 feet above the sea, are temperature conditions very similar to those of Budapest, for the more southerly latitude is counterbalanced by the greater elevation;

in respect of rainfall, also, there is but little difference between Sofia and Budapest (see the figures on p. 26).

Yet within this northern or non-Mediterranean part of the Balkan Peninsula the variations of altitude are so considerable that the local climates dependent upon elevation are accompanied by marked contrasts in the natural vegetation. In the valleys and basins this has been displaced or largely modified by cultivation or by the use of the land for pastoral purposes, but the slopes and highland areas are still partly covered by forests, "mixed" at moderate elevations and coniferous at higher levels; an alpine zone of low growths is found in the highest parts of the Dinaric Alps and the Rodopi Mountains.

In the highlands of Albania and Macedonia these climatic conditions and their associated forms of vegetation continue far to the south between the Ægean and Adriatic areas and form an indefinite boundary between the regions which can be clearly distinguished as "Temperate" and "Mediterranean" respectively: even the Pindus Mountains of Greece show rather similar characteristics, although they rise from the clearly Mediterranean part of the Peninsula.

The true Mediterranean climate and life-forms are indeed only found on the lower slopes of the coastal mountains, and in the adjoining valleys and plains. Yet this Mediterranean region is situated so far southward, that on the lowlands it has its full development of winter warmth and summer drought. Accordingly the figures for Athens (as given on p. 26) show remarkably high temperatures both in summer and winter; also, while the total annual rainfall at Athens is only 15 inches, that of the three summer months combined is less than one-tenth of this amount. With such climatic conditions, trees of the evergreen, hard-leaved type form woods in situations where man has not destroyed them, but maquis and expanses of thorny shrubs, such as thistles, are common.

Along the Dalmatian coast the Mediterranean conditions extend exceptionally far to the north, for in the Adriatic Sea currents flow in a counter-clockwise direction and take warm waters northward along the coast, while the great mountain barrier of the Dinaric Alps is at least a partial protection from the winds which would otherwise bring cold air from the north-east in winter time. Yet the Dalmatian coast-lands are occasionally visited by a bitterly cold north wind, the Bora, which comes

down from the Karst Plateau region, and is produced in the same way as the Mistral of southern France.

On the eastern side of the Balkan Peninsula, open both to the north and to the east, the true Mediterranean conditions give place before greater winter cold, and save in exceptional spots the olive extends only as far as the shores of the Sea of Marmara. The Black Sea coast-lands show a transition towards the steppe type of climate, and while woods are found on the higher lands, the chief natural growths of the lower country are drought-resistant shrubs and the spring-flowering herbaceous plants and grasses.

Constituent Regions.—*The Dalmatian Coast-lands.*—In the north-west of the Balkan Peninsula the limestone mountains of the South-east Pre-Alps are continued behind the Adriatic sea-board, with folds running in a north-west to south-east direction (refer back to Fig. 58). The structure is, however, more complicated than this statement alone would suggest, for in the coastal area there have been overthrusts, faultings and sinkings, which have produced the succession of peninsulas and gulfs, islands and inlets, small coastal plains and precipitous cliffs which make up the Dalmatian Coast-lands region.

On either side of the plateau of Istria deep gulfs allow ships to reach the narrowest part of the mountain barrier. Here the ancient city of Trieste flourished while it was the outlet of the Austrian Empire, but when this broke up and Trieste passed to Italy, its commercial significance declined, although industries have been developed under the new regime and the city has a quarter of a million inhabitants. Similarly, Fiume became important as the port of Hungary, but when that country lost its sea-board and Fiume became Italian, the trade decreased. The suburb of Susak, however, remained in the hands of Yugoslavia and has become the chief port of that State.

As the highlands rise steeply behind much of the Dalmatian sea-board, there are relatively small areas of productive lowland. The slopes are in part well forested, and timber is sent out from several ports, but cultivation is mainly limited to the islands, the Istrian peninsula, the coastal lowland between Zara and Split and terraces on the hills bordering the sea. Maize, wheat and barley are the cereals; vineyards and olive-yards are scattered along the coast.

Fishing, as well as cultivation, is the work of the people in

many villages ; moreover, an increasing number of visitors from other lands are attracted by the beauty of the scenery.

Bauxite (from which aluminium is prepared) is obtained from the Istrian Peninsula, the inner margin of the Zara-Split lowland and at some points farther south ; it is exported from Split and Sibenik. There is but poor railway communication inland from these ports ; hence, although industries are now being developed, the trade and population are not great.

The Karst Plateau Region.—Behind the coast-lands, the fold-mountains have been peneplained and subsequently uplifted, with the result that steep walls of rock bound high plateaus, which in the south reach 8,000 feet above sea-level. The limestone of which they are mainly formed has been but little dissected by surface streams, and much of the drainage is underground. Deep gorges cut the plateaus, and in some of them rivers issue from the depths and after a course of some miles disappear into subterranean tunnels and caverns. The surface is occasionally pitted by dolines, i.e. solution hollows, and in these there is generally an accumulation of soil, reddish in colour and clayey in composition, which has remained when the limestone has been dissolved away.

On the plateau levels the permeable surface is commonly dry, in spite of a heavy rainfall, and with the coldness of the winters conditions do not favour vegetable growth. Poor pastures on which feed sheep and goats, but relatively few cattle, are the main resource of the higher areas, though in dolines and some valleys cultivation can be carried on. There is little mineral wealth, though bauxite is quarried near the Neretva valley, which enables it to be conveyed to the coast for export. The gorge-like valleys generally hinder rather than help communication, and the population is small.

The Croatian-Serbian Mountains and Valleys.—Behind the Karst belt the structure is more complicated; eastward the limestones are less pure, and are then succeeded by older rocks, including granites. With the greater variety in the bed-rock the soils improve, and with the lower elevation the country becomes more habitable. The higher areas bear forests, in which oaks are specially valuable, both for their timber and also for acorns which give food for the many swine kept in these districts. As the valleys become lower and broader towards the Sava and Morava, agriculture becomes the main occupation :

maize, wheat and potatoes are grown on the level lands, and on the slopes are plum, mulberry and other trees, and vines. The older rocks contain a considerable variety of minerals: zinc, iron, lead and manganese are worked at several places, but although some coal and lignite are also found, there is a lack of suitable fuel for smelting, and consequently there is little industrial development beyond some chemical works.



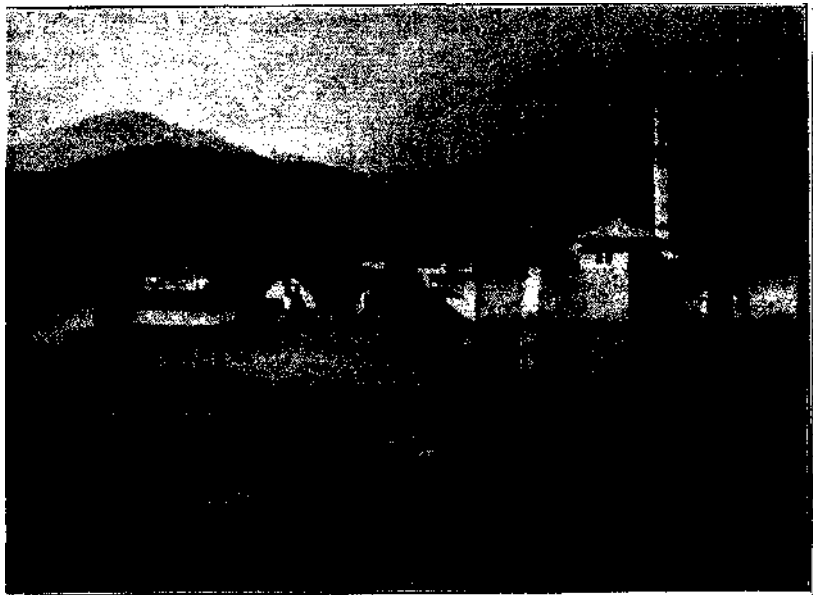
[Royal Geographical Society.]

FIG. 60.—VIEW ON THE KARST PLATEAUS.

Note.—The view shows how the almost level surface of the plateau is cut by steep-sided valleys which make communication very difficult. The photograph was taken in spring when the snow had almost melted, and it may be seen that little vegetation exists. The almost vertical walls of the valley, above the screes, are bare, and expose the strata which form the plateau.

The productive valleys lead down to the Sava and Morava and along the valley of the latter river comes the traffic from the Mediterranean and the East; consequently the district where the two rivers meet the Danube is the focus of routes both from all parts of Yugoslavia and from a much wider area. Beograd, with an elevated site above the junction of the Sava and Danube, is therefore well placed as the capital of Yugoslavia; as a political and commercial, and to a less extent industrial, city it is the centre of a conurbation of over 300,000 persons.

The Albanian Coast-lands contrast with those farther north in showing less effect of subsidence and having considerable areas of recent formation. The region is in part alluvial with swamps and lakes, and in part consists of low hills covered with maquis. In recent years reclamation has allowed the extension of the cultivable land, and farming has now outweighed the winter pasturing for which alone the Albanians earlier utilized the region. Maize is the chief grain crop, while tobacco is grown in



{Royal Geographical Society.

FIG. 61.—VIEW ON THE RIVER BOSNA.

Note.—This is a scene in the higher part of the "Croatian-Serbian Mountains and Valleys" region; there is here but little agricultural land, and the forests are the chief resource of the area. The minaret shows that in this district of Yugoslavia the people are Mohammedans.

the north and some rice and cotton in the south. Olives and mulberries are obtained, and in the warmer parts oranges and lemons. The towns are small: Shkodra (Scutari) has only about 25,000 people, and the capital, Tirana, has still fewer inhabitants.

The Albanian-Macedonian Highlands and Basins.—The Karst Plateaus and the adjoining Serbian Mountains end southward in heights, sometimes called the North Albanian Alps, which overlook a series of relatively low areas lying between the north of the Albanian coast-lands and the upper Morava valley. This

series of lowlands comprises the basin in which Lake Shkodra (Scutari) is situated, the north-easterly part of the valley of the River Drin, and the two basins of Djakovica (Diakova) and Kosovo (" D " and " K " in Fig. 59). These depressions afford a moderately easy way across the highlands, and to them collectively has been given the name of the Albanian Gap.

Towards the south and east of the Balkan Peninsula appear more of such basins, known as polyes. They have been formed probably by subsidence as well as solution ; they are often bounded by steep walls, and in them water tends to collect. Lakes have commonly resulted, and in some cases still remain, e.g. Ohrid and Prespa on the borders of Albania and Macedonia. In most cases, however, the lakes have disappeared and their beds yield soils which, though liable to floods, give almost the only extensive areas for cultivation and settlement in the highland regions.

South of the Albanian Gap there is a complicated mass of mountains, difficult to cross. The western part is Albanian, and here the structure is like that of the Dinaric Alps to the north. The eastern part is in Macedonia, where granites and other crystalline rocks predominate, as the area forms part of the great mass of ancient rock which lies between the folds of the west of the Balkan Peninsula and those of the Balkan Mountains proper ; in this block, sometimes known as the Rodopi Massif, minerals have been found, and there are also considerable areas of recent eruptive rock.

The highlands, especially in the Albanian portion, have an irregular relief, and the country often has a wild and savage appearance. It is mainly used for the summer pasturing of sheep, goats and cattle. The polyes are the sites of all the important settlements ; in them are grown maize and wheat, the vine and fruit trees, while in sheltered areas in the south even olives are produced.

Petroleum has been found in the marginal district between the highlands and the southern part of the Albanian coast-lands; some copper is obtained, and chromium and other metals are known to exist in the mountainous parts of the region, but mining and industries have not been developed to any considerable extent.

The Balkan and Rodopi Mountains.—The Balkan Mountains which curve southward from the Danubian gorges increase in

height till, where they run parallel with the river, the highest ranges attain a height of nearly 8,000 feet. The foldings have involved rocks of varied age and composition, and in them are some mineral ores and lignite deposits. In the small portion belonging to Yugoslavia in the north-west considerable amounts of lignite and copper are mined.

The ranges are cut by a number of river valleys, and half a dozen passes lead roads across from the north to the south of Bulgaria. Forestry is carried on, and animals are sent up to pasture during the summer, while in the valleys there is mixed farming.

The Rodopi Mountains rise higher, and since they are relatively flat-topped there are wide elevated areas on which the only vegetation is of the sub-alpine or alpine type. The slopes, however, are well wooded, and forestry, with the production of charcoal and the sawing and working of timber, is the principal resource of the small population. There are a few fairly wide valleys, notably that of the River Struma, but in the main the upland edges are cut only by small streams.

The *Sofia Basin*, situated between the Balkan and Rodopi highland regions, is on the great route from central Europe to Istanbul and the East, while the Iskar and Struma give passages to northern Bulgaria and the Ægean Sea respectively. Due to this nodal position, the city of Sofia has had a long history, and it is now the capital of Bulgaria, with 300,000 people.

The soil conditions of the elevated basin, however, are not favourable and the climate may be rather severe ; the chief grain crop is a hardy mixture of rye and wheat, and potatoes and vegetables occupy much of the cultivable land, though in the more sheltered positions there are extensive orchards.

The Eastern Lowlands.—This is the part of the peninsula which is distinguished by steppe-like or almost steppe-like conditions. Together with the Walachian Hill-lands, it forms part of the sub-region of Temperate Europe called the "Drier South-eastern Lowlands," marked "10" in Fig. 21, and it comprises the following areas. The *North Balkan Low Plateau* is formed of almost horizontal layers of limestone, which give a uniformity in scenery, although in parts layers of clay and loess add greatly to its fertility ; on the great plains maize and wheat are produced in large amounts. Only in a belt of foot-

hills adjoining the Balkan Mountains is there any marked variety in relief and any extensive growth of trees.

The *Black Sea Coast-lands* are varied in structure and relief. The higher lands have oak woods, low scrubby growths and poor pastures used mainly for sheep, but the lower lands are cultivated with barley, wheat and maize, and fruit trees. Situated by inlets due to subsidence are Varna and Burgas, the two ports of Bulgaria ; the latter has the greater amount of trade because of its more direct railway communication with the chief towns, Plovdiv and Sofia.

The *Plovdiv Basin*, open only to the east, has rather extreme temperatures and a low rainfall; consequently its most prosperous agriculture depends on the natural water-supply being supplemented by irrigation. With this help the meadows yield good pasture, the fields bear wheat, tobacco and even some rice, and the slopes have orchards of warmth-loving fruit. Plovdiv, on the banks of the River Maritsa, and on the main commercial route, has over 100,000 inhabitants.

Communicating with this basin, and sheltered from the north by the Balkan Mountains, is the narrow but very fertile valley of the upper Tunja ; it is famous for extensive gardens of roses, from which scent is distilled.

The *Edirne Basin* is the southernmost of the steppe-like Eastern Lowland regions. Cultivation, mainly of barley and rye, has not widely developed, except in the river valleys ; in these, however, even cotton and rice are grown to a limited extent, for the summer heat is considerable. The basin is drained by the lower River Maritsa, which forms the boundary between Greece and Turkey ; Edirne, at the junction of the Tunja and the Maritsa, is in Turkish territory.

The Marmara Region.—The main significance of this region, situated along the north-western shores of the Sea of Marmara, lies in its position at the crossing from one continent to another.

Near the southern end of the Bosphorus, a small inlet known as the Golden Horn gives good harbourage, and here in ancient times arose the city of Byzantium, later called Constantinople ; when the Roman Empire was divided into two parts in A. D. 395, the city became the capital of the Eastern or Byzantine Empire as well as the centre of the Eastern or Greek Church. For many centuries it was the focus of the civilization and trade of

all the lands around the Eastern Mediterranean. In A.D. 1453 it was captured by the Ottoman Turks from Asia Minor, and its trade declined ; in recent centuries its chief importance was in being the capital of the Turkish Empire, which extended far into Europe. When, after the war of 1914-18, the Turkish territory in Europe was restricted to its present small limits, the capital of Turkey was removed to Ankara in Asia Minor, and the old capital, now known under its Turkish name of Istanbul, lost much of its significance.

Yet Istanbul still has a population of nearly a million, if the suburbs of Galata and Pera on the opposite site of the Golden Horn, and Uskudar (Scutari) across the Bosphorus, are included. The city has a markedly Oriental appearance, with the numerous cupolas and tall minarets of its mosques.

The Greek Region is that which is most truly Mediterranean in character. On the mainland it almost coincides with the political territory of Greece, and it includes the iEgean islands.

The region is composite, in that it is formed in the main of three types of country, distinct in character, though intricately associated in situation. First, there are the mountainous areas, broadest and highest on the mainland, but reappearing on the larger islands. They are usually rugged in their relief, and have only a sparse population living in small villages in the valleys ; on the heights are summer pastures for sheep and goats which winter in the adjoining lowlands.

In marked contrast are the low and level basins ; the largest of these afford relatively extensive lowlands, e.g. by the lower courses of the Struma and Vardar, by the northern coasts of the Ægean, in the plains of Thessaly (marked " Th " in Fig. 59) and by the Ionian Sea. They have the possibility of considerable agricultural production ; wheat, and to a less extent, barley and maize, are grown, particularly in Thessaly, and tobacco on the northern plains. But marshes have in the past covered extensive areas, and, as in many of the Mediterranean lowlands, the mosquitoes which bred in the marshes made malaria a very serious scourge to the population. Now drainage is being carried out, malaria is being reduced, and cultivation, even including in some parts cotton, is being extended.

The third important type of country is that of the hilly coastal areas of the mainland and the islands. Such areas may have small lowlands, though for long stretches they are formed by

slopes terraced for cultivation. ' Cereals are grown, but the characteristic production is of olives, tobacco, grapes and other fruits. The grapes are in part used for the making of wine, in part dried and exported ; currants are obtained mainly from the southern shores of the Gulf of Corinth (whence the name " currant " was derived) and the neighbouring coast-lands of the Ionian Sea, and sultanas mainly from the island of Krete.

The other fruits include figs, locust beans, oranges, mandarines, and the lemons which are grown chiefly in the southernmost districts. On the northern shores of the *Ægesm* Sea mulberry trees are grown and silk-worms are reared ; the cocoons are mainly exported to the silk mills of western Europe.

Minerals, including iron, emery, magnesium, chromium and lead, are obtained in several parts of Greece, but in no large quantities ; industrial development is handicapped by a lack of fuel, though lignite is found on the island of Ewoia (Euboea) and the neighbouring mainland.

Fishing is another resource. Moreover, the people are further encouraged to become seafarers by the fact that the land traffic is hindered by the highlands of the interior and by mountainous spurs which reach the sea and almost isolate the more productive basins ; on the other hand, the numerous islands facilitate maritime communication between all parts of the *Ægean* region. The greater part of the population of Greece lives in the coastal lands, and here are situated the capital and the largest trading towns.

Athens was at first only a small city-state in one of the small basins bordering the *iEgean* Sea, but in it art and science developed in almost miraculous fashion in those centuries preceding the Christian Era in which Greece was the centre of a civilization to which mankind owes more than to any other. Traces of the former greatness are still to be seen in the temples and statues remaining in and near the city, but for a very long period Athens shared the decline of Greek civilization and power. With the independence and growth of modern Greece the capital has also grown, but the manufacturing which has recently begun to develop has not added to its beauty, although it has increased its population. Being a few miles from the sea, Athens has as its port the Piræus, and the whole conurbation has about three-quarters of a million inhabitants.

The chief port of Greece is Salonika ; its trade is considerably increased by an arrangement by which Yugoslavia has a " free zone " through which goods to and from that country can pass without paying Customs duty to the Greek Government,

QUESTIONS

1. Discuss what truth there is in the dictum : the Balkan Peninsula turns its back to Europe and looks to the Orient.
2. Describe the chief trade-routes across the Balkan Peninsula, and show how they are related to the physical geography.
3. Give an account of the mineral resources of the Balkan Peninsula. How far has their relatively slow utilization been affected by physical conditions and by human factors ?
4. State the limits, and describe the character and productions, of the " Mediterranean climate " areas of the Balkan Peninsula.
5. Describe the coastal areas and their hinterlands as they would be observed on a journey along the eastern Adriatic Sea from the Strait of Otranto to Trieste.
6. State the location of the chief farming areas in the " Temperate climate " region west of the Balkan and Rodopi mountains ; give an account of these areas and the work carried on in them.
7. In what ways, and to what extent, may the north-eastern part of the Balkan Peninsula be considered as transitional to the Steppe-lands of eastern Europe ?
8. Make a comparative study of the four cities : Athens ; Belgrade ; Istanbul ; Sofia.

CHAPTER XIV

THE ITALIAN PENINSULA AND NEIGHBOURING REGIONS

The North Italian Plain.—Between the Alps and the Apennines is situated the great lowland sometimes called the Plain of Lombardy, but better named the North Italian Plain. It is, as it were, a half-way house between central and southern Europe, for while on the one hand its climate (as explained in Chapter II) is of the Mid-Temperate type, on the other hand it is so cut off from the north by the Alps and so easily accessible from the south, that in its human geography it is closely bound up with the Mediterranean lands.

The North Italian Plain has been greatly influenced by the adjoining Alpine region, for the lowland occupies a great depression within the curve formed by the Alps and Apennines, and its surface is formed mainly by deposits brought down from these mountains and particularly from the Alps. Indeed, the differences between the various tracts constituting the North Italian Plain are largely due to the nature of these surface deposits ; they are generally more elevated and of coarser and drier material on the margins, and become progressively lower, finer in texture and wetter towards the centre and near the Adriatic Sea.

Constituent Regions.—The " *Morainic Amphitheatres* " which are grouped round the southern exits of some of the larger Alpine valleys, from the Dora Baltea to the Tagliamento, recall the regions of recent glaciation on the northern margins of the Alps (see Fig. 53). The " *amphitheatres* " have outer rings of irregular, and sometimes quite high, end-moraine surrounding areas of clayey ground-moraine ; the latter are sometimes wet and moor-like, but because of the southern aspect and lower altitude they are more responsive to cultivation than the northern Alpine margins, and indeed are in parts so sheltered from winter cold that fruit trees and even olive trees can be grown.

A continuous belt along the whole of the Alpine border of the plain, and another on the eastern part of the Apennine border,

may be termed the *Drier Margins*, as compared with the better-watered interior. On these margins, rather coarse material has been spread out by the streams ; it is often permeable and the water-table lies well below the surface, which is therefore dry and not remarkably fertile. In parts there are still some heath-lands or wood-lands, but most of the land has now been farmed. The productions are those which one would expect from the fact that the climatic conditions resemble those of the Rh&ne valley in the same latitudes on the other side of the Alps : maize is the chief grain crop, followed by wheat ; mulberry trees are grown for the culture of silk-worms, and there are vineyards and orchards.

The Well-watered Plains are of lighter material, and the soil is generally a fine and fertile loam. Much of the natural inequality of the surface has been obliterated in the construction of extensive irrigation systems. North of the Po, the water is derived from innumerable pools known as fontanili, which are mostly artificial reservoirs, fed by water which seeps out from below the coarser material of the drier margins, where this overlaps the finer deposits along the northern edge of the well-watered plains.

The water is available during the whole year, and during the winter and spring it has been kept at a relatively high temperature while beneath the surface of the northern margins. Consequently its warmth is very useful when in spring it is allowed to spread out over the meadows of the lower plains ; it aids the rapid growth of the grass, which is cut for hay six or eight times during the year. Cattle are stall-fed on this fodder, and milk and cheese are important products of the plain.

The streams, too, are used for irrigation, and the natural drainage system has been supplemented by canals ; some of these are employed also for transport. Irrigation is necessary for the flooding of fields for rice, grown either as an annually repeated crop or in rotation with others, such as maize and flax. There are also unirrigated areas dependent on the rainfall, and these also yield a great variety of products.

It is in this most thoroughly cultivated and extraordinarily productive region that the same field may be planted with lines of mulberry trees, with vines trained along them, and grain growing between the rows.

The *River-valleys* of the larger streams are generally broad and

liable to flood ; they are therefore less used and are avoided as building sites. The innumerable large villages and towns of all sizes in this densely populated plain usually stand away from the rivers ; it is noteworthy that between Turin and the sea there are only two cities on the River Po, and these, Piacenza and Cremona, are situated on the high banks on the outer side of the river-meanders.

The *Deltaic Areas* are of relatively recent formation, as is



[E.N.A.]

FIG. 62.—VIEW ON THE NORTH ITALIAN PLAIN.

Note.—Men are preparing a rice-field ; it is a shallow, rectangular basin irrigated from the canal shown in the background. On the banks are planted rows of pollarded poplar trees—a common feature of the landscape of the plain.

shown by the fact that Adria, from which the sea was named, is now 14 miles inland. The Po has seven distributaries ; these have deposited so much material that the other streams which once joined the Po, such as the Adige and Reno, have been forced into independent courses.

The rivers of this region have to be dyked to prevent disastrous floods, and reclamation like that of the Dutch polders has been undertaken. By the coasts, sand is washed southward by the counter-clockwise currents of the Adriatic, and sand-spits and dunes have cut off great lagoons.

The " *Hilly Enclaves* " are exceptional areas in the North Italian Plain, The largest is that of Montferrat, which may be thought of as a detached and lower portion of the Northern Apennines ; on its rounded slopes are orchards and vineyards and " Asti " wine is named from a town on its southern border.

In the north-eastern part of the plain rise the Berici and Euganean Hills ; they are formed partly of volcanic rock, from which trachyte was taken to build the palaces of Venice amid the coastal swamps and waters.

Communications and Cities.—The largest settlements are commercial centres whose positions are to a considerable extent related to the Alpine valleys which open upon the plain. The largest city, Milan, with well over a million inhabitants, is at the meeting-place of routes from the Simplon, St. Gothard and Spliigen Passes. Its nodal position, with roads and railways constructed from it to all parts of northern Italy, has helped to make it the most important commercial and industrial centre of the whole Kingdom. Water-power from the Alps has aided in its manufactures of silk and other textiles, and in engineering of all kinds; there is also much preparation of food-stuffs, and the city is a centre of book-production and publishing.

A similar development has occurred at Turin, where the route from the Mont Cenis Pass reaches the Po ; here, also, water-power from the Alps is used for a similar group of industries, including the construction of motor-cars and associated rubber manufactures. The population of Turin is approaching three-quarters of a million.

Where the more easterly and commercially less important Alpine valleys open upon the plain are a number of smaller cities, including Verona on the Adige.

An ancient route led from the crossing of the Po at Piacenza, south-eastward along the Dry Margins of the Apennines to the Adriatic coast, and along this route a series of towns grew up, including Parma, Modena and Bologna. The last-named city is the most important, for it is the crossing-place of the easiest route from Northern Italy, by the La Futa Pass through the Apennines, to Florence, Rome and southern Italy.

The one port along the difficult Adriatic shore of the plain is Venice, on the " safe " side of the Po estuary away from the current-drifted silt. Here, in the early Middle Ages, refugees from a Hun invasion of the mainland made a settlement on an

island. Later, Venice became the centre of trade with the East and arose to political as well as commercial dominance in the eastern Mediterranean. When the fall of Constantinople stopped the trade, the power of Venice declined, but its past wealth is still shown by the palaces standing by the canals which serve as streets. More recently the trade of Venice has revived, and there are plans to connect it by a ship-canal to **Milan** ; at present it has a permanent population of nearly a quarter of a million, and many visitors are attracted by its historic and architectural interest, and by the fashionable resort of the " Lido," the sand-spit which encloses its lagoon.

Peninsular Italy shows " Mediterranean " characters, with the exception of the north-facing part of the Northern Apennines. We have earlier made a distinction between the cooler part of the Mediterranean region in which the olive is the typical plant and the warmer part where the citrus fruits flourish ; following this distinction we may separate the peninsula into two sub-regions, central Italy and southern Italy, as shown in Fig. 63.

Central Italy.—The Apennines, the " back-bone " of Italy, consist of broad uplands which occupy a large proportion of the peninsula. In central Italy they curve round so as to leave a narrow coastal lowland by the Adriatic, while within the curve there is a wider area of generally hilly country facing the Tyrrhenian Sea ; thus there are three well-contrasted tract-groups in central Italy.

The Northern and Central Apennines.—The north-eastward curve of the Apennines shows some similarity with the outer, north-western portion of the curve of the Alps, for in both cases there have been overthrusts towards the outer side of the folded areas, and in both cases the rocks are largely either limestones, or flysch comprising sandstones, marls or clays. In central Italy the Apennines show the characters of more recent uplift, and broad terrace-like plateaus are divided by relatively narrow valleys.

The *Northern Apennines* are transitional in character, for they are " Mediterranean " only in the sheltered Riviera region. The climatic statistics for Genoa (see the table on p. 26) show that the winter temperatures are remarkably high for the latitude, and to such a degree that even citrus fruits here find **an** exceptional possibility of growth in the northern Mediterranean region. As in the French part of the Riviera, the tourist

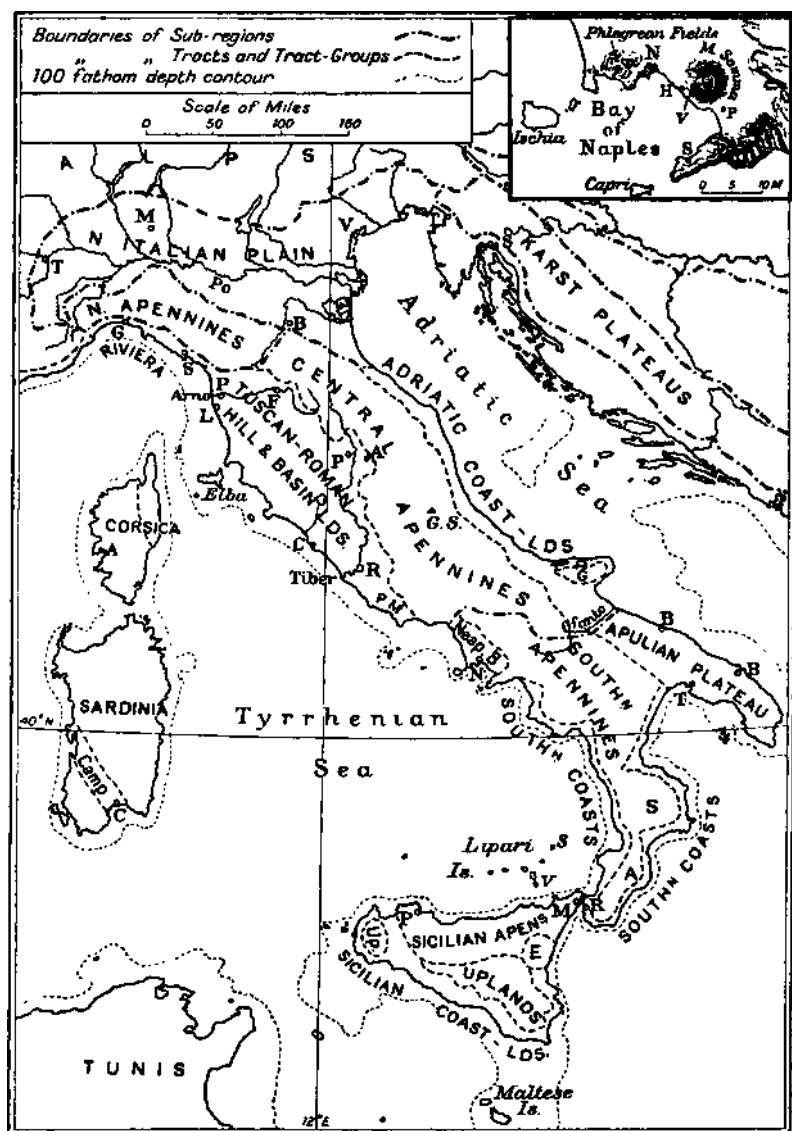


FIG. 63.—REGIONS OF THE ITALIAN LANDS.

industry has led to the rise of a chain of large and small settlements along the coast. Genoa is the great port, for behind it the Giovi and Bocchetta Passes give easy roads across the Apennines to the North Italian Plain, and thence by the Alpine routes to

central and north-western Europe. Around Genoa have grown up industries, especially, those connected with ship-building, and the population of the port numbers about 400,000 people.

Li a sheltered harbour farther east is the naval dockyard of Spezia. Near here the limestones of the Apennines have been metamorphosed into marbles which at Massa and Carrara have been for many centuries quarried and exported for buildings and statuary.

The Central Apennines.—These mountains rise to over 9,000 feet in the great limestone range of the "Gran Sasso d'Italia," the highest point in the peninsula. The more elevated areas are generally almost bare, and even at rather lower elevations there is little forest remaining; below the waste or *macchia*-covered heights there is a zone of chestnut woods, and the valleys are cultivated. In the *flysch* areas the peasants are menaced by land-slides and mud-streams, which result from heavy rainfall on the heights washing down unconsolidated marl and clay into the valleys. These "frane" rank with earthquake shocks as being as destructive in central Italy as the floods in the northern river-valleys, or as volcanic outbursts and earthquakes in the south.

On the plateau areas there is summer pasture for sheep and goats, and "transhumance" between the uplands and the lowlands on both sides of the peninsula is a feature of the life of central Italy. In the Apennine region east of Rome are deposits of *bauxite*, which are important as giving supplies of aluminium to Italy, a State rather lacking in mineral resources.

The Adriatic Coast-lands.—The low terraces of the eastern Apennines gradually descend to a coastal plain, which is very narrow for most of its length. It is, however, important in affording an easy land-route from the north to the south-east of Italy, and thence by sea to the Orient. In this part of the peninsula the coast is regular, with the exception of the spur-like promontory formed by the upraised and karst-like limestone block of Monte Gargano.

The Tuscan-Roman Hill-lands.—This is a region of complicated structure and correspondingly varied relief and character. There are hilly districts of ancient and crystalline rocks in which some iron, lead, quicksilver and other minerals are found; to these areas may be added the adjacent island of Elba, which yields iron ore. There are also districts of eruptive rock, and

others where recent volcanism has occurred ; the heat obtained from vapour from " fumaroles " is utilized in electrical power-stations. The Alban Hills south of Rome and the small lakes north-east of the lower Tiber are of volcanic origin.

Much of the region has been shaped by the erosion of sedimentary rocks of various composition, and the result is a land of numerous small ranges of hills, divided by narrow valleys or by wider basins. In general, it is fertile country producing the wheat, fruit, olives and wine characteristic of the northern Mediterranean region. The hills are often crowned by villages or small walled towns, built during earlier centuries in situations where defence was easy, although the peasants might have to go some distance to their fields. Perugia and Assisi, with their old buildings and beautiful outlook over the surrounding country, are small hill towns which attract many visitors.

By the coasts are small lowlands, once malarial marshes, but now reclaimed. South of Rome are what were formerly the Pontine marshes (" P.M." on the map in Fig. 63); here and by the mouth of the Tiber fields have been laid out and new cities have been built in the work of reclamation.

But if some features of the region are quite new, others are very old, for the history both of Tuscany and the Roman country goes back many centuries. Florence, on the banks of the Arno, with its palaces now used as museums and picture galleries, is still a rich treasury of mediaeval art and life, though around the old city tenement houses and factories of the machine-age have grown up, and raised its population to over a quarter of a million.

The chief port of the Tuscan area is Livorna (Leghorn) on the " safe " side of the mouth of the Arno. A few miles up the river is Pisa, once the port of Florence, but the silt of the river has destroyed its shipping trade, and, incidentally, proved an insecure foundation for the Campanile, which became the " leaning tower of Pisa."

Still older than the mediaeval buildings of Tuscany are the memorials of ancient Rome, the " Eternal City." In the beginning it was a small settlement built on " the seven hills " (merely the eroded banks of the Tiber and small side-streams) at a point where a narrowing of the swampy valley made crossing relatively easy. On this site the city became the chief town of Latium, and, when the power of its rulers increased, its central and accessible position enabled it to become the capital of their

extended dominions. In this respect the history of Rome resembles that of other capitals of Europe, but with the unparalleled growth of the Roman Empire it virtually became the centre, both politically and geographically, of the civilized world.

When the Roman Empire fell, Rome declined, but it recovered to some extent with the growth of the power of the Popes, and became the spiritual capital of the world. Yet although its central position in the Mediterranean made it a good centre for widely extended realms, it has no large productive area in its vicinity and it is off the main lines of commerce ; hence with the growth of trade near the end of the Middle Ages, Rome fell behind the other Italian cities in population, and its ancient buildings, streets and aqueducts continued to decay.

When, in 1870, the new Kingdom of Italy was formed, Rome became the political capital, while continuing to be the seat of the Papacy. The memorials of its ancient grandeur which remained throughout its chequered history, the many traditions of the past, and the reverence attaching to its spiritual eminence, —these have drawn to Rome visitors, and even residents, from all parts of the world.

Recently the growth of national feeling in Italy has led to restorations and improvements in the appearance of the city and to its development as the centre of the national life. Its population has increased, and now numbers considerably over a million people. Settlements have spread down the Tiber valley, where marshes have been reclaimed, but the chief port of the region is Civitavecchia, situated to the north, away from the sediment brought down by the river.

Southern Italy.—This is the part of Italy in which is experienced the full development of the "Mediterranean" characteristics of mild or even warm winters and pronounced summer drought, strikingly exemplified in the coastal regions on each side of the "toe" of the peninsula.

The Apulian Plateau.—On the Adriatic side, the low plateau of Apulia is exceptionally dry, and the limestone of which the region is formed is so permeable that there is no surface stream between the Ofanto and the far end of the "heel" of Italy, a distance of 150 miles. Nevertheless, there are fields of drought-resistant wheat, and the water-supply is carefully utilized for growing vines, olive trees and almond trees.

Round the coast there is a fairly considerable population, and

Bari and Taranto are fair-sized towns. Brindisi, which has a good natural harbour, is the port for traffic which has come as far as possible by the quick over-land route for mails and passengers to the East.

The Neapolitan Basin.—On the opposite side of the peninsula is the Neapolitan Basin ; it is separated from central Italy by uplands which extend from the main mass of the Apennines to the coast of the Tyrrhenian Sea. In the lowland around Naples the winters are appreciably warmer than at Rome, and warmer even than on the sheltered Riviera ; consequently the citrus fruits grow well. The Neapolitan Basin is an area of subsidence surrounded by macchia-covered limestone heights, and within the region are both alluvial and volcanic deposits ; here, as in several parts of southern Italy recent volcanism has important geographical consequences.

West of the town of Naples are the " Phlegrean (burning) Fields," a volcanic area in which small craters are to be seen and the " solfatara " still emit steam and hot, muddy water (see inset map in Fig. 63). East of the town the great cone of volcanic ash of Vesuvius rises to about 4,000 feet, capped by clouds of steam which occasionally rise to a glowing column ; at intervals there are outbursts of ash and streams of lava pour down the sides. Vesuvius stands within the broken crater of what was once a much greater volcano, Monte Somma, whose eruption in A.D. 79 destroyed part of its cone and overwhelmed the ancient cities of Pompeii and Herculaneum.

The lava of Vesuvius weathers to such a fertile soil that the peasants take the risk of cultivating the slopes for vineyards and orchards. Indeed, the Neapolitan basin in general is very productive ; besides grain, fruit and vegetables, tobacco and hemp are grown, and the region is densely populated.

The city of Naples is primarily the market and port of this productive area, and also for the wider region of southern Italy, of which at one time it was the political capital. There has been a recent growth of industries of various kinds, and there are many hotels to accommodate the visitors drawn especially by the interest of Vesuvius and the beauty of the Bay of Naples. The population of the city now numbers about one million.

The Southern Coasts.—From the Neapolitan Basin southward, and around the coasts of Calabria, the " toe " of Italy, are many small patches of lowland and stretches of terraced hill-sides on

which there is an intensive cultivation of vines and olives, figs and almonds, oranges and lemons.

Around these coasts and farther east on the peninsula of Apulia are the remains of Greek settlements, temples and statues, for here was "Magna Græcia," a region of Greek colonial expansion long before the rise of the power of Rome.

Facing the Strait of Messina is Reggio, a "ferry-port" for the narrow crossing to Sicily. The break between the peninsula and the island is due to faulting, and the earth's crust is here still so unstable that an earthquake in the early part of the present century reduced both Reggio and Messina almost to ruins.

The Southern Apennines.—Although at several points fertile valleys lead through these mountains, the uplands are less productive than in central Italy; the flysch districts are often poor and the limestone areas bare. In the far south the structure is different: the Sila mass (marked "S" in the map) is formed of granite and other crystalline rock, and has rounded heights reaching to over 6,000 feet, while Aspromonte ("A") is of gneissic rock, has sharper outlines and is of rather greater elevation. Although the highest parts are snow-covered in winter, the middle slopes bear deciduous trees and the lowest parts have extensive chestnut plantations. On the Sila there are great water reservoirs intended both for irrigation and for the supply of electricity for industrial development.

Sicily is essentially part of southern Italy. Its northern heights may be termed the Sicilian Apennines, for across the Strait of Messina appear mountains of gneiss like those of Calabria, while the rest of this area is mainly formed of massive limestone uplands.

By the east coast the great volcanic cone of Etna rises to a generally snow-clad summit 10,000 feet in height. Like Vesuvius, its slopes have small craters and lava-streams which menace the olive-yards, vineyards and dwellings of the very considerable population which has invaded it.

The rest of Sicily is, in the main, a much-dissected plateau of sedimentary rocks with a lower coastal zone, and these, too, have been well utilized. The interior of the island grows much corn, especially wheat, and by the coasts is an intensive cultivation of fruit, for which the climate is specially favourable.

But the sirocco wind, felt throughout the central and southern parts of the Mediterranean, blows here frequently and very

unpleasantly. It is a southerly wind accompanying the passage < of depressions along the Mediterranean Sea, and it brings very hot and dust-laden air from the North African desert.

A minor resource of Sicily is sulphur, but this is now of less importance than formerly. Many tourists come to enjoy the warm and sunny climate, the beautiful scenery, especially in the neighbourhood of Etna, and the memorials of ancient Roman and Greek occupation. With its varied resources, and the export of much wine and citrus fruit, the island supports quite a dense population. On the east coast is the port of Catania, with a quarter of a million inhabitants, while on the north coast the capital, Palermo, has nearly half a million people.

The Lipari, or Molian, Islands, which emerge steeply from the Tyrrhenian Sea, are of volcanic origin; Stromboli is almost constantly in eruption, and on the island Vulcano, from which the name volcano was derived, there is occasional activity.

The Maltese Islands are small limestone areas which rise from the shallows separating the eastern and western basins of the Mediterranean. They are most thoroughly cultivated, and are extraordinarily densely populated. They are a British possession, valuable as affording a port of call and a naval base on the Mediterranean route to India and the East.

Corsica and Sardinia.—In the main, these islands are composed of great masses of granite and other crystalline rocks which have been caught up among the folds of Alpine date. They are the highest parts of a belt of the earth's crust which has escaped the great subsidence of the Tyrrhenian Sea on the one side and of the western basin of the Mediterranean on the other. A rift-valley cutting off the south-western corner of Sardinia stands only just above sea-level and gives a lowland, the Campidano, which is exceptional in these high and cliff-bordered islands.

The very irregular relief and considerable altitude of much of the land would greatly limit cultivation, while parts of the coastal lowlands and the Campidano of Sardinia are naturally swampy and malarial. There have been recent improvements, but on the whole human agency seems to have brought about a deterioration of the natural conditions, for the widespread destruction of forest has led to the growth of almost valueless maquis over a great deal of the country.

Olive-yards and vineyards are cultivated at various parts of the coastal belts of both islands and in the Campidano lowland,

while on the uplands there are rather poor pastures for sheep and goats. Sardinia has a considerable amount of ores of lead, zinc and iron, and these are exported for smelting in Italy.

The capital of Sardinia, Cagliari, is a rather small town, and Ajaccio, the capital of Corsica, is still smaller, though it is the centre of a tourist industry attracted by the natural beauty of the island.

Sardinia is the least populous part of the Kingdom of Italy ; with about the same area as Sicily it supports only about a quarter as many inhabitants. Similarly, Corsica, which is one of the " departements " of France, ranks among the least densely populated areas of that country.

QUESTIONS

1. **Write** an account of agriculture in the North Italian Plain, tracing as far as you can the causes of the facts you adduce.

2. Make a reasoned study of the cities of North Italy, with special reference to their commercial and industrial development.

3. **How** far is it true that the Apennines are an unproductive barrier between the productive lowlands of Italy ?

4. What differences of climate can be observed in Peninsular Italy (apart from mountain regions) ? Show how these differences are related to the positions and productions of the various parts of the Peninsula.

5. Make a study of Rome and its evolution in relation to its site and its position both in Italy and also in the Mediterranean Lands as a whole.

6. Compare and contrast the islands of Sicily and Sardinia in as many respects as possible.

7. Examine the mineral resources of Italy with special reference to its industrial activities.

8. State and account for the broad features of the distribution of population in the mainland territory of Italy.

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VOLUME II

EUROPE

BY

J. F. UNSTEAD, M.A., D.Sc.

**FORMERLY PROFESSOR OF GEOGRAPHY IN THE
(UNIVERSITY OF LONDON)**

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PREFACE

THIS study of the lands and peoples of Europe is written primarily for the use of students taking " Intermediate " or " General " courses towards a University degree, " Higher School " examinations, or courses in Training Colleges.

It aims at providing a twofold training : in the first place it not only presents facts but points out their significance and how they may be correlated ; in the second place, it shows the interaction between the facts of geography and those human affairs, economic and political, which are the concern of all.

From both points of view a study of Europe is important. To the geographer, this continent offers a great variety of conditions within an area small enough to be studied in some detail and with some approach to actuality. To every man, the economic and political affairs of Europe influence his own life whether he lives within the borders of the continent or beyond the seas.

Yet a study of Europe involves considerable difficulties, for it is scarcely too much to say that it confronts one with a mosaic of geographical units, a jig-saw puzzle of nationalities and a kaleidoscopic picture of States ; one has to work out a method of recognizing order and causation in this complexity, for the three factors cited above overlap and conflict in a most confusing manner. In many cases, the natural unit of the geographer, e.g. the Rhine Rift Valley, the Alpine Highland or the Lower Hungarian Plain, is inhabited by people of more than one nationality and divided among two or more States ; again, the fact that the limits of the nationalities by no means correspond with those of the political divisions is the origin of some of the most serious problems of Europe.

Because the various States bear so little relationship to geographical regions, and also are liable to sudden and catastrophic changes, it seems to the writer impracticable to arrange a study of Europe according to the political divisions ; hence this book has three parts.

Part I makes a general survey of the continent as a whole—its relief and structure, its climates, soils and vegetation, the

types of land-utilization and production and, by combining these factors, the major geographical regions; at this stage, also, a general survey of the peoples and States of Europe is given. The broad pattern of the distribution of the physical and human elements is thus brought out.

Part II presents a more detailed study on the basis of the natural or geographical regions which comprise the continent : the major and minor regions and, except in eastern Europe, the sub-regions. These are treated as units, and in each the interrelations of the physical and human factors are considered. This is the longest section of the book, and in it the economic conditions are given special attention.

In Part III each of the States is dealt with in turn. Their physical and economic foundations are reviewed, the peoples who form their populations are considered, and an examination is made of the boundary changes of recent years and of those international problems which are either influenced by geographical factors or have geographical effects. In this section, facts are stated without prejudice, causes and consequences are pointed out, but judgments are deliberately withheld as unsuitable to a geographical text-book.

The relative space allotted to the various parts of the continent has been determined partly according to their importance as the homes and work-places of large populations or of characteristic groups of people, and partly according to the nearness to Britain.

A large number of maps have been specially drawn to illustrate the text. These deal with all aspects of the geography, but the available space has been used to supplement, not to duplicate, the maps to be found in atlases; it is assumed that an atlas will be constantly used with this book.

Questions have been added, in many cases designed to require a reconsideration of the facts and ideas already given and to promote individual thought.

The writer cordially thanks Mr. L. Brooks, M.A., Mr. G. J. Cons, M.A., Professor C. B. Fawcett, Dr. H. A. Matthews and Dr. S. W. Wooldridge, who have each read the draft of parts of the book and have given advice which has been gratefully accepted.

J. F. U.

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NOTE

IN March, 1939, while this book was being printed, the State of Czecho-Slovakia was dismembered ; Germany established one Protectorate over Bohemia and Moravia and another over Slovakia, while Hungary annexed Ruthenia (Carpatho-Ukraine). The political boundaries on the end-paper maps have been altered to conform with these changes, and on pages 344 and 345 the geographical consequences are described in such a way as to bring Part III of the book up to date. The statements made in Chapter XIX regarding the States of Germany and Hungary must therefore be modified by the facts given on pages 344 and 345.

The account in Chapter XIX of the conditions of Czecho-slovakia, as it was just before March, 1939, explains the fundamental political and economic factors in the problems and relationships of the three States ; many of these factors, though modified in certain respects, still remain and are still important in the human geography of Central Europe. Similarly, the map of the earlier boundary changes in Czecho-Slovakia (Fig. 80) is still useful in showing important features of the areas which have now passed into the possession of Germany and Hungary.

In April, 1939, following disagreement between the governments of Italy and Albania, Italian troops overran Albania. The King fled, a group of Albanians offered the Crown to the King of Italy, and the two States were thus united.

April, 1939.

PART I

EUROPE AS A WHOLE

CHAPTER I

RELIEF AND STRUCTURE

Introduction.—If we want to understand the nature of any region and the manner of life of its people, and we trace back to the reasons for the facts, we find that the most fundamental consideration is the position of the region in the world—its situation on the globe.

That position has, in the past, determined the way in which the region has shared in the great earth movements which have, for example, raised some areas to broad highlands, subjected some to foldings producing mountain systems, or lowered others, in some cases even below sea-level; in other words, the position has determined the broad features of the relief and structure of the region.

The main characteristics of the climate are similarly due to its position on the globe, which exposes the area to the influence of the sun and to that of one or more great wind-systems, while the relief also influences the climatic conditions.

Climate and relief together are directly or indirectly the chief factors conditioning the type of vegetation which can live in the region, and this in turn has a great influence on the agricultural and pastoral work by which many of the people get their living.

Of course, the environment of a people does not *determine* their work, nor their particular manner of life, for different peoples are at different stages of development and have different traditions and habits. Yet the position of a region in relation to other regions, either near at hand or far away, has been one of the main factors in aiding the immigration of peoples and ideas, and so affecting the character of the population and their mode of life. Moreover, the incentives and opportunities which their environment may offer influence their further development.

The position of regions may therefore be regarded from several points of view, and in each of the earlier chapters of this book, which deal with the general characteristics of Europe and its peoples, we shall examine the position of the continent from the particular aspect with which we are concerned. Accordingly, we will now consider how the varied relief and structure of the continent are related to the situation of its constituent regions.

A relief map of Europe shows at once a marked contrast between the relatively level and unbroken east, and the remaining part of the continent which is diversified by many uplands and lowlands and, moreover, is divided by invasions of the Atlantic waters and by inland seas. This fundamental distinction as to relief and outline affects practically all aspects of the physical and human geography of the two contrasted regions, known sometimes as "Trunk Europe" (because it forms part of the great trunk of the Euro-Asiatic land-mass) and "Peninsular Europe" respectively. The cause of the contrast lies in the fact that whereas eastern Europe is situated in a part of the globe which has been relatively stable through much of its geological history, the rest of the continent has been involved in repeated disturbances and dislocations of the crust of the earth.

In Peninsular Europe, on the north-west margin of the continent, one group of highlands stands out clearly and will be first considered.

The North-western Highlands.—The Highlands of Scotland-and-the north of Ireland resemble in many ways, though on a smaller scale, the Highlands of Scandinavia because they have shared the same geological history."

Some of the rocks comprising these regions were formed before the Palaeozoic Era, i.e. before any life appeared upon the earth ; even at that time the surface was contorted, and these earliest rocks were folded into great mountain ranges, but of these denudation has by now removed all but the deepest roots.¹

During the Palaeozoic Era other rocks were formed, and in the Devonian Period there occurred a series of dislocations of the earth's crust which were called the " Caledonian " earth-movements because their effects were studied in the structure of Scotland. At this period the rocks were subjected to great

¹ A time-sequence of the geological periods and the great earth-movements is given in Appendix I.

foldings in a general south-west to north-east direction. As a result the Caledonian mountain system arose, which extended over all the region now forming the north-western margins of Europe (see Fig. 1), including Spitsbergen far to the north of Scandinavia. In the course of these disturbances much of the rock was metamorphosed into crystalline forms, including schists and gneisses, while there are also large areas of granite, gabbro and other resistant igneous rocks.

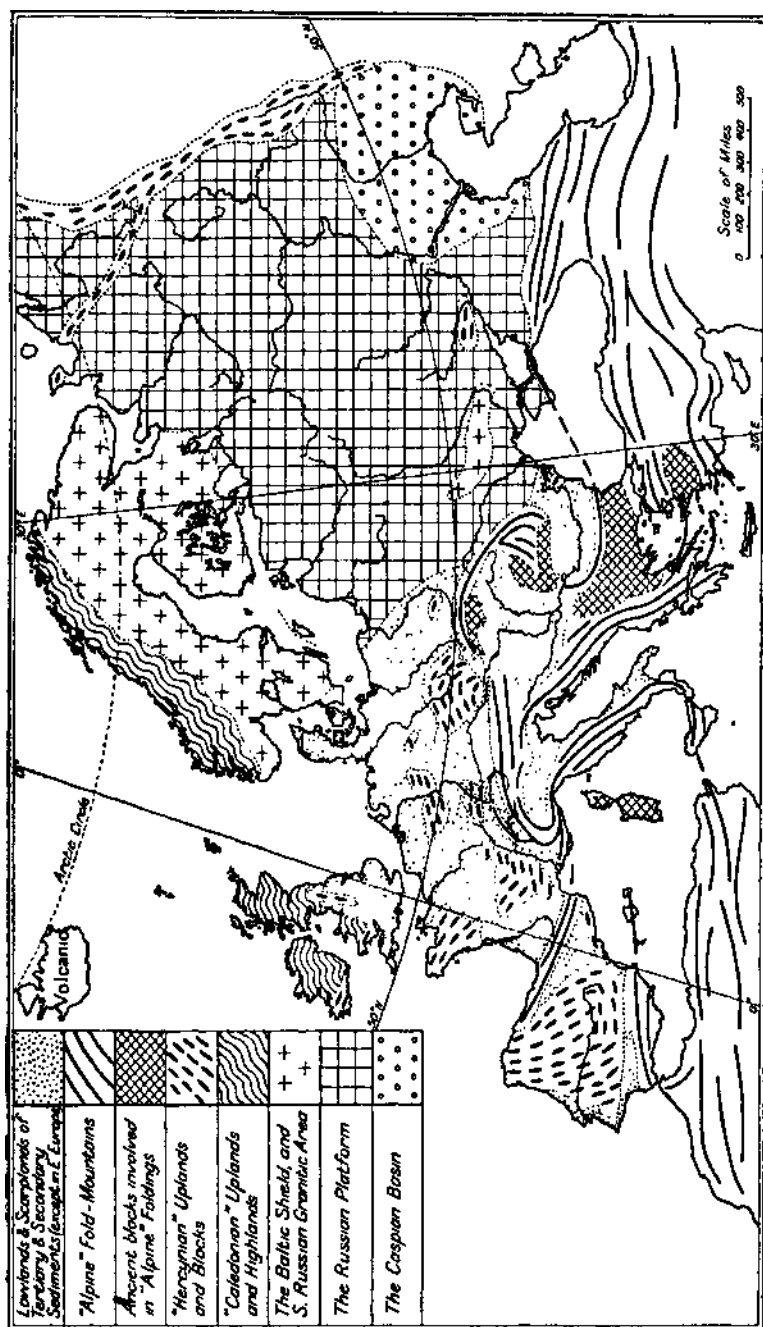
From this period onward through the Secondary Era the great mountain system was worn down to the condition of a peneplain, and only its stumps remained. Then, in the "Alpine" earth-movements of the Tertiary Era, the region again suffered disturbance, this time by faulting and the uplift of some of the resultant dislocated blocks and the subsidence of others. At this time, too, that part of the earth's surface now under the Atlantic waters was detached from the continental platform from which the lands of Europe rise, and the present shape of this margin of Europe was determined.

On the continental side, the blocks were raised probably in more than one stage, so that a low terrace-like step was formed between the sea and the great plateaus which in the Dovre Fjeld now reach over 7,500 feet and in the Jotun Fjeld over 8,000 feet (see Fig. 2). Moreover, the area was dislocated by faults running in several directions, and along these cracks there occurred both subsidences and also lines of weakness along which rivers eroded deep valleys in the plateaus.

Through such cracks and vents in the earth's crust, the pressures associated with the Alpine disturbances forced volcanic material in a number of places, and the Faroe Islands and Iceland in the far north-west are almost entirely formed of these volcanic accumulations.

In the Ice Age, snow accumulated on the high plateaus and ice was formed which worked its way down the valleys, deepening them and changing their section from V-shape to U-shape. In many other ways, too, glaciation played a part in producing the present relief; and its general importance is so great that we may at this point consider it further, although its influence extended far beyond the limits of the North-west Highlands.

At one stage the climate was so cold and precipitation was so great that the great ice-sheet from the Scandinavian Highlands and the smaller ones from the British Highlands extended south-



ward as far as the broken line marked as the maximum extension of the ice on the map showing the distribution of glaciation (Fig. 3). After this period, the climate became warmer, the southern part of the ice-sheet gradually melted and its edge lay progressively farther north ; this continued until the climatic improvement ceased and the margin of the sheet remained in the same position. Here lines of terminal moraine, composed of boulders, gravels, sands and clays, marked the end of this stage in the retreat of the ice. In the area between the outer margin of the earlier ice-sheet and the terminal moraines, there was now visible a layer of boulder-clay, the ground moraine formed below the ice in its wider extension. Also, melted ice-water washed away clayey and sandy material from the later terminal moraines, and much of this was deposited upon parts of the ground moraine ; occasionally such sheets of gravel and sand covered considerable areas. At later periods, with other climatic changes, the ice-edge withdrew farther, and the various stages in the retreat of the ice are therefore marked by alternations of lines of very irregular and often hilly terminal moraines, and flatter stretches of clayey or sandy character. Since the farthest southward advance of ice occurred, there has elapsed sufficient time for streams and weathering to reduce considerably, and to smooth out to some extent, the glacial deposits, but some of the later series remain so little affected that they dominate the landscape and largely control the way in which man uses the land.

An important effect of the ice was to obstruct or alter the courses of the streams, and in many parts this is now shown by rapids in the rivers and by the presence of lakes or swamps. Immature river-development and poor drainage are frequent characteristics of glaciated regions.

In general, the areas from which the ice worked its way outward are those in which its scouring action predominated, while the marginal areas of glaciation are those of deposition. Hence, over parts of the North-western Highlands region the soil was completely worn away and bare rock is the witness of the action of the ice, while in other parts are the coarse gravels and sands of the later terminal moraines. Taken as a whole, in the northern regions glaciation has made surface conditions more difficult for man's occupation and use ; on the other hand, some of the glaciated regions of central and western Europe have

benefited by the finely ground and fertile material brought from the north.

Another very important element in the evolution of the North-western Highlands was a succession of changes in the relative level of land and sea which have occurred several times since the Alpine dislocations, and are still in progress. These changes

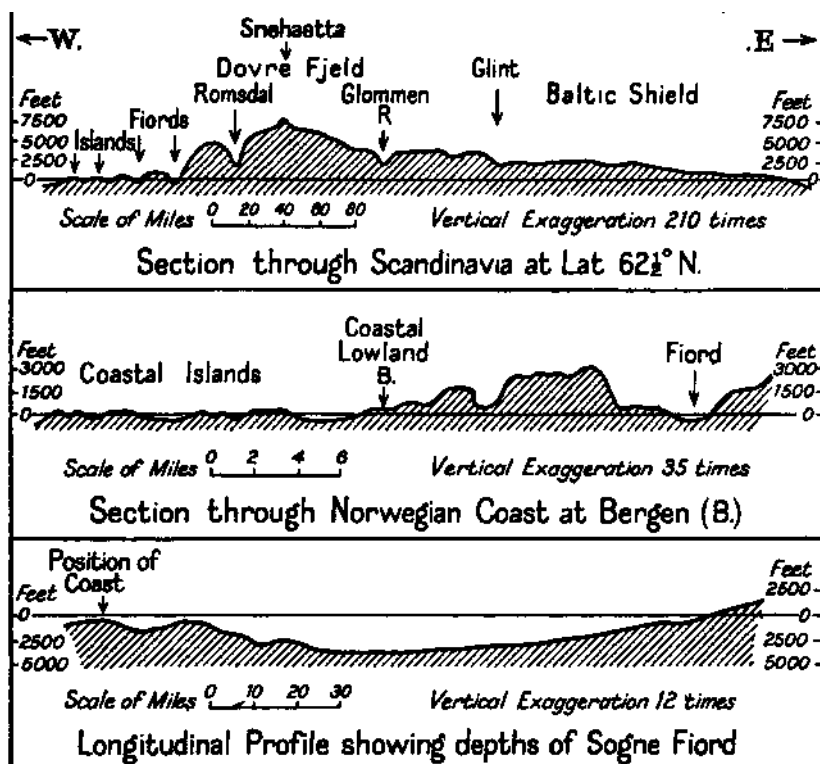


FIG. 2.—SECTIONS SHOWING RELIEF OF SCANDINAVIA.

may be due either to alterations in the level of the sea or to the slow risings, sinkings or tiltings of the land masses; in this part of the world the broad result has been a general sinking of the continental margin as compared with the Atlantic waters, and consequently the shores have been partially "drowned." The low terrace off the Norwegian coast has been reduced either to several small archipelagoes or to narrow patches of lowland extending beyond the highlands (see middle section in Fig. 2).

Also, the lower parts of the valleys, whether due to faulting, to stream erosion, to scraping and deepening by ice, or to a combination of these processes, have been invaded by sea-water and have become the wonderful fiords, with great side-branches leading inland, in some cases for scores of miles. Usually the fiords have steep or even vertical sides, rising to many hundreds of feet, while below the quiet waters are corresponding depths (see bottom section in Fig. 2). Apart from the narrow patches of coastal lowland the only habitable areas are either at the heads of the fiords or at the sides where old terraces interrupt the mountain slopes ; they give landing-places when they are at the water-level, and fields and pastures when they are a little above it.

The influence of this history and its resultant land-forms on human occupation will be considered in detail later. Yet it may be at once observed that it is in the main unfavourable, although the indented coast affords harbours for seafaring. Less obvious is the fact that the enormous amount of denudation has brought the surface of the earth down to the level of the minerals, originally formed in the depths, and now able to be reached by man ; iron and copper ores are therefore among the rather scanty resources of the Scandinavian Peninsula (see Fig. 6).

Another very important result of the geological history is the modification of climatic conditions by the upraised continental margin bordering the ocean. The precipitation of rain or snow is concentrated, as it were, along the coast and on the neighbouring mountains, while in the lee of the great barrier the Baltic lands are relatively dry. Similarly, the moderating influence of the oceanic winds is mainly limited to the Atlantic margins ; behind the highlands continental conditions at once begin, and from Sweden right across north-eastern Europe and far into northern Asia extend regions where the long, severe winters allow the growth only of the tundra or coniferous forest vegetation.

. **The Baltic Shield.**—The Scandinavian Highlands descend, often by a marked drop, known as the Glipt (see Fig. 2), to a great region which dips gently eastward under the Gulf of Bothnia and rises again in Finland, thence sinking in northern Russia till its border is largely covered by the waters of the Arctic Sea, the White Sea and Lakes Onega and Ladoga. Because this

region is slightly concave towards its centre under the northern arm of the Baltic Sea, and thereby resembles an inverted shield, it has been termed the Baltic Shield. It is one of the most ancient land surfaces on the globe, for it is composed of highly resistant granites, gneiss and crystalline schists which, although folded in the dim geological past, before life appeared upon the earth, have remained almost undisturbed during and since the Palaeozoic Era. Faultings have let down parts where relatively small areas of Palaeozoic sedimentary rocks have been preserved,

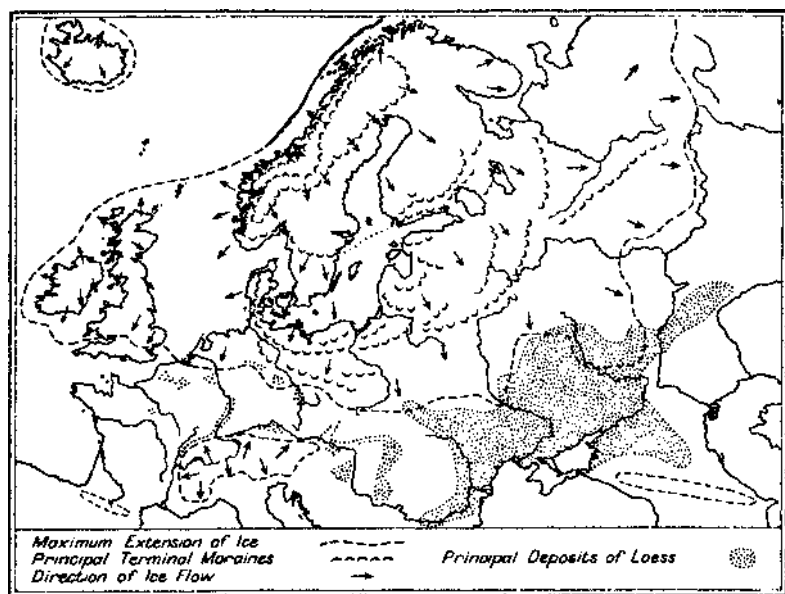


FIG. 3.—DISTRIBUTION OF GLACIATION AND LOESS.

and where the surface is rather lower than the rest, as, for example, in the "Lake Belt" of southern Sweden, in which are situated Lakes Vaner, Vatter and Malar.

For the most part the bed-rock forms undulating country in which the characteristic land-forms are due to glaciation. Near the southern margin there are long lines of hilly terminal moraines, behind which the glacial deposits are still so abundant and so recent that rivers have not been able to develop mature drainage systems. Their courses are irregular, and lakes are numerous. In central Finland, indeed, lakes and marshes cover much of the country and the roads make use of long,

narrow, winding ridges which stand above the waters; these are asar, or eskers, trains of gravel and sand deposited beneath or on the margins of the ice-sheet.

Yet over large areas the naked rock is exposed, for much of the soil was scraped away by the ice and transported to the surrounding regions ; nor was this loss remedied in the lower areas near the Baltic Sea and the Gulf of Bothnia by the deposit of sandy or clayey material when, for a time, the waters spread farther over the land.

Although the ancient rocks contain certain minerals, the Baltic Shield has proved a generally inhospitable region to man, even apart from its climatic conditions.

3. The Hercynian Uplands.—As the mountains of the north of the British Isles are akin to the Scandinavian Highlands, so the uplands of the south of Ireland and of the south-west of England and Wales are akin to a number of others scattered widely over the continent. They are known as the Hercynian Uplands because they represent fragments of mountain systems folded in the Hercynian earth-movements which occurred at the close of the Carboniferous Period. These mountains were continuous over great areas, though their traces are now found only in scattered fragments, and their folds ran in various directions. In the south-west of Britain and the adjoining region of Brittany, the general direction was about west to east with a trend to the south-east towards the centre of France, as is shown by the direction of the lines in these areas in Fig. 1 ; folds running in this direction are referred to as Armorican, from the ancient name of part of Brittany. In central Europe, however, the common direction is from south-west to north-east, termed Variscan, from the name of a tribe long ago living in the neighbourhood of the Fichtel Gebirge.¹ The Variscan direction is seen in the structure of the Rhine Plateau, which is cut across by the Rhine in its course between Bingen and Bonn, and also in the Harz Mountains, the Vosges and the Black Forest Mountains. In the Central Plateau of France both directions are seen, and still others appear in other regions, notably in the central tableland, or " Meseta " of Spain, in the " Diamond " formed

¹ Both the term " Armorican " and that of " Variscan " are sometimes used to denote all these foldings and all the regions of this type, but it seems best to restrict them as is here done, and to employ the term " Hercynian " in the general sense. " Hercynian " is derived from the old name of the Harz Mountains, one of the regions of this type.

by Bohemia and its margins, and in the Lysa Gora -Uplands of Poland. Even in eastern Europe are two similar Hercynian areas, viz. the Donetz Plateau in the south, and the Ural Mountains, with their offshoot, the Timan Uplands, on the borders of Asia.

The various mountains formed by the Hercynian movements have had a history somewhat like that of the older Caledonian mountains ; they were worn down to peneplains, so that the directions of the folds showed only in the strips of the various strata outcropping along the surface, like the graining of the wood in a sawn tree trunk. The Hercynian peneplains later suffered changes : over some areas they were depressed and upon them were laid down sedimentary rocks during the Secondary and early Tertiary Eras, and in the succeeding Alpine earth-movements they were considerably fractured, tilted, upraised or depressed.

Consequently much of what continuity they had previously shown has disappeared, only those parts which stand up above the surrounding lowlands being clearly recognizable as Hercynian Uplands of the usual type. These, which are shown as such on the map of structural regions in Fig. 1, were uplifted to plateau-like form, with more or less level surfaces, but denudation has since removed most of the overlying sedimentary rocks of Secondary and Tertiary date, and has exposed the older rocks of the peneplains with their graining ; even in this older rock the less resistant strips have been etched out so that the more resistant stand up above the general level as ridges running in the direction of the original mountain-folds.

Where an uplifted mass is bounded by clearly marked, and more or less parallel, faulted edges, it is known as a " horst," and such structures are common in the Hercynian Uplands. The converse of a raised horst is a rift-valley, which has subsided between two parallel series of faults. One very important rift-valley is that in which the Rhine flows between Basel and Mainz ; the parallel faults which bound it are shown in the map in Fig 46, and the section in Fig. 47.

In many cases, uplands due to dislocation rise steeply on one side where they are bounded by marked faults, and descend more gently in other directions ; structures of this kind are commonly known as " massifs " and are exemplified by the " Massif Central " or " Central Plateau " of France, which is fault-edged where it overlooks the Rh6ne Valley.

The dislocations which broke up the Hercynian areas allowed igneous material to be forced up along faults and through volcanic vents, and in several parts, notably in the Central Plateau of France, great sheets of lava and the remains of volcanic cones bear striking witness to this part of the history.

In the rocks of the Carboniferous Period which enter into the structure of the Hercynian regions, there were formed widely extending coal-measures containing seams of valuable coal, and these coal-measures were involved in the Hercynian foldings. Where they formed parts of the upfolds which were first denuded, the coal-measures have been worn away, but where they formed parts of downfolds or basins they have, to a certain

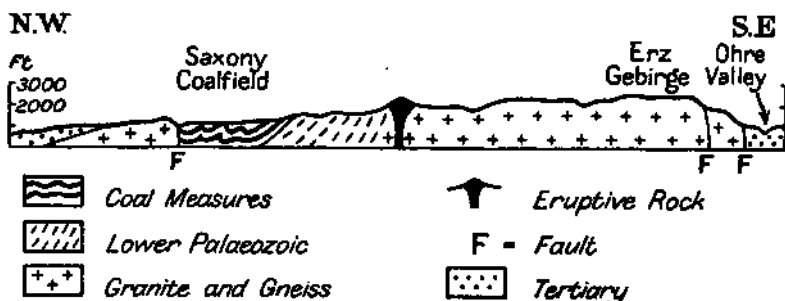


FIG. 4.—SECTION THROUGH THE SAXON UPLANDS, ERZ GEBIRGE AND EGER (OHRE) VALLEY.

extent at least, been preserved. Consequently there are important coal-fields associated with some of the Hercynian Uplands, and these, together with other mineral resources found in their exposed rocks, are the basis of mining and manufacturing industries which have attracted people to the mineral-bearing areas.

The structure of the Hercynian Uplands is illustrated in Fig. 4 by the section through the Erz Gebirge and Saxon Uplands; this area exhibits most of the elements described above.

Yet in general the Hercynian Uplands are not well populated, for they are not productive agricultural regions, since, as they stand above the surrounding lowlands, they have a relatively cool and moist climate, and also they do not usually bear fertile soils. Hence they naturally tend to be heath or moor lands or to be clothed with forests.

4. Central and Western Lowlands and Scarp-lands.—After the Hercynian earth-movements and the later wearing down of the resultant mountain systems, most of Europe, except the north, was submerged under the waters of seas or lakes. This submergence was, however, not uniform over the whole of the southern part of the present continent; some parts were beneath relatively deep seas in which was deposited the ooze from which limestones were formed, while other parts were covered by shallow seas or lakes in which clay-forming muds were laid down, while elsewhere sand was dropped which was changed to more resistant sandstones or remained in an unconsolidated form. Moreover, alterations in the depths of the various parts brought differing conditions first to one region and then to another, and thus at a given place there might occur first the formation of sandstones, then of limestones, and later perhaps of sands or clays.

Thus over wide areas of central and southern Europe there was a succession of deposits of varying composition during considerable parts of the Secondary and Tertiary Eras, and consequently thick strata of sedimentary rock covered platforms of more ancient formation.

Where, in the Alpine earth-movements, the platforms and their coverings of Secondary and Tertiary sediments were broken and upraised, the Hercynian Upland regions were formed as has been described above, but in the less-disturbed areas the strata remained at a lower elevation and the sedimentary cover was less exposed to denudation. In central and western Europe this was the case between and around the blocks of the Hercynian Uplands, where basins were formed such as those of south-eastern England and northern and south-western France, or where there were broader depressions, such as that on the southern shores of the North Sea and the Baltic Sea; in these regions the older rocks are still covered by a succession of sedimentary strata lying above one another in more or less saucer-like form or in an almost horizontal position, as is shown in the section through northern France in Fig. 38. v*

In other parts the rocks have a pronounced tilt, as in England west of the London Basin, in France west of the Vosges Mountains and in Germany east of the Black Forest Mountains; in such cases the less-resistant strata have been worn away, leaving the more resistant as long, tilted slabs, and giving to the

whole region a scarp-land character. This structure is shown in the section in Fig. 48.

Moreover, in the Ice Age, parts of these lowlands were invaded by ice, especially from the North-western Highlands, as was described above, and in such parts various deposits of clays, sands and gravels were laid down.

Frequently, fertile soils have developed upon the rocks of the lowlands and scarp-lands, and agriculture and pastoral work are carried on in such forms as the generally favourable climatic conditions have allowed.

Exceptional fertility marks the soils which have been derived from a mantle of loess covering the earlier deposits in certain parts of the central and western lowlands, and over a great area in south-eastern Europe (see Fig. 3). This loess resembles that of China in its composition ; it is fine-grained, loose and sufficiently porous to allow a free downward drainage of water after rain, and a slow upward movement by capillary-action in dry weather. Its existence in Europe is due to dry climatic conditions which occurred during and after the Ice Age, when southward-blowing winds raised clouds of dust from the finely ground particles of the moraine areas, and deposited them over the surrounding lowlands until a layer was accumulated, in the west often to a depth of scores of feet, and in the east to much greater depths. In central and western Europe the existence of the loess was specially important during the period of man's early settlement and cultivation of these regions, for loess areas were usually free from forest, easily worked and gave abundant return to the simple forms of agriculture then practised.

Minerals are not characteristic of the later sedimentary rocks, though iron ores were formed in some of the Secondary strata (again see Fig. 6), and lignite deposits are found in some of the Tertiary. Yet where the older rocks of the Hercynian Uplands dip down beneath the edges of the basins, the coalfields may extend beneath the younger strata, and therefore in several cases coal-mining has spread from the Hercynian margins some distance into the neighbouring lowlands.

Because of the subsidence of the basins and hollows, the waters of the Atlantic have invaded the lowest parts, and oceanic inlets or inland seas adjoin these lands and bring opportunities for fishing and trading. Hence the lowlands and scarp-lands of central and western Europe have varied resources, and as a

whole have become the most densely populated parts of the continent.

3. The Regions of " Alpine " Folding.—Great as were the changes brought about by the Alpine earth-movements in northern and central Europe, they were but small compared with those which entirely transformed the southern part of the present continent.

It appears that during a very long period about the middle of the Tertiary Era, the block of the earth's crust which forms northern Africa moved northwards towards the similar block forming the platform of ancient and resistant rock which in central Europe underlay the sedimentary strata of Secondary and early Tertiary date. The northward movement was irresistible: the older rock structures of central Europe were broken and displaced, while the younger, sedimentary strata of the south were contorted in a most complicated fashion.

In a general way it may be said that massive sheets of limestones and other sedimentary rocks were ridged up into folds along lines which formed great curves, as indicated in Fig. 1. These curves appear to sweep round from the south of Spain across the Strait of Gibraltar into the Atlas Mountains of northern Africa, whence they are continued across the central narrows of the Mediterranean Sea into Sicily and through the Apennine backbone of Italy into the Alps; even the Pyrenees and the Cantabrian mountains of northern Spain are linked with this system, which therefore almost completely encircles the area of the western Mediterranean. A small spur from the Alpine system is seen in the Jura Mountains.

On their eastern side the Alpine folds appear to spread out, both to the north-east in the Carpathian system and to the south-east in the Dinaric Alps, thus enclosing the lowlands of the middle Danube. The southern part of the Carpathian system swings round into the Balkan Mountains, so that between these and the southward continuation of the Dinaric Alps is another enclosed area in the neighbourhood of the northern part of the *Mæan* Sea. An eastward continuation of the Balkan Mountains is probably to be seen in the Yaila Mountains of the Crimea and in the Caucasus, while those of the southern part of the Balkan Peninsula are continued in the islands of the southern *Mæan* and curve again into the mountains of Asia Minor. Indeed, the whole system extends east-

ward across Asia on a still greater scale and culminates in the highest ranges of the world.

The term "folded" is, however, inadequate to describe the^T contortions which the strata have suffered (see Fig. 5). They have been squeezed together in most complicated ways, and on the outer side of many of the curves, sheets of rock (called "nappes") measuring hundreds or thousands of square miles in area, have been thrust bodily forward over other strata till

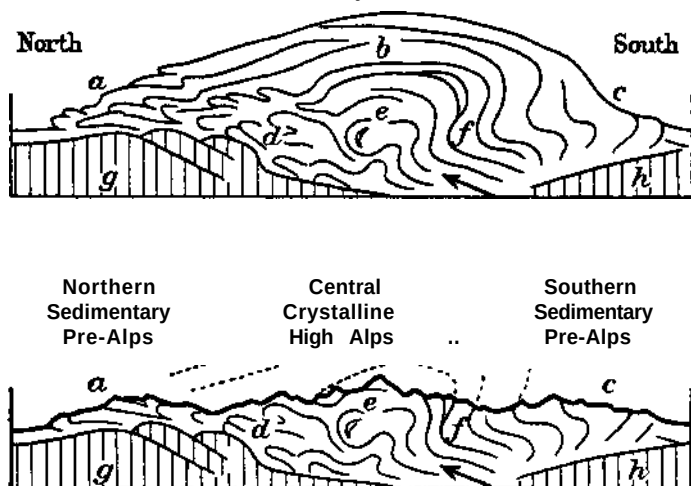


FIG. 5.—DIAGRAMMATIC SECTION THROUGH THE EASTERN ALPS.

(Vertical Scale greatly exaggerated.)

Note.—The upper diagram shows in a simplified form the contortions due to a thrust from the south. The underlying platform, *g* and *A*, is dislocated; the lower sedimentary rocks, *d*, *e* and *f*, are metamorphosed into crystalline nappes; the sedimentary nappes of the upper strata, *a*, *b* and *c*, are thrust northward (except in the extreme south), far from their roots.

The lower diagram shows the present constitution of the Eastern Alps after great denudation. In the central zone the crystalline nappes are exposed, and in the northern zone the sedimentary strata are left widely separated from their counterparts in the south.

they have been parted from their "roots" and now lie in regions far distant from those in which they were formed.

Under the pressures which have brought about such movements, some of the rock was metamorphosed into crystalline form; for example, a large part of the central Alps is composed of crystalline rocks which were thus formed. In some parts, too, molten material was forced up from the depths, and igneous rocks thus add to the complexity. Moreover, volcanoes were formed and are still to be observed, and even now earthquakes show that stability has not yet been attained in this part of the earth's surface.

The Alpine foldings have not only affected sedimentary rocks ; within them have been enclosed masses of older date and more resistant composition. For example, in the central Alps themselves are large areas, including the Mont Blanc massif, consisting of splinters of an Hercynian floor driven up into the folded pile above ; again, in the system of the Carpathians (in the wider sense of the name) is the great and ancient massif of the Transylvanian Alps as well as ancient fragments on the west of Transylvania and in parts of the Tatra Mountains.

Other blocks or massifs occur within the folded mountains of southern Europe, notably that between the Balkan Mountains proper and the western heights of the Balkan Peninsula ; here is the massif of which the Rodopi Mountains form the highest part. Again, within the curved folds of the western Mediterranean, there stand up ancient massifs forming the greater part of the islands of Corsica and Sardinia.

Another very marked, and very important, feature of the region affected by the Alpine foldings is the formation of great basins within the mountain system. These are of varying depth : in the western Mediterranean subsidences have let down the earth's surface over 10,000 feet below sea-level; the Adriatic Sea, however, is relatively shallow, especially in its northern part, and the North Italian Plain is essentially a continuation of this depression now just above the level of the sea. The iEgean Sea occupies another area of subsidence ; it is " half-drowned," and the higher parts of the previously continuous mountain chains form the islands which appear as stepping-stones between the Balkan Peninsula and Asia Minor. The southern part of the Black Sea is another well-marked basin; the north-western edge of the deeper area is the line of shallows showing the earlier connection between the Balkan Mountains and those of the Crimea.

A less-marked basin is that between the Balkan Mountains and the Transylvanian Alps where the relatively recent deposits forming the Walachian Plain stand above sea-level, and thus resemble those of the North Italian Plain.

Broadly similar in origin are the lowlands between the Alps and the great curves of the Carpathian system.

The Alps themselves, and to a less extent other parts of the great fold-mountains, reach such heights that, during the Ice Age, they bore ice-sheets which overrode the highest parts, and

in the case of the western Alps extended into neighbouring regions. The complex results of glaciation in the Alpine Lands and the Alpine Forelands will be described in later chapters.

The effects of the geological history on other conditions than structure and relief are very great; we can here only hint at a few of the results. There is the existence of the Mediterranean and Black Seas which separate Europe from Africa and southern Asia; these seas have physical influences, such as their warming influence upon the winter climate of the neighbouring lands, and influences upon human life, such as the way in which they have enabled civilization to spread all around their habitable coasts.

Corresponding to the variety in the rock structure and the relief of southern Europe is the variety of resources which include mineral deposits, Alpine pastures, mountain forests, broad inland lowlands and hill-sides facing the seas, all capable of human utilization; thus the extraordinary complexity of the geological history has been followed by an extraordinary complexity in the conditions of human life.

6. The Russian Platform.—In eastern Europe the physical development and the human history have been quite different. The ancient rocks of the Baltic Shield dip gently south-eastward, and form the substratum of the great structural region known as the Russian Platform. Apart from its margins, where there are the Hercynian areas of the Ural and Timan Mountains and the Donetz Block, the whole area between the Caledonian Highland system and the fold-mountains of the Crimea and Caucasus has remained almost unaffected by the later disturbances, and the most important movements have been relatively slight alterations in its general elevation as compared with sea-level. Because of these alterations, the area has been covered by the waters of seas of varying extent, and hence the ancient rocks which continue those of the Baltic Shield are covered in the north-west of Russia by deposits of Palaeozoic age, while farther to the south-east these are followed first by Secondary, and then by Tertiary, strata.

But because these deposits have lain almost undisturbed, they have not been subjected to pressures which would have changed their character, and in general even the oldest remain in much the same condition as those of recent formation; stone

which could be used for building or road material is a rarity over large areas of Russia.

The region is not of uniform elevation ; the Valdai Hills are over 1,100 feet above sea-level and form part of the water-parting between the rivers flowing north-west to the Arctic and Baltic Seas and those flowing south-east to the Black and Caspian Seas. The greater part of eastern Europe is less than 600 feet in height, while the land immediately north of the Caspian and the surface of that great inland lake are below the general sea-level of the globe.

Moreover, there have occurred warpings of the underlying platform which, although very slight if measured in degrees of slope, when continued over the great distances of eastern Europe have important consequences. The most marked of these warpings occurs in the south-west, where it brings up to the surface a belt of granite (Fig. 1); through this resistant mass the Dnieper River has been able to cut its southward reach only incompletely, and there are rapids which prevented navigation, but gave water-power now used for industrial purposes.

It must also be observed that all the northern part of the region has been glaciated, with results similar to those found in the plains of the central and western parts of the continent.

Because of its uneventful history, the Russian Platform has in general lacked the formation of mineral ores. Apart from some coal in the Palaeozoic strata near Moscow and iron in the granitic belt, the chief minerals are in the Hercynian areas of the Donetz and the Urals, where industrial development can utilize resources lacking over most of European Russia.

One consequence of the geological history is of the first importance. Undisturbed by the great forces which have led to such a complicated relief in the rest of Europe, the east has remained open, level country in close physical association with the similar lands of western Asia, for the Ural Mountains do not form an effective barrier of any kind. Hence the climates of western Asia are continued across " Trunk Europe " about as far as " Peninsular Europe." Similarly, the belts of natural vegetation, i.e. the tundras, the forests, the steppe-lands and the semi-deserts, extend unbroken from Asia across eastern Europe. Consequently peoples who have adapted their ways of life to each of these types of vegetation have worked their way, either westward or eastward, along almost the whole extent of the

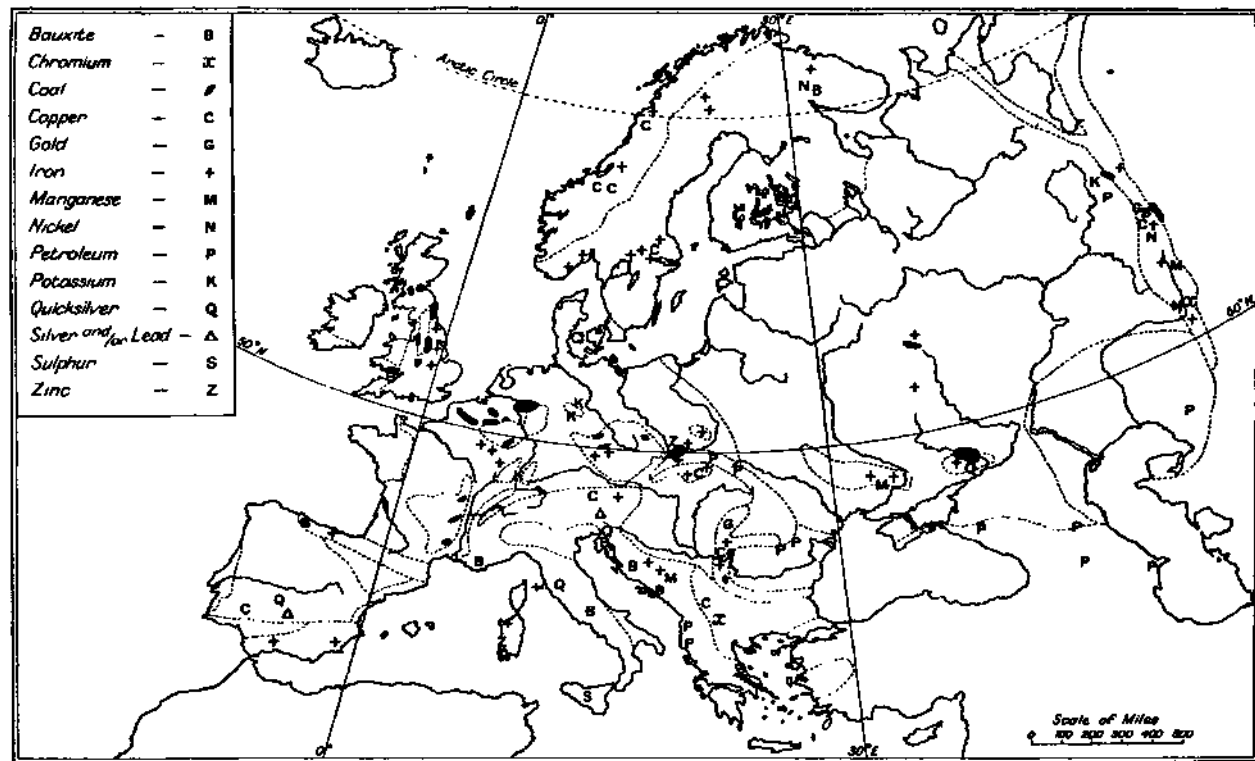


FIG. 6.—PRINCIPAL MINERAL WORKINGS.

Note.—There are also numerous lignite workings, especially in central Europe.

belts, and so kept western Asia and Trunk Europe in very close association from the human point of view.

7. The Caspian Basin.—Here is a region which is certainly more " Asiatic " than " European." It is a part of a great depression which includes the three inland seas : Caspian, Aral and Balkash. To this hollow flow the waters of the surrounding higher lands, and to the Caspian Sea the Volga brings the drainage from a large part of eastern Europe. With the water is brought down the material worn away by the rivers, and the Caspian Basin is covered partly by such recent alluvium and partly by deposits formed when a greater sea than the present one occupied the area.

Moreover, the formation of the Caspian depression, in causing the greatest river of Europe to flow, not towards the Mediterranean, but to the south-east, and to end in a lake without access to the oceans, has tended to hinder close association between eastern Europe and the remaining part of the continent.

QUESTIONS

1. How much knowledge of the Ice Age do you consider necessary in order to understand the present-day geography of the northern half of Europe ? Illustrate by reference to particular areas and their characteristics.

2. Certain parts of Europe may be referred to as being regions of " Alpine folding." Make a sketch-map showing these regions, and consider to what extent they have geographical, and not merely geological similarity.

3. What are the common structural characteristics of the " Hercynian Uplands," and how do these characteristics affect their utilization by man ?

4. Distinguish between four types of coast on account of their structure, and state their location in Europe. Give a description of any two of these types.

5. Define " Trunk " and " Peninsular " Europe respectively, and explain the fundamental causes of the contrasts between these areas.

CHAPTER II

CLIMATE

Wind Systems.—Over much of Europe, oceanic influences play a very great part in determining the climatic conditions, and the belts of wind systems which are developed over the oceans are therefore important. Since these belts lie in certain latitudes, the position of Europe as regards latitude must be first noted. On its southern margin, Europe forms the northern part of the Mediterranean area; Gibraltar is about lat. 36° N. In the north of Europe the Scandinavian peninsula extends well beyond the Arctic Circle; North Cape is about lat. 71° N.

As a consequence of this position, all the continent except the east, i.e. Peninsular Europe as distinct from Trunk Europe, comes under the influence of the great system of winds known as the "westerlies," which appear on wind maps as blowing from a more or less westerly direction, that is, from the neighbouring Atlantic Ocean, whose waters are exceptionally warm for their latitude because they have been brought from tropical regions by the Gulf Stream Drift.

It may therefore be deduced that the climate of Europe, in so far as it is determined by these westerly winds, is not only made equable, but on the average is exceptionally warm for its latitude; further, it may be deduced that these winds bring water-vapour which is precipitated as rain or snow over the land, especially on the windward side of the highlands.

But though there is truth in these ideas, there is the complication that the westerlies are not by any means constant, even in those parts where the maps show that the prevailing winds blow from the west in all seasons. In England, for example, the "prevailing" winds may be shown on a climate map as coming from the south-west, but this is the actual direction of the winds only for about 20 per cent. of the observations. Indeed, the most characteristic fact about the winds experienced in England is that they frequently change, depending upon the passage of low-pressure systems called "lows," "depressions" or, less

frequently, " cyclones," or upon the development of high-pressure systems or anticyclones.

Hence the belt of the westerlies may be usefully considered as a belt in which depressions are common and travel in a generally west-to-east direction. In these depressions are two main streams of air, one coming from a south-westerly or

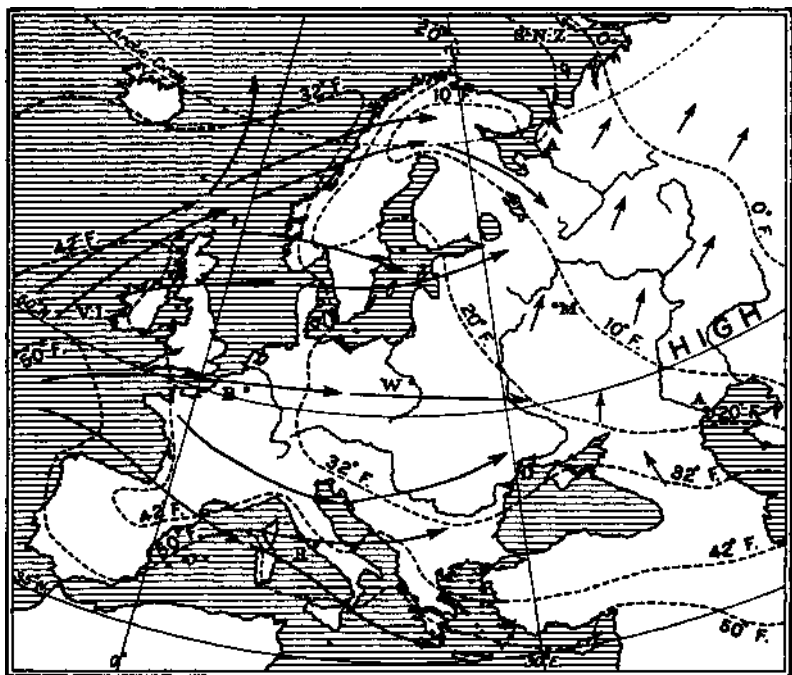


FIG. 7_JANUARY " LOW " TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean January temperatures reduced to sea-level.

southerly direction and bringing warmth and usually rain, the other coming from a north-westerly, northerly or easterly direction and bringing cool and dry weather. As the depressions pass over a given place, there are accordingly changes in the weather as the warmer and the cooler air-streams cover the area in turn ; on the whole, however, the " lows " bring rain, and on their southern side warmth, although cold weather may be found on their northern side. Since the centres pass most frequently over the northern part of Europe, it is their southern sections, with warmth and rain, which most affect the continent.

As the central parts of depressions are areas of low air-pressure, the regions over which they are most commonly found necessarily appear on maps showing the average barometric pressures as areas of lowest pressure, e.g. that between Iceland and north-western Europe.

On the contrary, anticyclonic conditions are marked by high

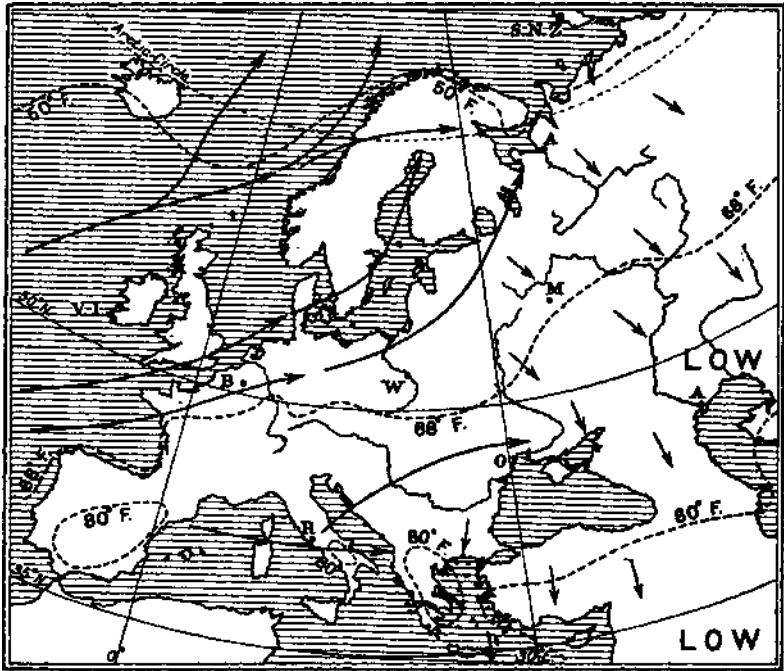


FIG. 8.—JULY "LOW" TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean July temperatures reduced to sea-level.

pressures, gentle winds or calms, and dry weather. Such conditions only occasionally develop within the belt of the westerlies, but they are more common on the southern side of this belt, that is, in the sub-tropical latitudes to the south of Europe, where the climate maps show relatively high average pressure.

Hence, one may shortly say that western Europe is in general under the influence of the belt of the cyclonic, rainy westerlies, while to the south of Europe lies the belt of sub-tropical calms and droughts.

The two belts, however, are themselves not always in the same latitudes, but shift with the sun, southward in winter and northward in summer. Consequently in winter the westerlies cover the whole of western Europe, and their depressions may fairly often pass over the Mediterranean area. In summer, on the other hand, the depressions leave the Mediterranean relatively free, especially in the east, and the south of Europe frequently experiences the calms and drought of the sub-tropical belt of high pressure.

In Figs. 7 and 8 the long arrows show the tracks commonly followed by the centres of "lows," but it must be understood that the area covered by a depression is normally very considerable ; if the centre passes over Berlin, for instance, its influence would probably extend from central Scandinavia in the north to the northern Adriatic in the south. Bearing this in mind, it will be seen from the maps that in winter cyclonic conditions characterize the whole of Peninsular Europe, while in the summer they are generally less frequent, particularly in the Mediterranean region.

In eastern or Trunk Europe the depressions have less influence, for they tend to pass over seas rather than lands, and when they do penetrate the great land-mass, they diminish in intensity. The climate of eastern Europe is therefore more closely related to that of Asia ; it is marked by a reversal of the conditions as between summer and winter which is associated with the monsoonal changes of the greater continent.

In summer the heat sets up a system of continuous low pressure over Asia towards which the winds blow inwards, though deflected, by the earth's rotation, to the right of the most direct path ; consequently in the east of Europe they commonly blow from a more or less north-westerly direction, as is shown by the short arrows in Fig. 8. Even in the eastern Mediterranean this influence is felt, and the prevailing northerly winds of this season were there known to the ancient Greeks as the " Etesian " or " annual " winds, whose onset marked the beginning of uninterrupted easy navigation for their small ships.

In winter the continental land-mass is cooled, high pressure is more continuously developed and the air tends to move outward. The winds, deflected to the right of their direct outward path, usually blow from a more or less southerly direction over most of eastern Europe (see Fig. 7), though in the Mediter-

ranean region they are more frequently interrupted by the passage of cyclones.

Temperatures.—The wind systems combine with the direct heating effect of the sun to determine the temperature conditions,

In the summer the sun's direct influence is the greater, as may be seen from Fig. 8, in which are shown the isotherms drawn from the records of the mean monthly observations of air temperatures in July. (To simplify the maps, the temperatures have been reduced to sea-level; consequently the uplands and highlands have cooler conditions than are indicated.) Where the sun is relatively high in the sky, that is, in southern Europe, the heat is greatest, and over the southern parts of the three peninsulas the lowlands have mean temperatures at, or even over, 80° F. during July. In the far north the temperatures are at about 50°. The course of the isotherm of 68° is worth noting: in the Atlantic area it is well to the south of latitude 50°, for the ocean is relatively cool; in eastern Europe it passes considerably to the north of this latitude because the continental mass is greatly heated by solar radiation; in central Europe the isotherm runs almost along the line of latitude, and places east and west of one another have about the same summer temperatures.

It is convenient to say that when the mean temperature is above 68° F. (20° C.) the climate is "hot"; when between 68° and 50° F. (20° and 10° C.) it is "warm"; when between 50° and 32° F. (10° and 0° C.) it is "cool"; and when below 32° F. (0° C.), it is "cold." Adopting these terms, we may point out that the temperature map shows that in July the climate of most of Europe south of latitude 50°, together with all south-eastern Russia, is hot, that of most of Europe north of latitude 50° is warm, but the lands adjoining the Arctic Sea are cool.

The January map indicates marked contrasts, for in the latitudes of Europe the winter sun is visible for a shorter time in the day and is lower in the sky than in the summer; consequently the sun has much less effect and the winds have relatively more influence, as they bring warm air from the Atlantic Ocean.

The isotherm of 50° is now the highest and, away from the Atlantic, only the southern Mediterranean lands have this temperature. This is due partly to the latitude and partly to the influence of the Mediterranean Sea itself, for this sea remains remarkably warm in the winter because it is shut off

TABLE OF CLIMATIC CONDITIONS

Climate Stations		Lat. N.	Height above Sea-level (Feet)	Temperatures (Deg. F.)				Precipitation (Inches)				
				Mean Monthly		Mean Annual		Annual Total	Seasonal Totals			
									Win. D.J.F.	Spr. M.A.M.	Sum. J.J.A.	Aut. S.O.N.
				Jan.	July	Min.	Max.					
Arctic	South of N. Zemlya	72	50	2	44	—	—	6	0.9	0.8	2.2	1.7
	Haparanda	66	10	11	59	—27	81	19	4.0	3.2	5.4	6.6
Boreal	Archangel	65	50	8	60	—32	84	17	2.5	2.7	6.6	5.0
	Stockholm	59	150	27	62	—2	83	21	4.6	4.2	7.0	5.5
Sub-boreal	Moscow	56	500	12	66	—17	88	21	3.5	4.6	7.7	5.2
	Bodo	67	10	30	55	7	75	36	9.1	6.3	7.7	12.5
Oceanic	Bergen	60	70	34	58	12	79	84	24.5	15.2	17.6	27.0
	Valentia Is.	52	30	45	59	28	72	56	17.3	11.4	11.8	15.2
Temperate	Brest	48	180	43	64	23	90	32	9.5	6.2	6.2	10.6
	Santiago	43	890	45	66	28	95	65	21.7	17.1	6.9	19.1
Mid-Temperate	London	51	20	39	63	18	88	25	5.6	5.2	7.3	7.0
	Brussels	51	200	34	63	14	88	30	6.6	6.0	8.7	8.3
Temperate	Paris	49	180	37	65	12	93	21	4.1	4.8	6.0	5.9
	Karlsruhe	49	390	33	66	8	91	38	7.3	8.7	12.1	9.7
Temperate	Lyons	46	570	36	70	10	95	40	7.0	8.7	10.1	11.1
	Milan	46	480	34	75	14	93	40	7.7	10.2	9.3	12.5
Temperate	Bordeaux	45	250	41	68	18	95	33	8.0	8.0	7.4	10.0
	Konigsberg	55	20	27	63	—2	90	25	4.1	4.6	8.8	7.8
Interior	Berlin	52	160	31	64	7	91	23	5.0	5.0	7.6	5.1
	Warsaw	52	440	26	66	6	90	22	3.8	4.7	8.5	5.0
Temperate	Munich	48	1,700	27	63	0	86	35	4.8	8.6	14.2	7.6
	Budapest	47	500	28	70	10	91	25	4.6	7.0	7.0	6.7
Temperate	Sona	43	1,800	27	69	2	95	26	4.3	7.1	8.0	6.2
	Genoa	44	180	45	75	28	90	52	13.2	11.7	6.9	20.3
Mediterranean	Marseilles	43	250	43	72	21	91	22	5.2	5.2	2.8	8.3
	Borne	42	160	44	77	27	95	32	9.8	7.7	3.2	11.9
Mediterranean	Oporto	41	270	48	67	32	93	48	15.8	13.4	3.4	15.4
	Madrid	40	2,100	40	76	18	104	16	4.0	5.4	2.1	4.9
Mediterranean	Valencia	39	70	49	75	32	99	19	4.5	4.8	1.6	8.2
	Palermo	38	230	50	76	39	99	29	11.7	6.7	1.5	9.3
Mediterranean	Athens	38	350	49	81	28	100	15	5.9	2.9	1.4	5.2
	Orenburg	52	360	4	72	—23	97	15	3.1	3.3	5.0	3.7
Steppe	Odessa	46	210	26	73	0	91	16	2.9	3.5	5.6	4.1
	Bucharest	44	280	25	73	—4	95	23	4.0	6.2	8.0	4.9
Arid	Astrakhan	46	—50	19	77	—15	97	6	1.3	1.5	1.7	1.3

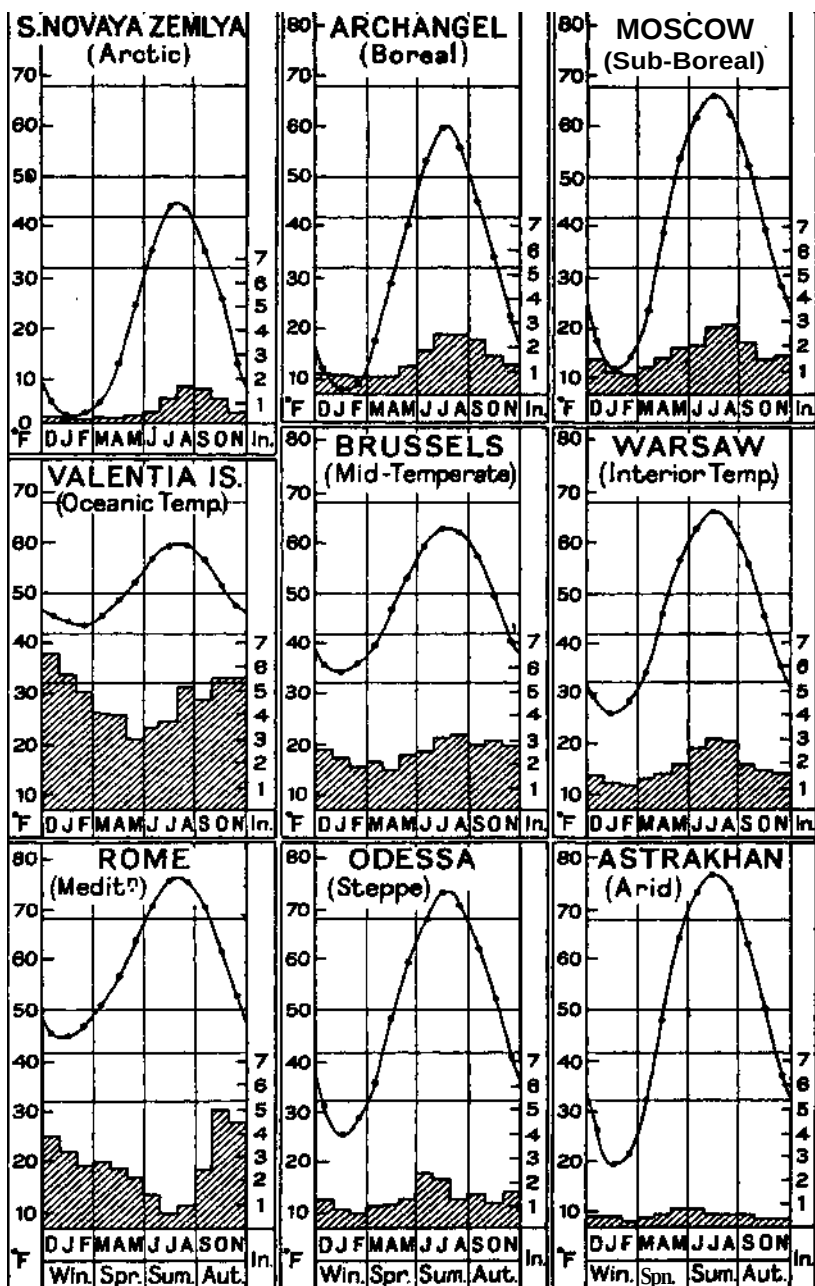


FIG. 9.—TEMPERATURE AND RAINFALL GRAPHS OF CLIMATIC TYPES.

from the cold waters in the depths of the Atlantic by the narrow and shallow entrance at the Strait of Gibraltar.

Most of the other isotherms of the January map have a course broadly similar to that of 50° : in the Atlantic area they run from north to south, showing that the oceanic west is warmer than the continental east, while towards the interior of Europe they run more from west to east because it is colder in the north, where the sun has very little effect.

The isotherm of 32° F. is of special interest, for it marks out an area to the east and north of it where, during a normal January, the average temperature is below freezing-point. As a consequence, within this area, precipitation in January normally takes the form of snow instead of rain, and if the snowfall is heavy there is a snow-cover to the land lasting for at least a month. Moreover, except in a narrow belt adjoining the course of the isotherm, inland waters are normally frozen over and harbours are closed by ice for a month or more ; the chief exception to this latter rule is that the warm Atlantic waters drifting along the coast of Norway keep the harbours of all the west coast of Scandinavia open throughout the year. The extremely cold winters in north-eastern Europe should be observed ; in the neighbourhood of the northern Ural Mountains the mean temperature in January is 0° F., i.e. 32° below freezing-point.

Employing the terms " cool," " cold," etc., as stated above, we may summarize the conditions in January by saying that in eastern Europe as a whole, together with most of Scandinavia and the eastern part of central Europe, the climate is cold ; in most of western Europe it is merely cool, while the south of the Mediterranean area has even warm conditions in this month.

By comparing the mean temperatures in January with those in July, as shown either on the maps or in the table on p. 26, it may be seen to what extent the climate of any place may be regarded as extreme or equable. Subtracting the figure for January from that for July, the annual range is obtained : e.g. for Valentia Island it is only 14° , for Warsaw it is 40° and for Moscow it is 54° . A climate with an annual range of about 30° or less may be regarded as equable, and western Europe as a whole and most of the coast-lands around the Mediterranean Sea have an equable climate. One with an annual range of over 40° is extreme, and all eastern Europe has an extreme climate.

Between these well-marked types comes central Europe, transitional in this respect.

The map of mean temperatures for January shows the average reading of the thermometer in that month, but the actual conditions are at some times above, and at other times below, this average ; hence the winter temperatures are at times more severe than the mean temperature suggests. The lowest temperature which is normally experienced in winter (i.e. the average of the lowest taken over a number of years) is called the mean annual minimum, and for certain stations is given in the table on p. 26. In this table it will be seen that, for example, while the mean January temperature at Moscow is 12° F. (20° below freezing-point), the mean annual minimum is -17° F., i.e. 29° lower (49° below freezing-point). Again, at Archangel the normally lowest reading in January is -32° F. (64° of frost).

Similarly the July map shows the mean temperatures for that month, but the summer temperatures actually rise much higher than these ; the table shows that while at Moscow, for example, the mean July temperature is 66° F., the mean annual maximum, which is the mean of the highest July readings, is 88° F. In the south of Europe the mean annual maximum at Athens is 100° , and at Madrid it reaches even 104° F.

All the conditions hitherto considered relate to those of the coldest or hottest months, but it is also important to know what is happening during other times of the year. This is to some extent shown by the graphs in Fig. 9, which indicate by dots the mean temperatures of each month and join these by curves depicting the normal " march of temperature " throughout the year. From such curves useful deductions may be made ; for instance, at Moscow the mean temperature falls below freezing-point (shown by the line at the level of 32° F.) about the beginning of November and does not rise above it until about the end of March ; we may therefore conclude that normally there is a period of frost lasting about five months. Similarly it may be deduced from the graphs that the period of frost at Archangel is about six months, while at Warsaw it is rather more than three months ; a map showing by lines the lengths of the normal period of frost in all parts of Europe is given in Fig. 10.

Another example of the deductions that can be made from graphs of the normal march of temperature is the duration of the " warm " period, i.e. the time during which the mean

temperature is above 50° F. (10° C). At Valentia Island, off south-west Ireland, the curve rises above the 50° F. line at the beginning of May, and falls below the 50° F. line again near the end of October; the warm period therefore lasts about six months; compare the curve for Archangel, where the warm period lasts only about three months. A map showing the

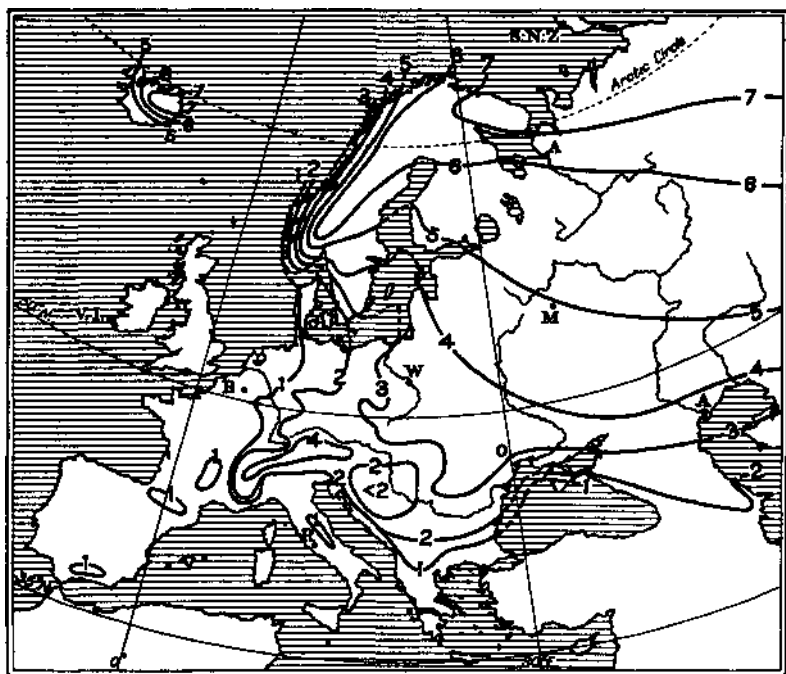


FIG. 10.—DURATION OF FROST PERIOD.

Note.—The lines show the number of months during which the mean temperature is below freezing-point (32° F., 0° C), the calculations being based on actual temperatures (not reduced to sea-level). On the Alpine margins the lines of 3 and 4 months are so close that the former has been omitted, and for a similar reason the 1-month and 2-month lines have not been separately indicated on the margins of the SE. Alps and Dinaric Alps. Note that the area of the Central Danubian Lowlands, marked < 2, has a period of less than two months of frost.

duration of the warm period in all parts of Europe is given in Fig. 11.

From the point of view of the relation of climate to plants the mean temperatures for the hottest month give a very inadequate idea of the temperature conditions which affect growth. For example, the figures for July show that the mean midsummer temperature is about the same at Valentia Island as at Archangel, and yet the graph shows that the warm period is twice as long at the former place as at the latter.

An important fact regarding the relation of climate to plant-life is that for a number of plants growth can begin only when the mean temperature rises above about 42° F. (6° C.). This level is shown by another horizontal line on the temperature graphs, and it may be deduced from the curves that, for example, wheat can begin to grow earlier at Brussels than at Moscow, although the latter place has a higher midsummer temperature.

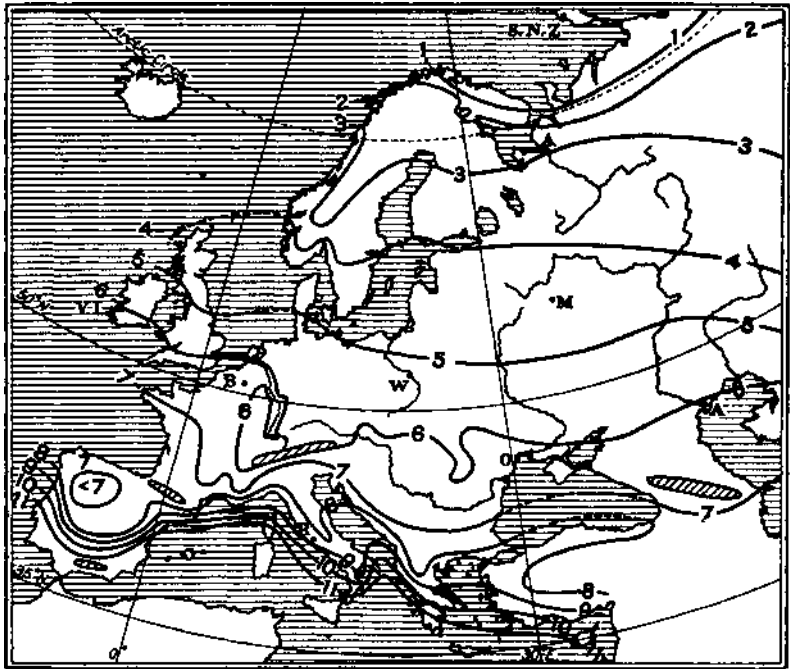


FIG. 11.—DURATION OF WARM PERIOD.

Note.—The lines show the number of months during which the mean temperature is above 50° F. (10° C.), the calculations being based on actual temperatures (not reduced to sea-level).

Conditions in the Alps and other high mountain regions vary so greatly that these areas have been excluded from the map. Note that in the interior of Spain an area marked < 7 has a period of less than seven months of warmth.

Precipitation.—The next element of climate to be considered is precipitation in the form of rain or snow, and this study may well be begun in connexion with the wind systems for July and January respectively.

In July, depressions advance from the Atlantic over northern and central Europe, and since in them the warmer air from the Atlantic rises, it is cooled and water-vapour is precipitated in the form of "cyclonic rains." In eastern Europe the prevail-

ing winds come from the north-west, and have sufficient water-vapour for rain to occur, although in less amount than in the west (see Fig. 13). The greatest precipitation is on the highlands which compel the air currents to rise and to produce "relief rains." In the Mediterranean region and in southern Russia depressions seldom occur, and cyclonic rains are therefore slight, though relief rains give a rather better water-supply

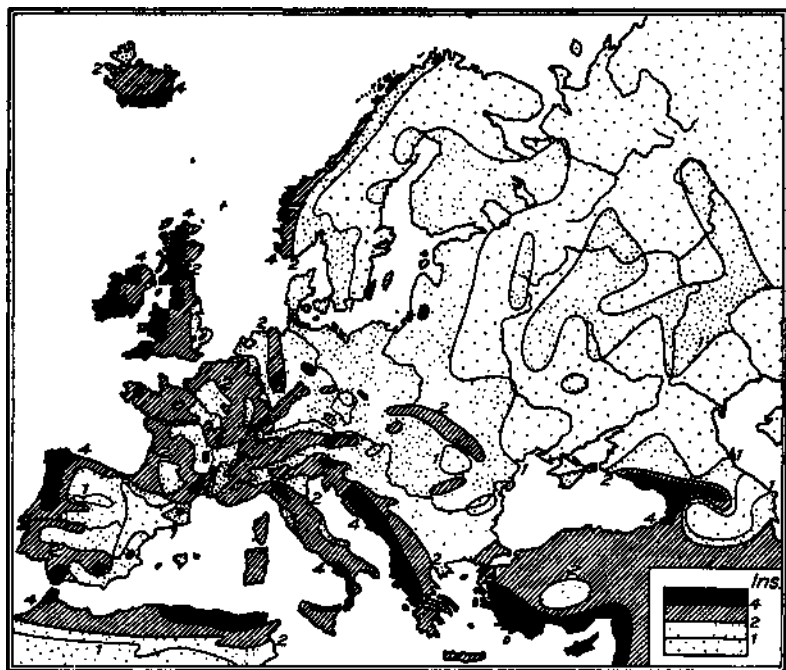


FIG. 12.—MEAN JANUARY PRECIPITATION.

to the mountains, especially to the Caucasus. In the far north there is little rainfall, even in connexion with the depressions, for the cool air can hold but little water-vapour and though the air is further cooled by ascent only a small precipitation can result.

Where cyclonic influence is weak, settled weather is the general rule, but during a period of such weather in summer there may occur thunderstorms and heavy rains, due to the relatively great heating and the consequent rising of the air in particular localities ; such " convectonal rains " account for a considerable proportion of the precipitation in central and eastern Europe.

In January, depressions normally affect the whole of the continent except the extreme east, and where the air is warm enough to contain much water-vapour, precipitation may be considerable. This is the case particularly along the Atlantic margins, where there are the heaviest rains, and in the Mediterranean region ; moreover, on the highlands relief rains add to the total (see Fig. 12). But away from the relatively warm areas adjoining the Atlantic and the Mediterranean the air is so

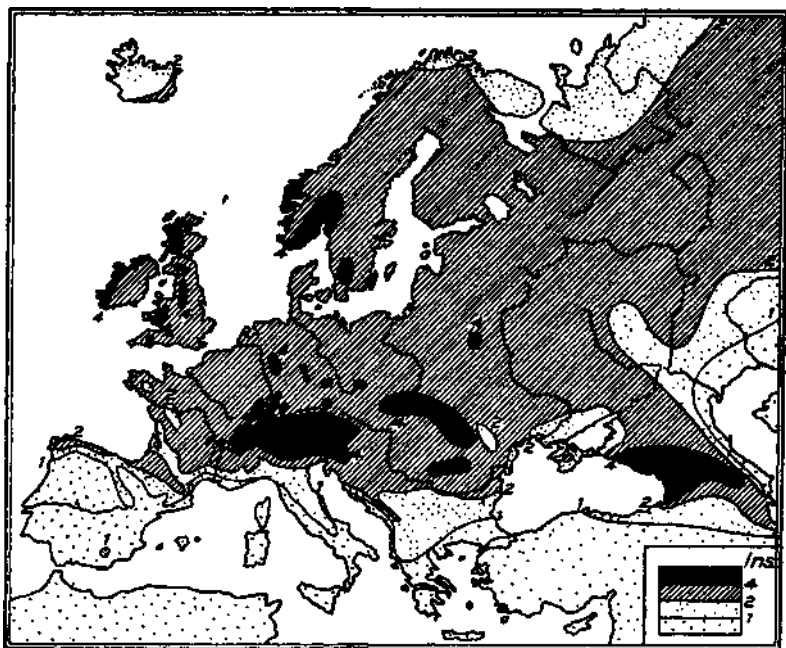


FIG. 13.—MEAN JULY PRECIPITATION.

cold that it can contain little water-vapour and precipitation is generally slight, though relief rains, or falls of snow, occur on the highlands. (In reading maps or statistics of precipitation, it must be remembered that in their compilation one foot of snow is taken as the equivalent of one inch of rain.) In eastern Russia the cold, out-blowing air from the Asiatic high-pressure area is necessarily dry, and this part of Europe would be rainless in winter but for occasional depressions.

The maps for January and July are in general indicative of the whole of the winter and summer seasons respectively ; this

can be seen by the rainfall graphs in Fig. 9, in which the three winter months of December, January and February and the three summer months of June, July and August are marked off by vertical lines.

The rains of spring and autumn are equally important, but as they are to a considerable extent transitional between the more extreme conditions of winter and summer, they are more evenly distributed over the continent. Near the Atlantic and in the Mediterranean region, however, the autumn rains are frequently heavier than those of any other season. These statements about the rainfalls of spring and autumn should be verified by examining the graphs for the stations given in Fig. 9 and the accompanying page of statistics.

A useful summary of the distribution of precipitation during the year at any particular place can be made by adding together the amounts in each group of three months to get the totals for the four seasons respectively, and this has been done for certain places in the table on p. 26. Further, the total for the whole year for the selected stations is given in the same table, and the distribution of the total annual precipitation over the continent is shown by the map in Fig. 14.

By putting together the facts given in the maps, the graphs and the table, a fairly complete idea of the precipitation can be obtained, and some of the main conclusions may be summarized as follows : (i) The regions adjoining the Atlantic have a heavy rainfall fairly well distributed through the year, although greatest in autumn and winter, (ii) Central Europe has an annual total varying according to elevation, considerable on the highlands and moderate on the lower lands ; on the whole, the rainfall is fairly evenly distributed through the year, although the greater amounts occur in summer and autumn and the tendency to a summer maximum increases towards the interior, (iii) Eastern Europe, including most of Scandinavia, has a rather small total precipitation with a summer maximum, and in the extreme north-east and south-east the amounts at all seasons are very small indeed, (iv) In the Mediterranean region the total annual rainfall varies from being very considerable on the highlands behind the Adriatic to being very slight over most of eastern Spain, but the common characteristic is that of summer drought; in the northern part of the Mediterranean region the period of drought is short, but towards

the south the period becomes longer and the intensity of the drought may be severe.

Indeed, throughout all southern Europe, including the south of Russia, the summer is normally a time of drought, for the high temperatures cause rapid evaporation, and the efficiency of what precipitation may occur is thereby greatly reduced. Conversely, in northern Europe evaporation is much less and the rainfall is correspondingly more effective.

Another important consideration is the variability of the rainfall from year to year. This variability is, in the main, greatest where the total amounts are least, and it is consequently quite considerable in the east and in some parts of the Mediterranean region. Moreover, while in a well-watered region a decrease from the average is not a serious matter, in the areas of scanty rainfall it may have calamitous results; thus, in particular years the normal summer drought of the Mediterranean may be unusually prolonged and may even become disastrous, while in southern Russia in years of sub-normal rainfall harvests fail and famines result.

One more point must be noted: when there is little rainfall either during the whole year or during one season of the year, that rainfall tends to occur in short, sharp downfalls; this is frequently the case in the Mediterranean region and with the summer thunderstorms of eastern Europe. A rapid fall means that the immediate run-off of water to the streams is great, and the plants cannot use so much of it; also, after the rain bright weather quickly follows, and evaporation may dispose of much of the water and thus further reduce the value of the already small precipitation. The rapid run-off, moreover, tends to wash away the soil, and therefore soil erosion is a serious factor in the utilization of the Mediterranean and other areas of short and sharp rainfall.

Other Climatic Elements.—The frequent passage of depressions over the Atlantic margin has effects upon the climate of that region besides the equability of the temperature and the heavy precipitation; there are, for instance, the facts that the winds are often violent and the sky covered with cloud. On the contrary, the relative absence of depressions in the Mediterranean region, even in winter, allows a clearness of the sky and an abundance of sunshine which are important factors in attracting visitors from north-western Europe. Similarly eastern Europe has in general clearer skies than the west.

The importance of the element of light in climate is, of course, great, and in this connexion latitude is the main factor. In northern Europe, which lies near and even beyond the Arctic Circle, there is a very marked contrast between winter and summer. In summer the days are very long, and within, the Arctic Circle the sun is above the horizon for the whole of the twenty-four hours during a period which at the Arctic Circle is

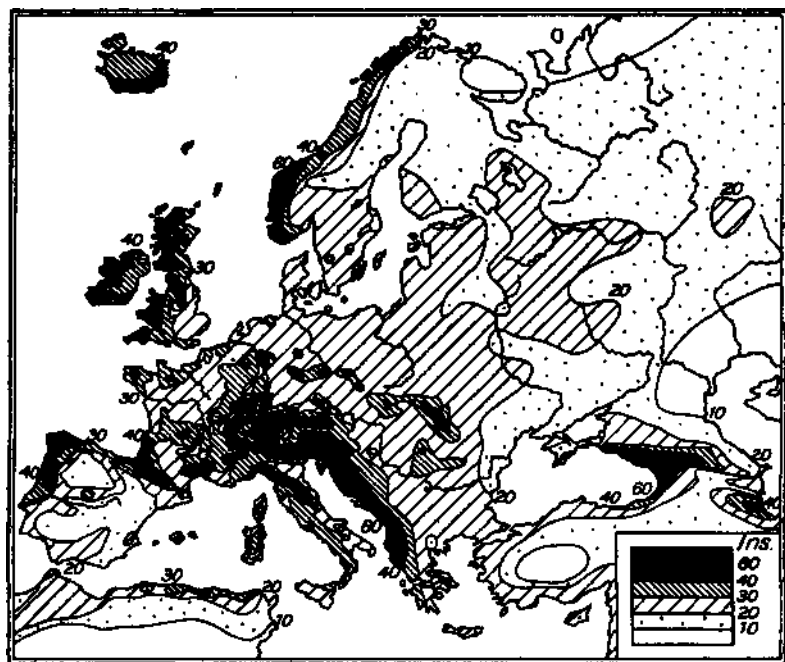


FIG. 14.—MEAN ANNUAL PRECIPITATION.

limited to one day, but at North Cape in Norway extends to over two months.

Conversely, at midwinter the sun is invisible at the Arctic Circle for twenty-four hours, and at North Cape for more than two months. Moreover, even during the short periods in winter when the sun is visible, it rises but little above the horizon.

Climate Regions.—The various elements of climate, e.g. winds, temperature, precipitation and light, of course all exist in the closest association ; they influence one another and have a combined effect upon other geographical phenomena and upon mankind. Regarded in this way, climate is seen to differ very

markedly in different parts of Europe, and it is useful to divide the continent into several regions, in each of which the climate has distinct characteristics. Yet climatic regions seldom have definite boundaries, and it must therefore be emphasized that, when maps are made like those in Fig. 15, the various regions usually "shade off" into one another and the descriptions are only generalizations which apply best to the central parts of the respective regions.

It is convenient, however, to draw lines to serve as approximate boundaries of climatic regions, and for this purpose two devices are commonly employed. In the first place, there are lines based upon meteorological records, like those drawn on the maps showing the conditions of temperature and precipitation. Such lines may be without much significance if they are based merely upon some arbitrarily selected numbers, such as 68° F. (rather than 70° F.), or a duration of frost for one month (rather than three weeks), or a rainfall of 10 inches (rather than 12 inches). It is often better, therefore, to employ the second device, i.e. the adoption of some more natural indication of the climates, and for this purpose vegetation, either natural or cultivated, is a useful guide. In the following chapter the main types of vegetation will be described, and it will there be pointed out how these types are related to climatic conditions ; in some cases it appears that the limits of the growth of particular plants correspond with a line indicating certain climatic conditions ; e.g. the northern limit of trees is found where the period of warmth (over 50° F.) decreases to one month. Hence the line indicating this condition on the map in Fig. 11 has been adopted on the map showing climatic regions (Fig. 15) as separating the "Arctic" from the "Boreal" type of climate. Similarly the other lines showing boundaries to climatic regions have been adopted because of some special significance which will be stated when the climates are described.

The conditions of the climates of Europe may now be summarized in the following paragraphs :

The Arctic climate is experienced around the Arctic Sea, and in the main within the Arctic Circle. Its "winter" is very long, with about seven months of frost, very cold, and for a considerable period almost sunless ; for most of the year the ground is covered with snow, and the subsoil is always frozen. The "summer" is correspondingly short, and although at mid-

summer the daylight is practically continuous, the sun is low in the sky; consequently the mean temperatures rise little above the limit of plant growth, and that only for a short period. Most of the scanty precipitation comes during the time of relative warmth, and is therefore available for plant-life; moreover, evaporation is little and the "effectiveness" of the precipitation is considerable.

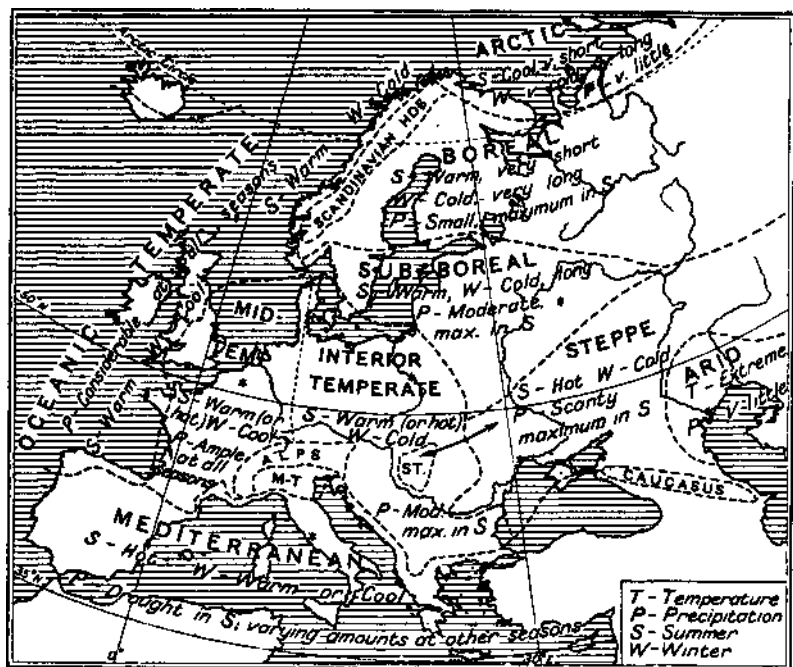


FIG. 15.—CLIMATE REGIONS OF EUROPE.

Note.—In all regions, the uplands or highlands show modifications of the general conditions, but the Alps, Caucasus and Scandinavian Highlands are shown as independent regions.

Except in areas of very marked relief, the boundary lines represent transitional belts rather than definite divisions between the regions. The asterisks indicate the situation of the stations for which graphs are given in Fig. 9.

The Boreal climate, or northern climate, is so called because it extends over much of the northern lands of the world which border upon the Arctic Circle; in Europe the belt begins immediately behind the Scandinavian Highlands, which largely exclude it from Atlantic influences. The cold is about as severe as in the Arctic climatic region at midwinter, but it has a shorter duration, and the thick cover of snow due to the winter precipitation lasts for less than half the year. In spring there is a

rapid rise of temperature above the limit of plant-growth, and the summer has from one to four months of warmth, with a small but effective rainfall. The contrast between the light conditions in summer and winter is very marked, though not so extreme as in the Arctic region.

The Sub-boreal climate is transitional between those of markedly continental character and those largely influenced by the Atlantic Ocean; it is experienced in a region in which Atlantic influence can just penetrate into eastern Europe, between the barriers of the Scandinavian Highlands on the north and the Alps and Carpathians on the south. The annual range of temperature is not much less than that of the European part of the boreal climatic region, but both in summer and in winter the temperatures are higher. The period of warmth lasts four months along the northern limit of this region, and increases southward. Also, during this period as well as during the rest of the year there is greater precipitation than in the boreal region. Hence conditions are more favourable for plant-growth, and for the utilization of the resources by man, than under the boreal type of climate.

The Steppe climate is a convenient label to apply to those conditions under which have developed the various forms of steppe vegetation which will be described in the next chapter. This type of climate, like all the others of eastern Europe except the transitional sub-boreal type, is definitely continental and extends far into Asia. It is exceptionally complex, especially as regards the interaction of the temperature and the precipitation, and demands a separate consideration of each of the four seasons.

For about three months or more there is a winter during which the mean temperature is below freezing-point, and for a considerable period the ground is covered by snow. In spring there is a rapid rise of temperature above the limit of plant-growth, and this growth is aided by the melting of the snow-cover and by a moderate amount of rain. In summer the precipitation as recorded by a rain-gauge is greater, but it tends to occur in heavy and short showers, while the weather becomes "hot" (over 68° F.) for about three months; consequently evaporation is great, the effectiveness of the rainfall is small, and the summer is a season of drought during which plant-growth ceases. In autumn, as in spring, the temperatures are moderate,

and the rainfall is consequently more effective ; yet it falls upon parched ground, and a reawakening of vegetable life is soon followed by the cold of winter.

As the complex climatic conditions are closely reflected in the periods of growth and rest which are characteristic of steppe vegetation, the approximate limits of this vegetation are here taken as the boundaries of the region.

In addition to southern Russia, there is an area in the central Danubian Lowlands which has a climate of this type, and may therefore be regarded as an " exclave " of the main steppe region.

The Arid climate is characteristic of the Caspian-Aral depression in the heart of the Eurasian continent, and is therefore only experienced on the south-eastern margin of Europe.

While in the north of the continent it is low temperatures which cause limitation of certain forms of life and activities, and while in the steppe region both the cold in winter and also the drought in summer are the critical phenomena, here in the Caspian-Aral region the precipitation is so scanty, irregular and ineffective, that aridity is the characteristic of the region during the whole year.

That is not to say that the temperature conditions are negligible. In the first place, the ineffectiveness of the precipitation is due to the high summer temperature, for a rainfall of less than 10 inches per annum, which here marks out the arid region, is accompanied by wet surface conditions in summer in north-eastern Europe. In the second place, the extreme character of the climate is in itself of geographical importance ; during the year a " cold " winter, which lasts about three months, is followed by a spring in which the climate rapidly passes through the " cool " and " warm " stages to a summer during which the weather is " hot " for three months, while the mean and maximum temperatures are among the highest in Europe.

The Temperate climate.—None of the regions of eastern Europe has climatic conditions which can be considered " temperate,"¹ for they all experience either considerable heat or considerable cold at some season of the year. In the south-east, moreover, there is a period of deficient moisture, and this characteristic of seasonal drought exists also in the Mediterranean lands.

¹ In accordance with the dictionary definition: " temperate = moderate in degree of any quality . . . cool, mild, moderate in temperature...."

Only in north-western and central Europe is there a comparative moderation of climatic conditions throughout the year ; hence the term " temperate " is restricted to the climate of this region. Within this region, however, conditions are by no means uniform, and three varieties of the temperate climate may be distinguished in Europe.

The Oceanic Temperate climate of the Atlantic margins of north-western Europe is markedly affected by depressions, accompanied by strong or even violent winds and by precipitation which, though heaviest in winter and autumn, is abundant at all seasons. The frequency of winds from the warm waters of the Gulf Stream Drift results in the warmth of the winters and the marked equability of the climate.

The extent of the region thus affected by the westerlies at all seasons is great from south to north ; hence there are considerable differences, especially as regards temperature, between the areas bordering on the Mediterranean climatic region at the one end, and those beyond the Arctic Circle at the other. Contrast the figures given in the table on p. 26, for Santiago in Spain, for Valentia Island, and for Bodo just within the Arctic Circle on the Norwegian coast.

The region which may be termed oceanic is clearly limited inland by the Scandinavian Highlands in the north, and almost as clearly by the uplands of the Iberian Peninsula ; but between these extremes there is a more gradual transition towards central Europe. In the British Isles the English lowland is less equable and less rainy than the uplands of the west and north, and may be better classed with the region next treated.

The Mid-Temperate climate has rather warmer summers, and the winters are so much less influenced by the maritime influences that there is a period during which plant-growth is checked ; also the precipitation is not so heavy. Except in the winter the conditions of heat and water-supply are sufficiently favourable to allow a considerable variety in the forms of plant-life which can here develop.

The North Italian Plain may be grouped with the warmest part of the Mid-Temperate climatic region, for its temperature and rainfall conditions closely resemble those of the nearest part of this region, viz. the Rhone Valley just below Lyons. (Compare the figures for Milan and Lyons in the table on p. 26.)

The Interior Temperate climate shows a further reduction in

the effects of proximity to the ocean. Apart from the higher areas, on which the temperatures are necessarily lower, a line drawn southward from the peninsula of Jutland separates the regions south of the North Sea, where in the coldest month the mean temperature is above freezing-point, from those south of the Baltic Sea, where the winters have a cold period lasting one, two or three months. Also, the precipitation is lower, and has a maximum in summer.

Eastward, conditions gradually approach those of the sub-boreal and steppe climatic regions, and it is convenient to take as the eastward boundary the approximate limit of the beech, which, because of its need for a fairly long vegetative period, is often regarded as a criterion of temperate as distinct from continental conditions.

The region extends far to the south-east, the main modification being a lengthening of the warm period and an increase in the midsummer heat, as may be seen by comparing the July temperatures at Berlin and Budapest.

The Mediterranean climate requires separate consideration for each season. In winter the temperature is almost everywhere above the limit of growth, and in the southern part it is definitely warm, while the rainfall is considerable ; hence neither plant-growth nor the outdoor activities of man need cease. In spring there is everywhere warmth, and in most parts there is sufficient rainfall for the processes of plant-life, enabling flowering, fruiting and ripening to continue. In summer there is a period of three months or more of heat (above 68° F.), and the maximum may be very high ; the rainfall becomes scanty or even fails, and with the high temperature this season is one of drought in which plant-growth ceases, except for deep-rooted types. In the autumn there is still warmth, and usually sufficient rainfall for a resumption of the growth of vegetation ; indeed, in much of the European part of the region the autumn is the season of maximum precipitation.

It is convenient to summarize the more striking features of the Mediterranean type of climate as "winter warmth and summer drought," but, as in the case of the steppe type, no simple meteorological formula can adequately express its character. For this reason the limit of the growth of the olive,, the most typical plant, is adopted as the northern boundary of the Mediterranean region save where, as in the interior of the

Iberian Peninsula, altitude modifies the climatic conditions and prevents the growth of this plant. (Compare the map showing the distribution of the olive in Fig. 18 with that of the climate regions.) It should be noted that, apart from the special case of the interior of the Iberian Peninsula (which will be discussed in a later chapter), the Mediterranean climate in Europe is rather closely restricted to the coast-lands of the Mediterranean Sea, together with the southern shores of the Crimean Peninsula.

Uplands and Highlands.—To simplify matters, it is lowland conditions which have been indicated in the text and in the map of climatic regions. In some parts, however, there are considerable complications, due to the lower temperatures and the greater precipitation which occur with higher altitudes. Such modifications will be taken into account in the more detailed regional studies which will follow, but here, and on the map in Fig. 15, attention can only be briefly drawn to the outstanding highland regions of the Alps and in Scandinavia. In several respects the latter highlands continue southward the characters of the Arctic climate, while conditions in the Alpine region are so complex that they must be specially described in a later chapter.

QUESTIONS

1. State the characteristics of the wind-belts which affect Europe. Explain how they influence different parts of the continent.
2. Draw a graph showing the annual "march of temperature" at any one place you name. Show (a) what deductions you can make from the graph, and (b) its incompleteness as a record of the temperatures.
3. For any one selected part of Europe, state and account for the essential characteristics of its rainfall.
4. Discuss whether it is possible to find and express definite limits to climatic regions.
5. Examine the truth of the statement that the critical element of climate in Europe is temperature in the north, and rainfall in the south.
6. "The Mediterranean climate has a mild winter and dry summer." Show in what ways this dictum is too simple.
7. Trace the normal succession of climatic conditions through the seasons in the steppe-lands of Europe.
8. Show by reference to one or more particular regions how the various elements of climate interact with one another.
9. To what extent can the climate of "Peninsular Europe" be regarded as a contrast to that of "Trunk Europe"?

CHAPTER I I I

VEGETATION, SOILS AND LAND- UTILIZATION

NATURAL VEGETATION

IN England and in other parts of Europe which have long been settled, the natural vegetation has been either greatly modified or entirely superseded by cultivated plants, but over other parts of the continent the natural vegetation still dominates the landscape and greatly influences mankind.

It assumes many forms, according to the climate, soil and other factors which determine its growth, but certain main types may be perceived ; we will consider each of these in turn, beginning with those of eastern Europe, where the contrasts are clearly displayed.

Tundra and Alpine Vegetation.—In the preceding chapter it was pointed out that trees cannot grow where the period of warmth is less than one month. The Arctic climate, therefore, with its cool and very short vegetative season, can support low woody shrubs only on the margin of the forest, and the characteristic vegetation of the tundra region consists of mosses and lichens, in addition to many kinds of small flowering and berry-bearing plants. On the drier parts of the tundra lichens grow together so as to form close mats ; in wetter situations mosses grow in abundance, and peat accumulates from dead vegetation and may form hillocks covered with living moss. Wet meadows occur, and swamps with cotton-grass and sedges occupy hollow places.

The region formed by the Scandinavian Highlands, known as the Fjeld, continues Arctic-like conditions southward, the change of latitude being largely offset by increasing altitude ; consequently, below the ice-fields of the highest parts, the mountain flora closely resembles that of the tundra, and may be considered as of the same type.

There are, however, considerable areas on the Scandinavian Highlands, where in the summer there is a thick growth of grasses and herbaceous plants, which afford a fairly rich pasture of the Alpine type. This pasture is so named from the

zone of the Alps situated above the tree-line but below that of perpetual snow ; it is found also on other mountain regions—for example, on the Urals, Carpathians and Pyrenees.

It is impossible to show such a zonal arrangement of vegetation, varying according to altitude, on a small-scale map, and consequently only the type which occupies the greatest area has been indicated in Fig. 16. Thus, while the northern Urals and the Fjeld have been marked as belonging to the tundra and Alpine type, the other mountain regions have been shown as being mainly forested, but with Alpine pasture.

The Coniferous Forest.—Between the tundra and lowland forest is no sharp line of demarcation. Outposts of forest extend northwards into the tundra region, and patches of tundra vegetation are found within the limits of the forest. The dwarf birch which grows on the borders of the Arctic region is replaced by a larger kind farther south, while the spruce and pine increase southwards in number and size till they form the dominant trees in the great unbroken region of the coniferous forests.

In the eastern part of this region, extending into Siberia, the forest is known as the taiga ; here Siberian species of spruce and pine are found, and fir and larch are subordinate members of the plant associations. In the west, the forest is composed of European species ; the pine is that often known as Norway pine or Scots pine, and a zone of birch frequently forms the boundary towards the tundra or the fjeld. Throughout the coniferous forest, on the drier soils the pine predominates, and on the damper soils the spruce, while in the areas of poorest drainage moors with sphagnum moss are common.

Adaptation to the climate, with its short period of warmth, is shown by the needle-like form and leathery surface of the leaves. They are thus protected against the cold winds, and against the loss of moisture by transpiration at seasons when the water in the soil is frozen and there is therefore a time of " physiological drought." Yet the leaves do not fall in winter and are ready to take advantage of every spell of growing-weather ; the forest, therefore, is evergreen. A store of food in the form of starch in the tissues of the wood is another adaptation to the climatic conditions, and the coniferous forests supply timber which is " soft," as compared with the " hard " woods of the deciduous forests.

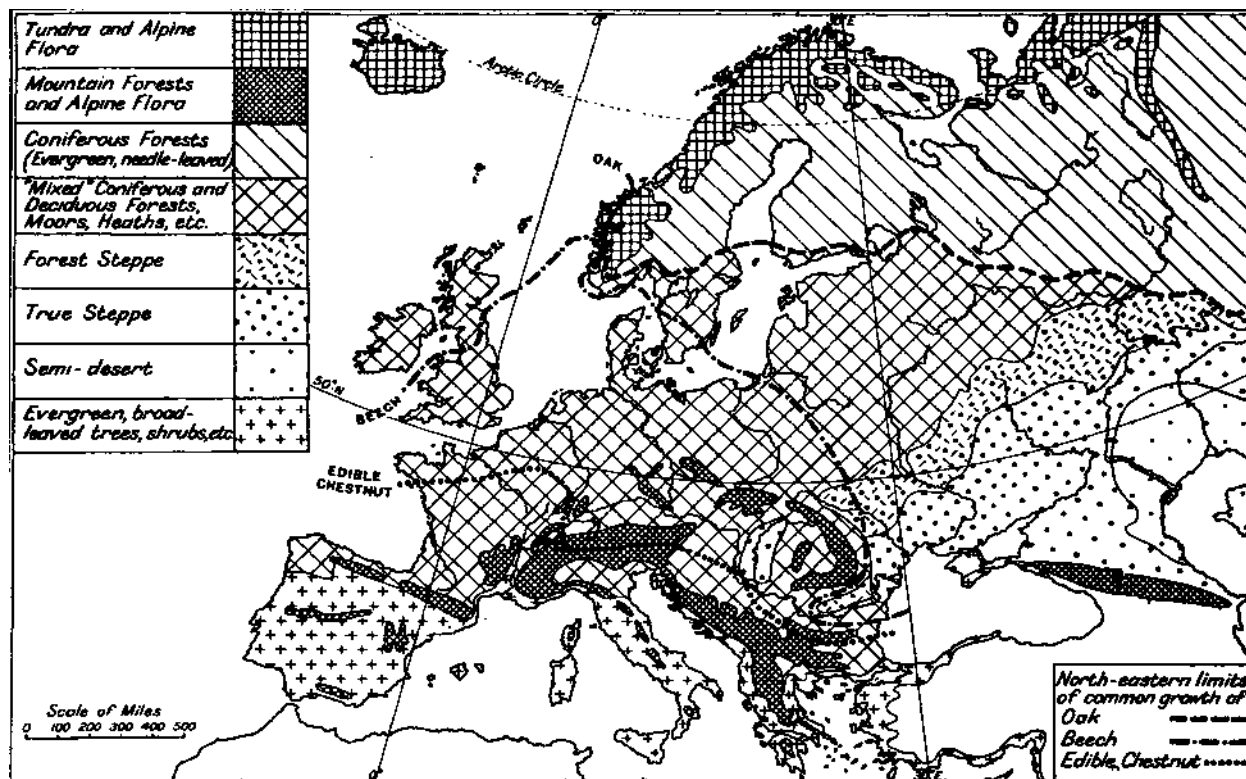


FIG. 16.—NATURAL VEGETATION REGIONS OF EUROPE.

The trees rise tall and straight, almost like poles, from a carpet of fallen needles, for there is little undergrowth in the coniferous forest. Factors which hinder the development of undergrowth are the lack of light beneath the high canopy of leafy branches, and the frequent freezing and thawing of the soil in spring and autumn, with the consequent injury to rootlets.

The "Mixed" Forest.—Even in the coniferous forests, there are representatives of the deciduous broad-leaved trees—for example, the birch, alder and poplar—and in more southerly regions these become more abundant, while others, such as the oak, appear and at last become common. Indeed, the occurrence of the oak is commonly taken as indicating the limit of the forests known as "mixed," and this criterion is here adopted on the map of natural vegetation. Yet the limits of even one species of tree cannot be accurately shown by a definite line, and those of the oak, beech, etc., shown on the map are necessary simplifications.

The annual leaf-fall of the deciduous trees is a protection against the cold and the consequent physiological drought of the winter, but this adaptation can occur only where the summer vegetative period is long enough, first for the growth of the new leaves, and then for their functioning. It appears that for this purpose it is necessary that the mean temperature should be above 42° F. for over five months.

The increasing length and warmth of the summers towards the south-west allow the growth of other species of trees which add to the variety, and in some cases to the value, of the deciduous forests. On the map in Fig. 16 this is illustrated by lines showing the approximate limits of the areas within which the beech and the edible chestnut are widely grown.

The varying nature of the mixed forests of coniferous and deciduous trees depends partly on the climate of the particular localities. In this respect, altitude, with the accompanying modifications of temperature and precipitation, is the main factor in causing the uplands and highlands to have forests of distinctive character; in central Europe the lower slopes are largely covered with deciduous trees and the upper with conifers, until the limit of forest growth is reached. Soil conditions as well as relief affect the character of the natural vegetation, and upland heaths and moors and lowland fens occupy considerable areas.

Over the greater part of the mixed forest region man has modified or transformed the original tree-cover. This has been done either intentionally, by cutting down the trees for timber or to clear the ground for agriculture, or unintentionally by fire or by allowing the young shoots to be eaten by goats[#] and other animals. Once destroyed, forests may be gradually replaced by a natural extension from neighbouring regions ; more commonly, however, new species are deliberately planted, in some parts forming woods of particular broad-leaved trees, and in other parts woods of conifers. In the main, however, cleared forest land has been utilized for agriculture or pasture.

On its southern margin, a climatic limit is set to the deciduous forest by an interruption of the period of summer growth. In the south-west and south this interruption is caused by the summer drought of the Mediterranean region, though the greater precipitation on the higher lands of that region allows trees to extend along the mountains far into the southern peninsulas of Europe.

In the south-east of the continent the hot and dry summer prevents tree growth in general, though there are tongues of forest stretching down the river valleys and " islands " of woodland or scattered trees in the damper places beyond the general limit. Indeed, the transition is so gradual that the northern belt of the steppe region is often known as the forest-steppe.

The Steppe Vegetation.—South-east of this transitional belt is the extensive region of the true steppes in which grasses and herbaceous plants, either annual or biennial, form the characteristic vegetation. As stated in the preceding chapter, the spring is the main season of plant activity ; the grasses and herbs appear above ground, grow rapidly, flower and produce their seeds in the short period between the winter cold and the drought of midsummer. Then they die down, and life is hidden beneath the surface, where, in tubers, bulbs, etc., a store of food is formed and preserved in readiness for the next season. A second short and less pronounced period of plant activity occurs in the autumn, but for most of the year until the next spring the ground appears bare.

According to differences of climate and soil within the steppe region, there are differences in the kinds, and the abundance, of the plant-forms. In the better-watered, northern and western parts of the true steppe there are areas of " meadow

steppe," of tall tufted grasses and gay flowering plants such as campanula and clover, which make a continuous thick cover to the ground ; even in a natural state, this can be mown to obtain a rich harvest of hay for use in the dry and cold seasons. In the less-watered districts, less succulent grasses and herbs which grow closer to the ground and are rather sparsely scattered form the greater part of the vegetation ; this can be utilized for grazing rather than for the cutting of hay.

As in the case of the more fertile forest regions, so here on the steppes the more productive areas have been much changed by man, both by pastoralists mowing or grazing the natural growths, and by agriculturalists cultivating the land for crops.

The Semi-desert Vegetation.—In the poorer steppe lands there appear some shrubs which have deep and long roots to obtain as much water as possible, and whitish, felted leaves from which the moisture is but slowly transpired ; there are also plants which are protected against the wind and the resultant loss of moisture by growing close to the surface of the ground. In the semi-desert, such forms of life adapted to an arid climate represent an increasing proportion of the vegetation as the grasses and herbaceous plants become fewer ; the amount of vegetation of any kind is but small and the bare soil is everywhere visible. As protection against still greater aridity, the woody growths commonly have their leaves reduced to spines. Also, as the conditions approach those of the deserts in which there are only occasional rains, the annual plants remain dormant below the surface for longer periods ; but whenever in the summer the soil receives a supply of water, they may appear, and pass rapidly through their very short vegetative period.

In the small areas in the extreme south-east which may properly be called desert, the vegetation is very scanty indeed, and only the " halophytes " adapted to living in salty soils, or plants which can find sufficient moisture in the sand-dunes, can exist.

The "Mediterranean" Vegetation.—As the winter temperatures are generally above the limit of growth, trees and woody shrubs which live throughout the year are the characteristic plant-forms ; they are protected against the loss of water in the dry summer by various devices, including deep and wide root development, a thick, rough bark, such as cork, and leaves of a different kind from those of the more northerly forest trees.

As the winter allows growth, there is no common period of leaf-

fall, nor need there be the extreme adaptation of a reduction of the leaves to needle-form ; the trees are evergreen and the leaves are broad, but their glossy and hard surface prevents rapid transpiration. The evergreen oak, cork oak, olive, holly, laurel and myrtle are of this kind and are typical of the region, although some of them may grow also in the south-western parts of the deciduous forest region where the winters are sufficiently warm.

Yet these broad-leaved evergreen trees are not the Only plants which can live under Mediterranean conditions, and an important group consists of low shrubs : e.g. heaths which are evergreen but have small and narrow leaves ; thyme, lavender and other aromatic shrubs ; the brightly flowering cistus, and many others.

Originally the Mediterranean region was largely forested, but these forests have almost disappeared ; now the natural vegetation, in the sense of that not deliberately planted by man, is only exceptionally forest or woodland, and that is found mainly on mountains or uplands where the temperatures are lower and the rainfall is greater than is normal. In such situations there are woods of evergreen oak or cork oak, as in the Iberian Peninsula, and there are also areas where the trees are those which are more common in other vegetation regions, such as the beech and edible chestnut, which extend southwards along the mountains of Italy, or the pines which grow on the uplands of the Balkan Peninsula.

Much more extensive are the thickets of evergreen shrubs which have replaced most of the original forests ; these growths may include low trees, such as the laurel and myrtle, and bushy plants, such as tree-heaths, cistus, broom and juniper. Such thickets are known as maquis in France, macchia in Italy and monte bajo in Spain.

Still poorer growths of lower bushes are formed of thyme, sage, lavender, small heaths, etc., with thistles and various flowering herbs, such as the asphodel and iris. These associations show bare earth between the plants; they are widely developed on the drier soils and are known as garrigues in France, tomillares in Spain and phrygana in Greece.

Meadows of the north-western European type are rare ; in well-watered situations there are associations of grasses and bulbous plants which give pasture, but these commonly dry up in the summer.

On the other hand, in very dry areas, such as the interior plateaus and the south-eastern lowlands of Spain, the climatic conditions and the vegetation approach those of the steppes of eastern Europe ; here grasses may predominate, and esparto grass is still the vegetation cover of some districts in Spain.

The natural or semi-natural vegetation is now found mainly on the higher parts, the steeper slopes and the poorer soils of the Mediterranean region ; most of the lowland and much of the hill-country has been taken in for cultivation.

SOILS

It might be expected that the nature of the soil is largely determined by the geological factor—the rock from which it is derived, for in England differences between soils often correspond to differences of the parent material. This view was generally held until Russian scientists, studying the soils of their vast country, which has such contrasted climates, realized that the climatic conditions are the main cause of the striking contrasts in the soils. To appreciate this, as well as to understand the essential character of the soils and their relation to agriculture, we may examine in turn the main soil types and soil regions of Europe, beginning with those of eastern Europe.

The Podsoles.—Beneath a thin superficial layer formed of fibrous vegetable material, the podsoles have an upper level, or "horizon," of an ashen-grey colour from which they were named (Russian : pod = under, zola = ash). This upper horizon has a loose structure, and consists of sandy and gravelly material. Both colour and structure are due to the washing down, or leaching, of the soluble salts, the lime constituent (calcium carbonate) and the clay from the uppermost to the second horizon, situated a foot or more beneath the surface. This second horizon, because of the materials washed into it, is usually compact, and often contains a layer cemented together by iron into an impermeable "pan." The essential process of leaching is the consequence of the downward drainage of water, and this occurs when the precipitation exceeds the combined loss by evaporation, the surface run-off and the transpiration of water by plants.

Hence climate is the main control of the development of the podsoles, and, moreover, the degree to which soils are leached is, directly and indirectly, due to the climate. The map in Fig. 17

shows the distribution of two types, the strongly leached and the moderately leached. The former extends widely over north-eastern Europe (excluding the tundra and mountain areas, which will be considered later), where the summer warmth is not enough to cause great evaporation. Also, the climate has here an indirect effect, since it allows the growth only of the coniferous forest, of which the vegetable residues tend to accumulate as a peaty layer, giving almost permanently wet conditions. The abundantly watered western side of Scandinavia also has soils of the same type. Farther south the coast-lands around the south-eastern corner of the North Sea have similar conditions, for the predominantly sandy character of the subsoil allows easy downward movement of the rain-water.

Soil conditions react upon the vegetation ; for example, the northern limit of the oak is partly determined by climate and partly by the difficulty with which this tree grows on the more strongly leached podsoles. Moreover, these strongly leached podsoles, having lost much of their plant-food constituents from the upper horizon, are unfavourable for cultivation ; to be productive, they need to be supplied with a considerable amount of lime and other manures and to be very thoroughly tilled.

The moderately leached podsoles are found in warmer well-watered regions, and in these the less-marked grey colour of the upper soil and the usual absence of a compact and cemented lower horizon bear witness to the retention of more of the plant-foods in a condition available for plant-life. The deciduous forests, too, supply an annual leaf-fall which is incorporated with the soil.

The map shows that the moderately leached podsoles extend over the deciduous forest regions of eastern Europe and over much of the north-western coast-lands of the continent, excepting the mountain areas ; they are also found on interior uplands. As there are no definite limits to climatic conditions and seldom sharp changes in the vegetation, so the resultant soil types usually merge into one another.

In areas of abundant water together with poor drainage, the podsol regions are characterized by the development of peaty soils. Moorland peats form acid soils of little value to man, but since the fen peats found in lower situations form less acid soils and contain more plant-food, they may prove productive when drained.

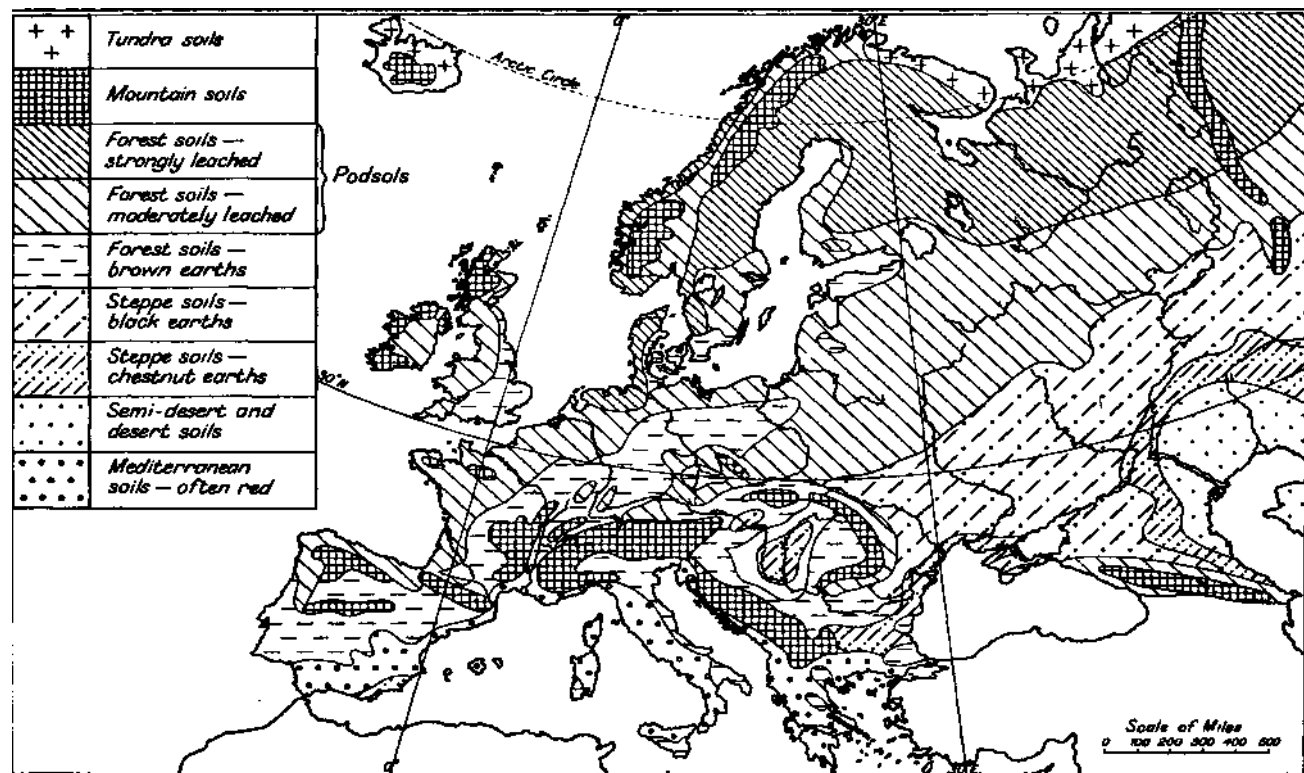


FIG. 17.—SOIL REGIONS OF EUROPE.

The Tundra Soils.—These soils of the far north are largely the result of their water-logged condition and the low temperatures. Evaporation is very slight and the subsoil is permanently frozen below a depth of 2 or 3 feet. Humus, the partially decomposed organic matter formed from plant residues, remains as a surface layer, for downward leaching is impossible, and the low temperatures hinder chemical or other changes ; peat is commonly formed.

It thus appears that an abundance or an excess of water is the main factor in determining the soil conditions in all the northern part of eastern Europe. In the south-eastern part, on the contrary, seasonal or permanent aridity is the controlling factor.

The Black Earths are the characteristic soils of most of the steppe areas, where they are known as chernozem. The black colour is due to a large proportion of humus in the upper horizon, which is usually about 3 feet in depth, and at the base of this there is an accumulation of calcium carbonate, before a transition to the parent material. This parent material is often, but not always, loess.

The humus is derived from the annual addition of vegetable matter from the grasses and herbaceous plants ; the decomposition remains incomplete, because it depends upon the activity of bacteria and other soil-organisms, which is limited, like that of the vegetation, by winter cold and summer drought.

Of great importance is the occurrence of rains and the melting of snow in spring followed in summer by heat and drought. In spring the calcium carbonate is washed down from the surface ; in summer the surface soil becomes dry, and by capillarity the water rises from below and brings up soluble matter, including calcium carbonate, which is then deposited as the water evaporates. There is thus an accumulation of the calcium carbonate at the base of the upper horizon—an indication of a balance in this black earth region between the downward leaching of the well-watered north and the upward movement which becomes most important in the arid south-east.

In the black earths there is an abundance of plant food, and cultivation is made easy by the crumbly structure of the humus-bearing layer ; consequently the black earths stand among the best of the world's soils from the point of view of fertility.

The Chestnut-coloured Soils.—On the northern side the

black earths pass through grades of greyness to the ashy soils of the forest regions ; on the south-eastern side they change to a light-brown, chestnut colour, since the dark humus decreases in amount as the plant-life from which it is derived becomes more scanty. Because of the increasing aridity there is still less leaching than in the black earths, and there is more calcium carbonate in the upper horizon. In themselves, these soils are nearly as valuable as the black earths, but the climate is not so propitious to agriculture.

It should be noted that the steppe soils, besides covering most of south-eastern Europe, are found in the middle Danubian lowlands and in other areas of central Europe too small to be shown on the map.

The Semi-desert and Desert Soils.—The marked aridity in the Caspian Depression continues the change just described, and the upper horizons of the soils progressively contain less humus and more calcium carbonate. Their colour changes through brown to grey, and their fertility decreases. In the most desert-like areas, blown sand is accumulated and even heaped up in dunes. Also, in some parts there appear upon the surface thin crusts, or efflorescences. These are formed by water from the occasional rains sinking some distance into the soil, which then again dries ; the water, after a period during which it dissolves the salts in the soil, works upward by capillarity and evaporates on the surface, where it leaves saline or alkaline deposits.

In these arid regions soil conditions combine with climate to make them inhospitable to man.

Brown Forest Earths.—From the point of view of the formation of productive soils, northern Russia suffers from an excess, and southern Russia from a deficit, of water ; the best balance occurs in the central Russian regions. A similar balance as regards the water-supply occurs in much of central and western Europe, and here it is associated with less severe temperature conditions than in the eastern part of the continent.

Consequently in these regions there is less leaching than in the case of the podsoles, while a greater activity of the soil organisms reduces the amount of humus as compared with that of the black earths. With a natural vegetation of deciduous forest, there is an annual leaf-fall which UNIVERSITY LIBRA

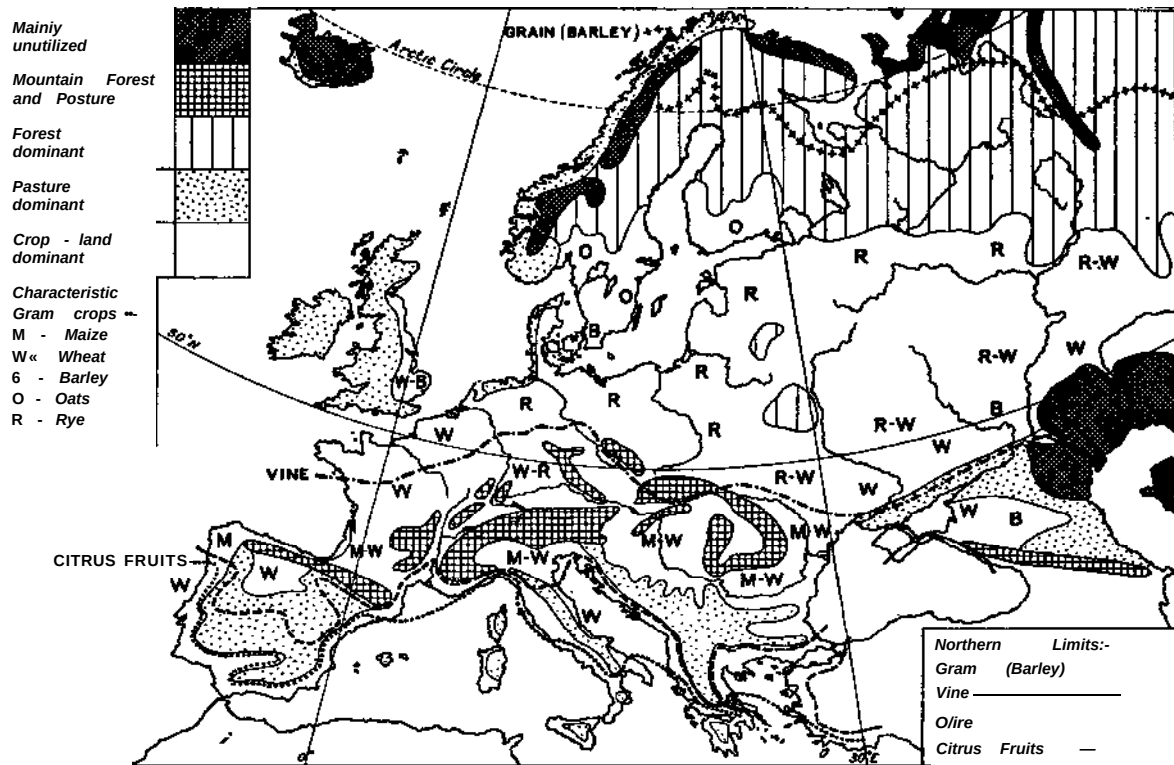


FIG. 18.—LAND-USE REGIONS OF EUROPE.

[Adapted from Jonasson.

the soils for cultivation, and their generally crumbly structure aids tillage.

This group of soils is a large one, and there are many differences in the colour and the other conditions, partly because with this "balanced" type of climate differences in the nature of the parent rock show themselves in the soils, as is well illustrated in the case of south-eastern England.

Moreover, since these soils are generally quite remunerative and have been worked by farmers for centuries, they have often been transformed from a natural to an artificial state.

Mediterranean Soils.—These are varied in character, but frequently have a reddish colour, and although they are often derived from limestone, they are typically fairly heavy clays; unfortunately soil science has not advanced far enough to reach an unquestioned explanation of their mode of origin. In several parts of the Mediterranean lands the red clays provide "oases" of cultivable land in otherwise almost barren limestone areas.

Mountain Soils.—Because of the low temperatures the weathering of the soils of mountain regions has been largely physical, and their development has not in general proceeded far. In the soils of areas above the forest limit there may be a humus layer, recalling that of the tundra, and below this a tendency to a podsol character shows itself. On the slopes there is usually only a thin covering of coarse rock fragments, while the finer material may be deposited as a deeper, and sometimes fertile, soil in the valleys.

LAND-USE AND CULTIVATION

The use that men make of the land depends partly on their desire for particular necessities and comforts, partly on their knowledge and equipment for obtaining these, and partly on natural conditions of climate, vegetation and soil.

Hence the map showing the main forms of land-use (see Fig. 18) shows certain broad similarities with the maps showing the climatic regions, the natural vegetation and the soil types.

Like those maps, that of land-use regions has had to be generalized, and the respective forms of utilization overlap considerably, but the following regions can be distinguished.

The "Mainly Unutilized" Areas.—In the cold north there are the tundra lands which offer practically nothing except a little pasturage for reindeer, the northern Urals and the parts of

the Scandinavian Mountains to which at best cattle may be driven for a few weeks in the year, and the greater part of Iceland, in which there are some areas of summer feeding for sheep. In the arid south-east of Europe there are only poor exclaves of the steppe-lands and small areas where irrigation is possible.

Dominant Forest areas are those of the coniferous forests in the broad belt of country forming the northern portions of Sweden, Finland and Russia. They are still mainly unbroken, although there are occasional clearings in which some agriculture and pastoral work are carried on. In the extreme north only vegetables can be grown, but in the remaining area barley, the grain crop which can ripen in the shortest vegetative period, is cultivated. . It should be noted that this grain is the " six-row " barley which is used for man's food ; it is an entirely different plant from the much more productive " two-row " barley which is grown in England mainly for malt, and in the south-west Baltic lands also as food for pigs. Farther south there are many " islands " of uncleared forest in the region marked on the map as dominant crop-land ; two of these are diagrammatically shown, one being the lake-studded area where Latvia, Lithuania and Russia adjoin, and the other the great Pripet Marshes.

Mountain Forest and Pasture.—These regions are the uplands and highlands of Central Europe and the Caucasus Mountains. In general, they are characterized by having deciduous forest with coniferous forest at higher levels, and then alpine pastures, and in some cases these are succeeded by culminating areas of bare rock and perpetual snow ; only in the valleys is cultivation possible. The use of the land varies from region to region, as will be explained in more detail in later chapters.

Dominant Pasture areas are those in which the main occupation of the people is the keeping of animals and in which a high proportion of the land is used for growing hay or for grazing, although there may be some crops grown either for fodder or for human use, and there may also be forests, moors or heaths. These largely pastoral areas fall into three main groups :

(i) Over much of north-western Europe, including the southern coast of Iceland, the climate is too wet for grain growing to be the most remunerative form of farming. In

Iceland sheep are reared ; in Britain both sheep and cattle are kept; in Norway, and in parts of the North Sea Lowlands, the keeping of cattle and the production of milk, butter and cheese are the main objects of farming. Grasses, clover and root crops are therefore grown and, as food for men, potatoes and oats—a grain which can ripen in relatively cool and wet summers.

(ii) In the Mediterranean region poor pasture has to a considerable extent superseded the forests of the uplands, while in parts woods of evergreen oak yield acorns as mast for animals. Not all the upland areas are used for pasture, however, for there are woods of cork oak, as well as of chestnut and other trees which yield their fruit. Sheep and goats are the animals most commonly kept, and in the Balkan Peninsula swine, too, are numerous. In the northern uplands of this peninsula, where the climate is not of the Mediterranean type, the forests have been so largely cut that even here pastoral work is now dominant ; cattle are relatively more important in these Balkan regions than in the other two southern peninsulas of Europe.

(iii) In the steppe-lands of south-eastern Europe the growing of crops gradually becomes less, and the work of the people becomes more restricted to the keeping of animals, towards the south-east. Cattle are reared in the rather better-watered part of the predominantly pastoral area around the Sea of Azov, and sheep mainly on the still drier country draining to the Caspian Sea.

Dominant Crop-land areas form the largest, as well as the most productive, group of agricultural regions of Europe. They are very varied in type, and one useful way of distinguishing them is according to the grain which is most commonly grown, although almost everywhere the keeping of animals is one aim of the farming, and generally vegetables are a product of considerable importance.

Grain Crops.—*Oats*, as stated above, form the characteristic crop over much of the pasture-lands of the north-west, and the crop-land in which they are predominant extends over southern Scandinavia to the lands north of the Gulf of Finland. Yet other grains, as well as root crops, are grown in the same area, and the two-rowed barley is particularly important in the region around the entry to the Baltic Sea. In eastern England, too, barley is largely grown, and here it rivals wheat as regards the amount of land devoted to it.

Rye.—The rye belt stretches from central Europe south of the North Sea and Baltic Sea across the middle of Russia as far as the Ural Mountains. Although rye requires a longer vegetative period than barley, and drier conditions for ripening than oats, it is a hardy grain and is largely grown on the inhospitable podsols of Russia and the glaciated areas of Germany and Poland. Rye bread has now been displaced by wheaten bread in western Europe, but it is still largely used in central Europe, and remains the staple food in the east. In Russia buckwheat and oats are also grown in the region in which rye is dominant.

Wheat.—The wheat zone is the most extensive, for its northern margin forms a great curve stretching from eastern England into central Europe and across Russia south of the rye belt, while it is largely grown in the warmer parts of central Europe and in the Mediterranean region. Thus wheat overlaps with barley in England, with rye in the Rhine-lands and in the black-earth areas of Russia, and with maize in the southern part of central and western Europe. Comparing the map of crop distributions in Fig. 18 with that of the duration of warmth in Fig. 11, it will be noticed that the northern part of the rye belt has a warm period lasting about four months, that of the wheat belt about five months and that of the maize belt over six months.

Yet the climatic conditions are, of course, by no means uniform over the whole range of wheat production of Europe, and the methods of cultivation consequently vary. In the west "winter wheat" is cultivated; that is to say, the grain is sown in autumn, remains dormant during the winter, grows as soon as the vegetative period begins in spring and is harvested in late summer. In the east the winters are too severe for this type of wheat, and "spring wheat" takes its place; though it is not sown until well in the spring, the hot summers allow a rapid growth and the harvest occurs rather late. In the Mediterranean region the wheat is sown in autumn, slowly continues its growth during the winter and ripens in the dry weather of the early summer.

On the map showing the crops, wheat is marked as the "characteristic" grain of certain regions, either with or without others indicated on this map, but it is almost always only one of several crops grown in rotation in successive years.

Maize.—In its climatic requirements this is the most exacting of the common grain crops of Europe, for it requires both con-

siderable heat and also a good supply of moisture ; hence it is grown in the parts of temperate Europe which have the warmest summers, but not commonly in the Mediterranean region nor in the eastern part of the steppe-lands, where there is a lack of rain in summer.

Barley.—Barley, and particularly the six-rowed varieties, can mature with little heat and with little moisture. Accordingly, barley is the marginal crop, not only in the cold north, but also in the dry south-east ; here and in the neighbouring parts of Asia it is the grain grown by the semi-nomadic peoples in the areas dividing " the desert " from " the sown."

Other Crops.—Space does not permit a separate comment on the distribution of all the other crops. Some are grown as food for men or animals, including grains such as rice, buckwheat and millet, potatoes, root crops, and vegetables of many other kinds. Other are " industrial " crops from which other products are obtained ; e.g. sugar-beet, flax and tobacco. Among these, the sugar-beet is largely grown over an area which almost coincides with the northern part of the wheat belt, that is, from eastern England across the north of France into Belgium and Germany, and thence across Poland and Czechoslovakia into the black-earth region of Russia. Flax is another important industrial plant, from which the fibre is used for manufacturing linen and the seed is crushed for oil and cattle - food. It has a fairly wide climatic range and is cultivated in districts as far apart as northern Ireland, and northern and southern Russia.

Fruits.—The northern part of the area shown as crop-land can allow the growth only of the more hardy kinds of fruit, notably apples and cherries ; in the central part appear others, such as pears and plums ; in the south there is an increasingly great variety. The northern limits of three fruits of considerable importance are drawn on the map. The vine is very widely cultivated, and the wine made from it is used both as a common drink in many of the vine-growing countries and for export as a luxury in cooler lands. It is significant that although the greatest amount of wine is produced in the Mediterranean region or on its margins, some of the most valuable kinds are obtained from near the northern limit of the vine, e.g. in Champagne in France and by the middle Rhine and its tributaries in Germany.

The olive, the most characteristic tree of lands with the Mediterranean type of climate, yields oil which is locally used to supply fat in the diet as butter is utilized in the cooler cattle-rearing countries. Citrus fruits, mainly oranges and lemons, need higher temperatures for ripening than generally occur in the northern part of the Mediterranean region ; therefore, although their limit is shown on the map to approach this margin in the Riviera district of the Gulf of Genoa, the yield here is neither so good nor so great as farther south. Indeed, the distribution of the citrus fruits indicates fairly well the extent of a " very warm," as distinct from a " warm," variety of the Mediterranean climate. As in the case of the other fruits of southern Europe, the oranges and lemons are grown partly for local use and partly for export, particularly to central and north-western Europe.

Besides citrus fruits, olives and grapes, many other fruits are cultivated in the Mediterranean region, e.g. apricots, peaches and edible nuts, such as almonds and walnuts.

So important is fruit growing, and so much of the work of the people is directly or indirectly bound up with it, that the area of the Mediterranean climate may almost be labelled as the fruit-growing region of Europe.

QUESTIONS

1. Describe the *transitions* between tundra, forest, steppe and desert in Russia.

2. Show how the natural vegetation is adapted to the climatic conditions of the " Mediterranean " region.

3. Give a description of the typical " black earth " of Russia, and account for its characteristics.

4. Distinguish between the various types of pastoral work in Europe, and give reasons for the differences.

5. To what extent, and in what ways, is the cultivation of wheat related to climatic conditions.

6. Explain how the differences between types of forest found in Europe are related to climatic differences.

7. Describe the nature and distribution of the podzols of Europe, and show how they are interrelated with both climate and natural vegetation.

8. Discuss the truth of the statement: "Natural vegetation regions are also regions of characteristic types of farming."

GEOGRAPHICAL REGIONS

IN the preceding chapters we have considered separately the most important factors in the geography of Europe, viz. relief and structure, climate, natural vegetation, soils and the use of the land ; in connexion with each of these factors a map has shown its special regions. Now, as geography concerns itself with the interaction of the various factors, we shall indicate regions, each of which has a character depending upon a special grouping and a special form of interaction of all the factors. These regions we call " geographical," preferring that term to " natural," which is likely to be regarded as equivalent to " physical," because here the human factors are also considered ; indeed, in some of these geographical regions man has very greatly modified, and even transformed, the natural conditions.

The geographical regions form definite and distinct environments of man, where people work in certain ways and in which they have developed characteristic modes of life ; in one sense, however, the regions are more than environments, for man himself is an essential element in them.

From the preceding chapters it will have become evident that climatic conditions occupy a pivotal position in this study of Europe ; in the first place, they depend upon the position and the relief of the constituent areas of the continent, and, secondly, climate very largely determines the natural vegetation, the soils and the use that is made of the land. Hence it is not surprising that the larger geographical regions correspond very closely with the climatic regions, as may be seen by comparing the maps in Figs. 15 and 19. That is true of the major geographical regions, but within these there are minor geographical regions which are distinguished from one another sometimes by minor climatic differences, and sometimes by other differences, particularly those of relief and structure.

Because the climatic conditions in the east and south of Europe extend over the adjoining parts of Asia and Africa, the major regions of eastern and southern Europe stretch far

beyond the limits of this continent; the map in Fig. 75 should be studied to see the relation between Europe and the other continents in this respect.

The Arctic Region.—The Arctic Region is primarily characterized by its cold climate, which has already been described, and it is to be noted that the region is considered as including both the tundra lands within the Arctic Circle and also the higher areas of the Scandinavian Highlands. When the minor regions of Arctic Europe are studied separately, the differences between these two parts must be taken into account. It may here be pointed out that the common climatic conditions of extremely long, cold and dark winters, with very short and cool summers, in both parts of the Arctic Region have resulted in similar conditions as regards the soil, which is wet in summer on the surface, but below this is permanently frozen. Consequently the natural vegetation is mainly of small growths, such as mosses, lichens and low shrubs, and man has been able to make little use of the region.

To the southern part of the Scandinavian Highlands cattle are driven in summer from the neighbouring lowland areas of Norway, while the northern part of these uplands and the tundra region are traversed by reindeer, which seek as food the sparse pastures of "reindeer moss," growing so slowly that it needs several years to form a fresh pasture after it has been cropped by a herd. The people who own the reindeer are necessarily nomadic and few in number; they retire in winter to the forest, where hunting is possible, and in summer advance to the coast, where fishing adds to their scanty resources. Since this region offers little which can be exchanged for the products of other regions, and since its position is so remote and the means of communication are so poor, there is very little contact with the rest of Europe, and the inhabitants live in a relatively primitive manner.

The Boreal Forest.—This is the region with the Boreal type of climate and with a natural vegetation cover of coniferous forest; the soils have been in general strongly leached and the surface is often swampy. Largely because of the unfavourable physical conditions, only small clearings have been made in the forests. This is most markedly the case in the east, where the winters are coldest and longest, and where the rivers, which offer the easiest routes, drain to the Arctic Sea. During the

winter the snow accumulates on the land, but with the rapid rise in temperature in spring it melts and floods the country; in this region the thaw occurs in the southern part while the lower courses of the northward-flowing rivers are still ice-bound. The inundations are therefore serious, and work on the land and traffic on the rivers are both delayed; the effective period of activity in summer is thus curtailed, and agriculture, pastoral work and trade are further handicapped.

In the north vegetables are the main crop; in the south barley is grown, and some oats and rye; some cattle, sheep and horses are reared, but the amount of farming is very small in relation to the great extent of the region. The maps in Figs. 18 and 19 show that only along parts of the southern margin have crop-lands extended into the Boreal Forest region.

In the main, forestry is still the characteristic occupation, and even this is largely limited to the southern part and to the neighbourhood of the rivers. Another resource is the hunting and trapping of the fur-bearing animals, though these have now been much reduced in numbers. With the exception of some towns situated on the rivers, and mostly either by the northern seas or near the southern margin, the settlements are small and widely scattered, and the population is scanty.

On the eastern margin of the region in Europe, the Hercynian block of the Urals yields mineral ores which have made possible industrial development.

The western part of the Boreal Forest region, in Finland and Sweden, is made more accessible by the existence of the Gulf of Bothnia, towards which the rivers drain; here there has been more development in connexion with all the resources of the lands and the waters. This is especially the case at the mouths of the rivers and around the coasts of the Gulf of Bothnia, where agriculture and pastoral work gain from some amelioration of the climate, and where the timber from the forests is worked up in saw mills and factories run by water-power from the streams. Moreover, in this western area the ancient rocks of the Baltic Shield emerge from below the sedimentary deposits of the Russian Platform; some minerals are obtained, and by the Gulf of Bothnia a little iron-working utilizes ore from inland mines. The population following these occupations is therefore more considerable in this narrow coastal belt than elsewhere in the Boreal Forest region.

The Sub-boreal Farmed Forest.—The more favourable conditions of the Sub-boreal climate region are reflected in the "mixed" character of the natural vegetation and the less thorough leaching of the soils. To these conditions is added greater accessibility from central Europe, whence came the greater developments in regard to the use of the land. Consequently the clearings have been more extensive than farther north, and now the region may be conveniently labelled "farmed



FIG. 19.—GEOGRAPHICAL REGIONS OF EUROPE.

forest." There are considerable areas of still virgin forest where timber is cut for export, but most of the region may be regarded as crop-land, oats and rye being the chief grain crops.

In the Baltic Shield area in Sweden there has been a development of mining and manufacturing, and around the shores of the Baltic Sea there have grown up a number of towns and cities dependent upon the agricultural and industrial occupations and the associated commerce. In the Russian area are the past and present capitals, Leningrad and Moscow, while industries and trade have grown up at a number of other large centres.

Yet in general the Sub-boreal Farmed Forest region is predominantly agricultural, and it is one of the less densely populated regions of the continent, with the exception of the Tundra, the Boreal Forest and the arid Caspian depression. The map of the geographical regions should be compared with that in Fig. 82, showing the density of population in Europe.

The Steppe Lands.—The steppe lands offer greater returns to agriculture than the forests situated north of them, because of their easier working and the greater fertility of their soils, especially in the belt of the black earth. The climate, too, is more favourable, with its longer summers and the higher temperatures in the growing season, except where the supply of water is scanty, as on the south-eastern margin. Although agriculture has only relatively recently superseded a primitive form of pastoral work, and although modern scientific methods of cultivation have still more recently been introduced, nevertheless this region has a wide range of products and is capable of giving high yields. This is particularly true in the western part of the steppe-lands, where the more valuable grains, maize and wheat, are grown in great amount, together with beet, flax and other industrial crops, and where the vine and other fruit trees are cultivated.

Towards the east the variety of products is reduced by the more extreme temperatures and the poorer supply of water; also the normal yield of the crops is less, and the keeping of animals is relatively more important than in the west. Moreover, the rainfall is more variable in the eastern steppe-lands and failure of the harvests is a serious menace. For these reasons, the population dependent upon agriculture is considerable in the west, but decreases greatly towards the east.

Mineral resources are associated with the two areas where the older rocks come to the surface in southern Russia. Within the eastward bend of the Dnieper the ancient rocks yield ores of iron and manganese, and where the river cuts through the resistant outcrop the rapids give enormous water-power, which is used for the production of electricity. In the Hercynian block of the Donetz region is a large coalfield which has also led to the growth of industries in southern Russia. There are oilfields on the margins of the Carpathians in the south-west, and of the Caucasus in the south-east, of the steppe-lands.

In spite of various drawbacks to navigation, the rivers, as

well as roads and railways, carry traffic through the steppe-lands between the Black Sea and the interior of Russia and Rumania.

With these varied resources and activities, the western part of the steppe-lands has much urban as well as rural development, and the density of population is greater than in any other part of eastern Europe. Indeed, the manner of life of the people is becoming similar to that of the central countries of the continent.

At its south-eastern margin, the region adjoins the Caucasus Mountains, which are geographically more closely related to the highlands of south-western Asia than to the neighbouring regions of Europe.

The Arid Caspian Lowland.—The low and irregular rainfall, the infertility of the soils, the lack of other resources and the remoteness of the position combine to make this extreme south-east of Europe a region of difficulty to man, and comparable in this respect with the extreme north-east of the continent. The lower valley of the Volga, with its port, Astrakhan, is the main exception to this rule.

The Mediterranean Lands.—To its position on the globe this region owes both its general climatic conditions of a mild, moist winter and a hot, dry summer, and also its general structural characteristics of fold-mountains enclosing sea-filled subsidence basins, as a result of which there are commonly narrow coastal lowlands rising rather steeply to hills or mountain ranges.

In the eastern part of the Mediterranean lands of Europe the climate tends to dryness and there is relatively little lowland ; here the growing of the characteristic fruits is one of the main occupations of the people, who have terraced the lower slopes for this purpose, while at higher levels there is little more than poor pasturage.

Around the western basin of the Mediterranean Sea and by the Atlantic coast in the same latitude, there is generally a better rainfall or better possibilities of irrigation, while there is also a greater area of lowland. Consequently there is a wider range of products, and grain and vegetables, in addition to fruits, are grown to a considerable extent.

The interior of the Iberian Peninsula is largely plateau, and while some higher ranges are well watered and bear a vegetation cover of woodland, much of the remainder tends to aridity

and is dependent upon an artificial water-supply for its utilization.

Coal deposits are lacking, and only in scattered areas are there other forms of mineral wealth, and in the Mediterranean region industrial development is mainly limited to certain ports at or near river-mouths.

The Mediterranean Sea and its extensions, the Adriatic, Ægean and Black Seas, give access from the ocean to a great part of southern Europe, and with the cutting of the Suez Canal the Mediterranean Sea links Europe with the Indian Ocean and the Far East. But the mountain-folds encircling the sea impede communications between the Mediterranean lands and those of the remaining part of the continent, and land traffic is restricted to a few breaks or passes in the mountain barriers ; hence in a few ports on the northern shores is concentrated a considerable amount of commerce, both in local products and in goods of wider origin. (The situation of the chief ports and their relation to the routes leading to central and north-western Europe is shown in the map in Fig. 20.) Trading is therefore important in certain parts of the Mediterranean region, and this occupation and the intensive agriculture and horticulture of the larger coastal lowlands have together given rise to some great cities and some areas of dense population.

Temperate Europe.—The region with a temperate climate is the only major geographical region which is entirely European, with the exception of the adjacent Sub-boreal Farmed Forest, for all the other major regions extend far beyond the limits of the continent. As shown on the map of Europe in Fig. 19, this temperate-climate region appears very extensive, but the map in Fig. 75 of the major regions of Europe and north-western Asia shows that its area is not remarkably great as compared with those which overlap the continents.

It has within it, however, such a variety of relief and structure that its constituent areas vary considerably, and no single descriptive label, such as " lowland " or " forest," would be applicable to it as a whole. It is, therefore, convenient to term it simply " Temperate Europe." The differences within it are so marked that it is necessary to divide it into three minor regions, as shown on the maps in Figs. 19 and 21, and these minor regions will now be separately considered.

The Atlantic Margins.—The characteristic feature of the

climate of Temperate Europe is the influence of oceanic winds during the whole year. This influence is particularly marked along the Atlantic Margins from the north of the Iberian Peninsula to the northernmost part of the continent, and throughout this extent it produces a very equable and rainy climate.

Also, along this marginal belt, the earth's crust has suffered dislocations which have resulted in the drowning of large areas and the upraising of most of the remainder, and hence the lands have a considerable elevation. Their altitude combines with the rainy character of the climate and the associated leaching of the soils to handicap agriculture. Forests, moors and heaths cover the highland and upland areas, and the relatively small areas of lowland are mainly given over to grass ; with the rather higher temperatures of the southern part, however, there is more cultivation.

There are scattered deposits of minerals, but only the coal of the British portion has served as the basis of manufacturing to any extent. Elsewhere, besides farming the chief resource is fishing, for the region is too remote from the busier districts of the continent for trading to be important. Hence the population is, with small exceptions, rather scanty. Even in Britain, as was explained in Volume I of this series, the Atlantic Margins differ markedly from the English Lowland, which belongs to the next minor region.

The Developed Lowlands and Wooded Uplands.—The map of climate regions in Fig. 15 shows that within this minor region there are modifications in the climate, particularly noticeable in an approach to extreme conditions towards the east. Moreover, a relief map shows that, apart from the Alps, there are in Central Europe considerable upland areas which are high enough to have distinctly cooler and wetter conditions than the adjoining lowlands ; these uplands areas are indicated also on the map of structural regions in Fig. 1 as belonging to the Hercynian group or as due to foldings of the Alpine type.

Putting these facts together, it will be seen that this minor region of Temperate Europe comprises (a) lowlands of sedimentary material, and (b) uplands of generally older and more resistant rock, and that each of these groups is composed of a number of relatively small areas with climatic differences corresponding to their respective positions (see Fig. 21).

The former group is here labelled as " developed lowlands,"

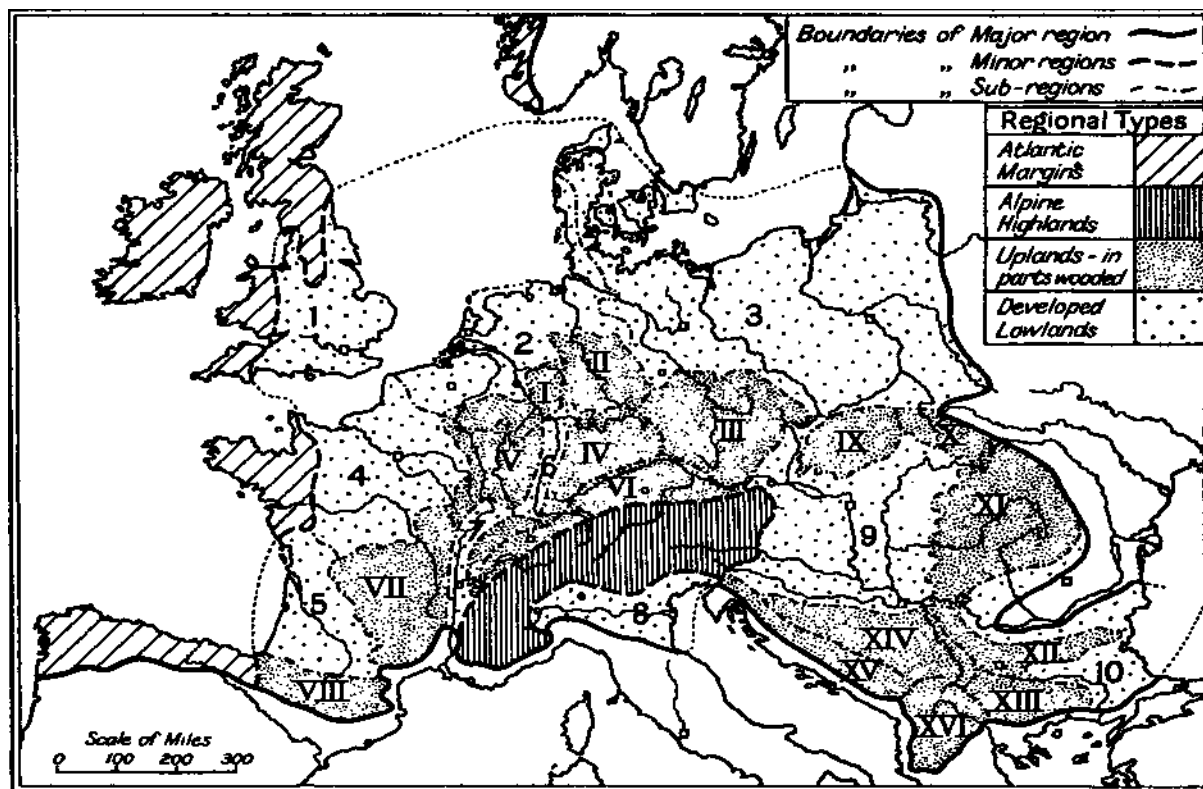


FIG. 21.—REGIONAL TYPES OF TEMPERATE EUROPE.

because their resources have been very thoroughly exploited and in them a number of districts have been largely transformed by human agency. In general, the climate and soil favoured early settlement, and for centuries men have used and improved the natural conditions, while even less-favoured parts, such as the marsh areas near the delta of the Rhine, have for various reasons also attracted settlers, who have converted them into productive lands.

Practically the whole of the lowlands are farmed, and much of the area is cultivated in an intensive manner, with a high yield as well as a great variety of products. According to the varying climatic conditions, rye, barley, wheat and maize are characteristic in different localities, generally associated in a rotation with other grains, industrial crops or fodder crops. Pastoral work in many parts is carried on in its most remunerative form, viz. dairy farming, to meet the needs of large urban populations. Minerals, too, have been exploited where they exist, particularly where coalfields dip down from the Hercynian Uplands under the margins of the lowlands, and some of the greatest and most densely populated industrial regions of the world have grown up in these lowlands.

The "drowning" of the continental margin has brought the sea far into the region, and from much of the interior of Europe the rivers bring traffic to the English Channel, the North Sea and the Baltic Sea. Because of the great amount of manufactured goods produced in the region, and the need of the dense populations for raw materials and food, commerce has developed here as in few other parts of the world and many important trade routes meet in the lowlands, as is shown in Fig. 20; there are also great ports, especially near the mouths of the rivers on the continental and English shores of the North Sea. Manufacturing and trading have thus led to immense urban development in the more northerly of the lowlands, viz. the English Lowland (numbered 1 on the map in Fig. 21), the North Sea Lowlands (2), the South-West Baltic Lowlands (3), and the North French Lowland (4).

On the other hand, some of the more southerly regions have more favourable climatic conditions and give a greater return to agriculture, as is exemplified in the Basin of Aquitaine in France (5), the Rhine Rift Valley (6), the Rh6ne-Sa6ne Trough (7) and the North Italian Plain (8). On the eastern side a lack

of rain may be a handicap in the Middle Danubian Lowlands (9), while a transition to steppe-like conditions is observed in the drier South-eastern Lowlands (10), which include the Walachian Hill-lands and the East Balkan Lowlands.

Each of these ten areas has sufficient unity within it, and sufficient difference from its neighbours, to be regarded as a distinct sub-region of the " Developed Lowlands and Wooded Uplands " of Temperate Europe.

The uplands of Temperate Europe, with their cooler and wetter weather, are less suited to crop growing ; they have considerable areas given to pasturage, but their characteristic vegetation-cover is forest. There is quite a variety of trees, and forestry is one of the chief occupations. The minerals, which in a number of districts first attracted settlers, have in several cases been largely worked out, and only relatively small industries are based upon them. Trade naturally avoids the higher areas (again see Fig. 20), and because of these combined conditions, the uplands are, in general, the homes of much smaller populations than the lowlands.

These uplands form a number of distinct sub-regions, which may be grouped according to their position. The Central Uplands of Europe comprise the Rhine Plateau (marked I in Fig. 21), the Weser-Saale Hill Country (II), the Bohemian Diamond and its margins (III), the East Rhine Scarp-lands (IV), the West Rhine Scarp-lands (V), the Jura Mountains and the Alpine Foreland (VI). In western Europe are the Central Plateau of France (VII) and the Pyrenees (VIII). On the eastern side are the three Carpathian sub-regions (IX, X and XI), and five more constitute a great part of the Balkan Peninsula (XII—XVI).

The Alpine Lands.—The great differences in elevation make it difficult to summarize the characteristics even of this relatively small minor region. It may be briefly said that the valleys provide sites for settlement, and offer opportunities of farming and other occupations which support the comparatively small numbers of inhabitants, while through some of the valleys pass routes connecting central and north-western Europe with the Mediterranean region. At higher altitudes forests supply timber, and still higher are summer pastures to which animals and people migrate for a few months. Above this habitable zone, dwarf shrubs, low cushion-like growths, lichens and other forms of alpine flora appear in summer and recall, in the heart of

Temperate Europe, the plant-life of the Arctic Region ; in the highest zone of all, only steep slopes and culminating peaks of bare rock emerge from snow-fields.

Peninsular and Trunk Europe.—We may regard Peninsular Europe as that part of the continent which adjoins the Atlantic Ocean and has been given peninsular form by the penetration of the North and Baltic Seas on the north and the Mediterranean Sea on the south. It may be broadly limited eastward by a line drawn through the Gulf of Bothnia and the Baltic Sea to near the mouth of the Niemen (Memel) River where Temperate Europe adjoins the Sub-boreal Farmed Forest Region, and thence the limit approximately follows the boundary of Temperate Europe to near the delta of the Danube.

By such a division, both Peninsular and Trunk Europe include portions of several geographical regions, but the former is more open to maritime and western influences, while the latter has a continental and eastern orientation. The physical causes of the differences have now been shown ; corresponding contrasts in the human geography of the two areas will be brought out in several sections of the next chapter.

QUESTIONS

1. Define the limits of the " Arctic " region of Europe, and show how the geographical factors within it interact with one another.

2. What justification is there for regarding the Boreal Forest region as a geographical unit ?

3. Describe the common characteristics of the Mediterranean geographical region, apart from its climate.

4. Discuss whether it would be better to incorporate the region here termed " Sub-boreal Farmed Forest " into one or more of the neighbouring regions.

5. Consider whether the areas marked as " Atlantic Margins " should be distinguished as a separate minor region of " Temperate Europe."

6. It is difficult to find short names which well denote geographical regions. Discuss, and suggest alternatives to, two names adopted here for major regions, which seem rather unsatisfactory.

7. Discuss the possibility of dividing Europe simply into two great regions, " Peninsular " and " Trunk," on the basis of their general character.

THE PEOPLES OF EUROPE

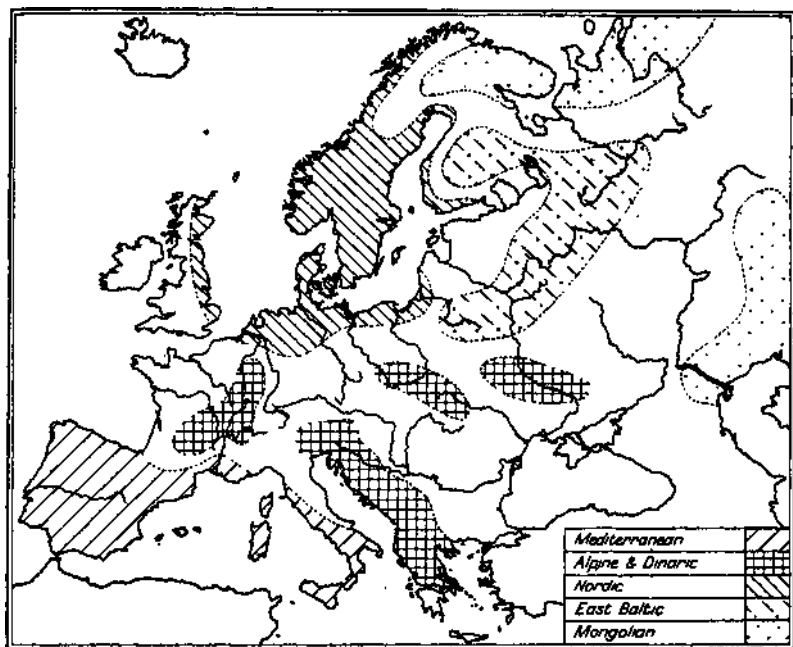
IN the preceding chapters the people who live in the various parts of the continent have been referred to mainly in relation to their respective environments ; we will now consider the peoples themselves.

The Racial Elements.—The physical characters of people are fundamentally determined by their descent, being handed down from generation to generation, and are therefore taken as indications of the race to which people belong. It is important to restrict the term " race " to groups of people who have in common a number of physical characters due to a more or less common ancestry, and never to use the term to denote groups who, although speaking the same language, or having the same religion, or being members of the same political State, nevertheless differ from one another physically because they have a mixed ancestry.

Anthropologists classify the greater part of mankind into three main racial or ethnic groups, distinguished from one another by the structure of the hair and the colour of the skin. These three groups are : (i) that of the negroes with woolly hair and black or very dark skin ; (ii) that represented by the Chinese and other Mongolians with straight, lank hair and yellowish skin ; (iii) the group to which the peoples of Europe mainly belong, with wavy or curly, yet smooth and not woolly hair, and with skins which are more or less white or light brown.

Among the Europeans, the various shades of skin colour are often, but by no means always, associated with the colour of the hair and eyes : a fair skin is in many cases accompanied by light-brown or even yellow hair and by blue or grey eyes, while the rather darker-skinned people commonly have dark-brown eyes and black hair. These contrasts between fair and dark are very clearly seen by comparing the typical Scandinavians showing the former characters with the inhabitants of southern Italy showing the latter, and they are so marked that they are taken as indicating distinct racial or ethnic stocks, to which the terms

"Nordic" and "Mediterranean" are respectively applied. People belonging to the Nordic type constitute a considerable proportion of the inhabitants of the northern plains of Europe west of Russia, and those of the Mediterranean type form a majority of the population of the western Mediterranean lands (see Fig. 22). Between them, in the highlands and uplands of Central Europe, most of the people have an intermediate



After Giinther.

• FIG. 22.—DISTRIBUTION OF PREDOMINATING RACIAL TYPES.

Note.—The shaded areas are those in which the respective racial types are common. In the intervening areas the mingling is so great that no type can be regarded as characteristic.

grade of coloration with chestnut-brown to black hair, and hazel-grey to brown eyes. Moreover, the people of the Nordic stock are generally tall, those of the Mediterranean stock are relatively short, while those of the central uplands and highlands are of medium height.

Yet these intermediate conditions of coloration and stature do not result from a mixing of the other two racial stocks, for they are commonly associated with a quite different shape of the head. Both the Nordic and the Mediterranean stocks are

characterized by " long " heads, that is, the length of the skull from front to back is markedly greater than the breadth from side to side, whereas the inhabitants of the central uplands and highlands usually have rather broader heads. Hence the peoples here are representatives of another racial stock, and to these people the name " Alpine " is applied.

Closely associated with these Alpine peoples are another group who are also broad-skulled, but do not resemble them in appearance, for they have a greater stature, a more slender figure and a longer face. They are numerous in the coastlands north-east of the Adriatic Sea, and for that reason this group is known as " Dinaric " or " Illyrian." Judging by the physical criteria, members of this stock spread northwards and now form one of the important racial elements in the plains of Silesia and south Poland.

The three ethnic groups—Mediterranean, Alpine-Dinaric and Nordic—together comprise the greater part of the population of Europe, and it is therefore commonly stated that there exist these three European races.

The ancestors of these groups worked their way into Europe thousands of years ago, displacing or mingling with the scattered hunting peoples who had occupied the south of the continent during the Ice Age and had moved northward as the climate improved and the ice retreated.

Of the three main races, the Mediterranean stock peoples were the first comers. It was probably before 4000 B.C. that they settled on the warm and fertile shores of the great sea ; there they had opportunities for growing grain and fruit, and for extending westward in Europe the civilization which had arisen in Egypt, Mesopotamia and the lands around the eastern part of the Mediterranean. In course of time they passed around the Iberian Peninsula to the Atlantic coasts, and thus reached the west of France and the British Isles (see Fig. 23).

Later, when climatic conditions in central Europe had become more favourable, the Alpine peoples migrated from Asia Minor and extended their settlements along the uplands and the neighbouring lowlands drained by the Danube. The loess areas of central Europe, fertile and free from forest, favoured the agriculture and pastoral work upon which they depended. They gradually worked their way westward into the valleys of the Alps and over the upland areas of what are now southern

and central Germany, Belgium and central France. The related Dinaric peoples followed those of the Alpine stock by much the same routes through the Balkan Peninsula and into central Europe, but they did not penetrate so far westward.

At a very much later date one branch of the Alpine stock spread from the Carpathian region into the adjoining plains to the north and east which now form part of Poland and Russia. These peoples are known as Slavs, and their descendants form a considerable proportion of the Russian people. A further migration southward gave rise to another group, the South Slavs or Yugoslavs, who occupied much of the Balkan Peninsula.

The ancestors of the Nordic peoples seem to have entered Europe after the Mediterranean and Alpine immigrants; originally pastoralists, they migrated across the plains of southern Russia, and eventually settled in the lands around the Baltic Sea.

Associated with the greater stature of the Nordics is usually greater physical strength than that of the peoples of the other stocks, and this doubtless helped them, at a much later date, to spread southwards and, in many instances, to conquer other peoples and to occupy parts of western, central and even southern Europe. For example, there were the settlements in Britain by the Angles, Saxons, Jutes and Norsemen, the incursions of the Goths into the Balkan Peninsula and Italy, and the penetration by the Vandals into the Iberian Peninsula and even into northern Africa.

Besides these peoples who have been so long established in this continent that they are regarded as truly "European," there are others whose origins are more recently Asiatic, and who are related to the Mongolian races of Asia. The Samoyeds have migrated from Asia into the northern forests and tundra of Russia, and the Lapps have spread even into the north of Scandinavia. They belong to the Ugrian racial group, who are characterized by broad heads and rather short stature, and often have a flat face and prominent cheek-bones ; the slanting eyes which are shown most strikingly among the Chinese and Japanese appear among the Samoyeds, and occasionally among the Lapps.

Allied to the Ugrian folk are the Finnish group of peoples who had earlier worked their way across the Ural Mountains into

northern Europe, and now occupy the greater part of Finland and the adjoining region of Karelia across the Russian border. Yet the Finns of the present day do not show the characteristic Mongolian features to the same degree as the Lapps or the Samoyeds, probably because the original Finnish immigrants here settled in an already populated area. It frequently happens that a group of intruders may dominate an area and intermarry with the inhabitants, upon whom they impose their name,

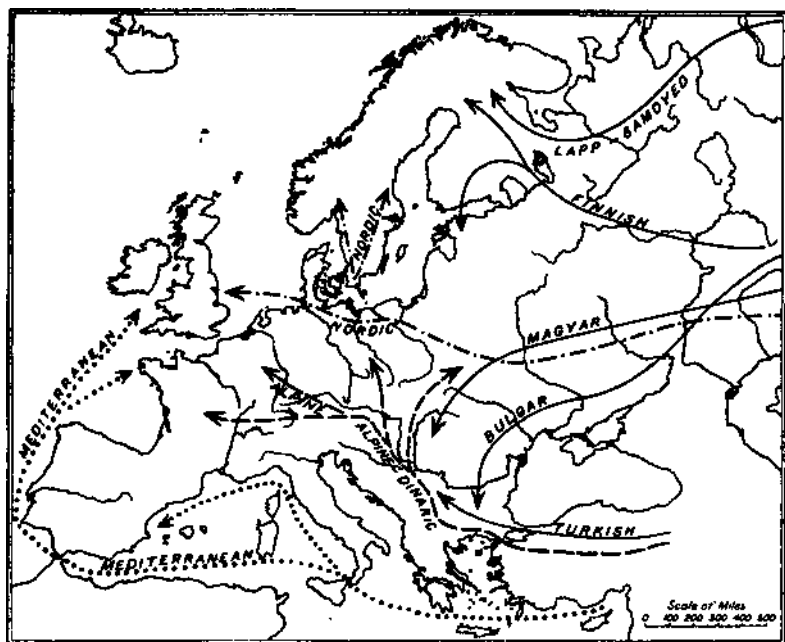


FIG. 23.—RACIAL MIGRATIONS INTO EUROPE.

language and traditions ; yet, if these subject people are relatively numerous, in the course of generations the blood of the dominating group becomes progressively diluted, as it were*. Hence, anthropologists are frequently faced with the fact that the name and speech of a people suggest one origin, and their physical features another. In the case of Finland it is certain that, in spite of the absence of Mongolian features, some of the ancestors of the present Finns migrated from northern Asia.

South of the Gulf of Finland are the Ests or Esths of Estonia, who are closely related to their Finnish neighbours. Moreover, in all the East Baltic region there are many individuals of a

type which seems to have resulted from a mingling of stocks of northern Asiatic and Nordic origin. These people are regarded as having by now been welded into a distinct ethnic sub-group, called East Baltic (see Fig. 22), and they form part of the population of a very wide area extending into Prussia on the west, Russia on the east, Finland on the north, and Latvia, Lithuania and Poland on the south.

Rather more recent immigrants from Asia of definitely Mongolian origin and speaking Ugrian languages came by a more southerly route along the steppe-lands. The Bulgars were nomadic horsemen, who in the seventh century A.D. crossed the lower Danube, conquered the Slav inhabitants and gave their name to Bulgaria. But though their name and some of the traditions of the invaders have survived, the language of the Bulgarians is now in the main Slavonic, and the people show little of the original physical characters of the immigrants.

A century or two later, other Asiatic tribes swept across the steppes, and some of these worked their way across the Carpathian Mountains into the Pannonian or Hungarian Basin. One group of these invaders spoke a language which was compounded of two Asiatic elements, the Ugrian and the Turki; the people of this speech were the Magyars, and the present inhabitants of Hungary still retain the name Magyars and speak the Magyar language, though their physical appearance shows that they have altered but little the predominating Alpine stock of the Slavs whom they conquered.

At about the same time that south-eastern Europe was thus invaded, the Moors of northern Africa crossed into the Iberian Peninsula and for a time ruled much of that region; yet they did not make great changes in the racial composition or the language of the people of the Peninsula, and the results of their occupation will be referred to in later sections.

The last of the great invasions was that of the Turks, i.e. tribes speaking a Turki language; they came from central Asia, and one group, the Osmanli Turks, overran Asia Minor, occupied Constantinople in A.D. 1453, and forced themselves as masters upon the people of the Balkan Peninsula. But throughout their long and victorious advance, they freely intermarried with their subjects, and accepted as "Turks" many who adopted their Moslem religion. Thus the Turkish State known as the Ottoman Empire spread from south-western Asia over much

of the Balkan Peninsula, and imposed its rule upon that region, but, nevertheless, the Balkan peoples still remained mainly of Alpine, Dinaric or Mediterranean descent and retained Slavonic, Albanian or Greek languages.

Other movements of peoples have occurred, some of which must be referred to in the next section in connexion with the spread of languages, but it may already be realized that the contacts and conflicts of the various migrant peoples have resulted in a mingling of the population in such a way that few districts show a uniformity of type.

Languages.—To use the words "Aryan race" for the Nordic ethnic group is doubly misleading, for in the first place the word Aryan applies only to languages, and in the second place it denotes a widespread group spoken by the great majority of Europeans (see Fig. 24). The Aryan languages have extended over almost the whole of the continent of Europe and through south-western Asia into India. Hence they are also known as Indo-Germanic, though they include not only the German or Teutonic family of languages, but also Greek, the Romance languages which have derived from Latin, the Slavonic family and the Celtic languages, as well as others spoken by some of the smaller communities.

Although in some areas, as in Wales, two languages exist side by side and many individuals may speak both, it is nevertheless possible to show the broad distribution on a map. This is done in a generalized form in Fig. 24, and in more detail for the central part of Europe in the end-paper map within the back cover of this book.

It is not possible to say what were the languages of the earliest folk who came into Europe; only the later movements of people, during historical times, can be definitely associated with the spread of the present-day languages.

By the generally westward migrations of conquering tribes the pre-Aryan languages became extinct, the one striking exception being the Basque speech, which has survived in the mountainous borderland of South-western France and Northern Spain. With the language there have remained old customs and traditions, and even a feeling of a distinct nationality among the Basque folk; nevertheless, the physical characteristics of the people do not show a uniformity of racial origin.

Another early language which has survived in the west of

Europe is the Celtic tongue. It is a member of the Aryan group carried across Europe in successive waves of settlement about 1000 years B.C. by folk probably of mixed descent ; later these people were themselves displaced or forced to adopt the languages, Teutonic or Romance, of other conquerors. Hence Celtic is now found, in several varieties, only in the peninsulas and islands of the Atlantic Margins in Brittany, Wales, north-western Scotland and Ireland.

The Greek language is spoken in the southern part of the Balkan Peninsula, and on the islands of the *Mgesm* Sea and Krete.

The Romance languages have a very wide distribution, for their spread resulted from the great extension of the Roman Empire. Italian is most directly derived from Latin, and is now spoken in the Italian Peninsula, the islands of Sicily and Sardinia, the North Italian Plain and some of the coast-lands north-east of the Adriatic ; it is also spoken in the part of Switzerland which projects southward to the edge of the North Italian Plain between Lakes Maggiore and Como.

East of Lake Como there are several small areas of the Alps in which the inhabitants of the mountain valleys speak distinct Romance dialects : Romansch or Rhaetic, Ladin and Friulian,

In the Iberian Peninsula, apart from Basque, are several languages belonging to the Romance family. The difference between them may be related to the invasion by the Moors, who at one time occupied all the Peninsula except the northern mountain regions, where the Christians held out and whence they reconquered the land. One line of reconquest spread the dialect of the north-west corner, Galicia, southward along the Atlantic region, thus leading to the growth of a distinctive language in all this western part of the Peninsula. Later, most of this area formed the independent State of Portugal, in which evolved the present Portuguese language. Hence the Galicians, or Gallegos, speak a dialect akin to Portuguese and markedly different from the Spanish language.

Spain was mainly reconquered from the north by way of the plateaus of Castile ; the Castilian rulers gradually extended their power over the whole of Spain, and thus Castilian became the standard form of the Spanish language.

In the north-east of the Peninsula the defeat of the Moors allowed the return to Spain of refugees from France who brought

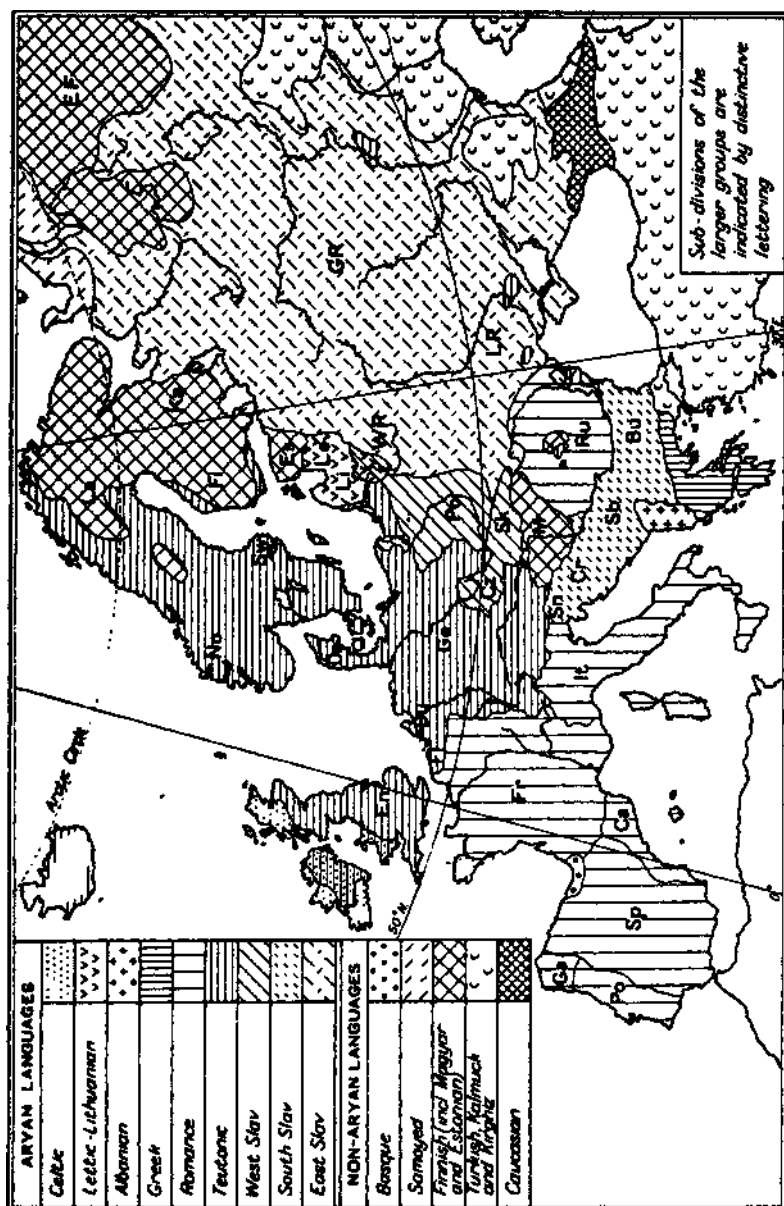


FIG. 24.—DISTRIBUTION OF LANGUAGES.

with them a dialect of the " Languedoc " spoken in the south of that country and akin to the modern French dialect Provençal; in eastern Spain this language became Catalan, and has spread to the Balearic Islands. In Catalonia, the north-eastern part of the Iberian Peninsula, the Catalan language has developed a considerable literature, and the distinctive language, traditions and literature have made the Catalonian people conscious of possessing a unity among themselves, and differing from the other peoples of the Peninsula.

The extent of the French language does not coincide with the territory of the French State, for while on the west Breton is spoken together with French, on the east the boundaries of the language and of the State diverge at several points. This is especially the case in three areas : (i) where the French speech extends into Switzerland, being spoken by about one-fifth of the population of that country ; (ii) where German-speaking peoples live in French territory in Alsace and Lorraine ; (iii) where French is the language of the Walloon people who form the population of the southern part of Belgium, viz. south of a line running approximately from east to west a little south of Brussels.

Rumanian is derived from the Roman language, as is clearly suggested by the native spelling of the name of the country—" Romania." It has been handed down from the provincials of this north-eastern outpost of the Roman Empire, but it has been greatly modified by the Slav-speaking and other peoples who have since then occupied the country. In most other parts of the eastern portion of the Roman Empire in Europe the later invaders have imposed their Slavonic speech, with the exception of Greece and Albania. In the latter mountainous country the Albanian language appears to be a survival of a primitive Aryan tongue.

The Teutonic family of languages probably had its home among the Nordic folk living in the plains around the west of the Baltic Sea and the south-east of the North Sea ; thence settlements and conquests in all directions led to the development of distinct Teutonic languages among peoples of varied origin. In the north there are the Scandinavian languages, of which Danish and Norwegian are almost identical; Swedish is closely related to the other two.

The English language is based in the main upon the speech

of the Teutonic invaders, modified by Romance elements introduced as a result of the Norman conquest. Other westward migrations of Germanic peoples have resulted in the development of the Dutch language in Holland and of Flemish in Belgium. This latter language is very closely akin to Dutch ; it is spoken by the Flemings, who form rather more than half the population of Belgium and occupy the part of the country north of the Walloon area.

Southward the Teutonic languages have had a wide extension over lands in which the people show relatively little influence of Nordic stock, i.e. from the racial point of view. German is spoken not only throughout Germany, but also beyond its borders in the Alsace-Lorraine portion of France, over the greater part of Switzerland, and in the upper Adige basin in Italy (see the end-paper map).

Eastward and south-eastward are " islands " of German speech, some of which are due to past wars between the Teutonic and Slav peoples. The Teutonic Knights won back East Prussia from Slavonic invaders and dominated the country now forming the States of Estonia and Latvia. In Poland, too, there are many German communities bearing witness to a similar ebb and flow of conquest. German settlers also went far into south-eastern Europe—into the Danubian plains and the upland basins and valleys of Transylvania, and even into the steppe-lands of Russia.

The Lithuanian and Latvian (or Lettish) languages, like the peoples of those countries, have a mixed origin. They are alike, and are regarded as a survival of an archaic Aryan type ; in each country the ancient tongue has been modified by the introduction of Slavonic and other elements.

The Slav languages have spread over the greater part of east-central and eastern Europe. There is the western group, including Polish and the closely related Czech and Slovak languages. There is the southern group, which includes Slovene, Croat and Serbian spoken by the three peoples who form the bulk of the population of the Yugoslav State. Bulgarian is another of the South Slav group of languages.

The widest extension of the Slavonic-speaking peoples has been eastward into the previously scantily occupied forests and steppe-lands of Trunk Europe. Of the East Slav languages " Great Russian " is the standard literary form, and is spoken

by the vast majority of the Russian people ; " White Russian " approximates to Polish, as its geographical distribution would suggest; " Little Russian " is the language of the Ukraine. The word " Ukraine " means borderland, and here the Russians had to oppose, and in course of time were to some extent influenced by, the invading horsemen from the Asiatic steppes ; consequently the Ukrainians developed differences from the Great Russians in several respects, and now Little Russian or Ukrainian is claimed to be a distinct literary language.

Lastly, there are non-Aryan languages of relatively recent introduction from Asia. In northern Europe, in addition to the speech of the relatively few Samoyeds, there is the Finnish group ; in the north-east are people speaking East Finnish dialects, while the West Finnish languages are spoken by the Karelians, the Lapps and the Finns themselves. These last people have developed the Finnish language proper and created a Finnish literature. Another west Finnish speech has spread southwards across the Gulf of Finland and has there become the Estonian language.

Magyar belongs to the same Finno-Ugrian family, although it has been carried into distant regions and imposed upon other peoples ; hence the Magyar speech of Hungary and Transylvania contains quite different elements from those of the Finnish group.

Of the other " Asiatic " languages, Turkish is now spoken by few people beyond the borders of the Turkish State, and the allied tongues of the Kirghiz, Kalmucks and other peoples of the south-eastern margins of Europe are giving way before the advance of Russian colonization and government. In the Caucasus and Transcaucasia there are spoken various non-Aryan Caucasian languages.

It will be observed that while Peninsular Europe has been influenced by many language developments and their associated forms of culture, Trunk Europe has seen the extension only of the Eastern Slav and the relatively late Asiatic groups of languages.

Religions.—It would be out of place here to attempt to state the faiths of the various religions or the effects they have upon individual people, but the religions have a geographical significance because the churches into which they are organized have had effects upon political, social and economic affairs, while their distribution is related to geographical conditions.

Christianity was adopted as the creed of the Roman Empire, and its spread was influenced by the extent of that power, but Christian missionaries carried even beyond the Empire both their faith and also such advances as reading and writing, better methods of cultivating the land, and various handicrafts ; hence the spread of religious ideas was often marked by a spread of other forms of culture.

Because the Roman power extended over a great part of western Europe the allied religious and cultural influences had more effect in transforming the lives of the " barbarians " in the west than was the case in the east of the continent, and these influences were one factor in bringing about the greater development in knowledge, in arts and sciences, in forms of government, and in economic matters, which long characterized western as compared with eastern Europe.

In the eleventh century the Christian Church was permanently split into two portions : in the east was the Greek or " Orthodox " Church ruled from Byzantium (now Istanbul), and in the west was the " Catholic " Church ruled from Rome. From the original home of European civilization in the Mediterranean region the line separating the areas influenced respectively by the Roman and Orthodox Churches runs from the head of the Adriatic Sea first north-eastward and the northward to the Arctic Sea, as can be seen from the map in Fig. 25.

In the east of Europe the influence of Christianity was greatly weakened by exposure to the attacks of Asiatic intruders. In the Balkan Peninsula the Turkish occupation resulted in a widespread adoption of the Mohammedan religion, and although the Turkish rule has been withdrawn from nearly all the region, nevertheless the people of parts of Yugoslavia and Bulgaria and of most of Albania remain Mohammedan. Here, in south-eastern Europe, the tall minarets of the mosques give an " oriental " appearance to the villages and towns, and from their summits the muezzins call the people to prayer. The Moslem women are still veiled, and the men still wear the round, tasselled fez, although in Turkey itself these distinctive marks of the Mohammedan religion are banned in order to avoid religious animosities between the different sections of the Turkish population.

Farther to the north-east, over most of Trunk Europe, the spread of religious and cultural influences was hindered by geo-

graphical conditions, for between the Mediterranean region and the homes of the early Russians in the clearings of the "farmed forest" region lay the steppe-lands; along these open lands passed wave after wave of nomadic invasion from Asia, which prevented effective contact between north and south. For the many centuries before the Russians dominated the steppe-lands, the advances made over the rest of Europe could reach the

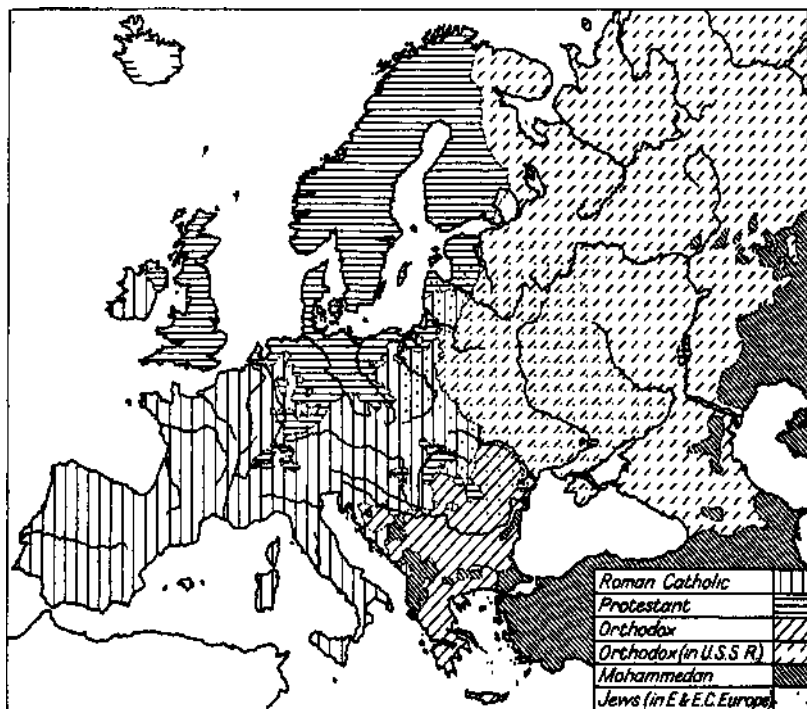


FIG. 25.—DISTRIBUTION OF RELIGIONS.

Russians only by a roundabout route through the Baltic Lands. This retardation is an important factor in explaining the differences between the peoples of Peninsular and Trunk Europe respectively.

The Orthodox faith at last spread over most of Russia and had a great influence for several centuries, but after the revolution of 1917 the new Government was so hostile to the Christian religion that now it is held, as a rule, only by people of the older generation who were brought up in that faith.

Yet one effect of its previous power is shown by the fact that here, as in the other countries in which some form of the Orthodox religion exists, the present alphabet is based upon the ancient Greek alphabet; on the other hand, in the countries to which the Roman Church extended the Latin alphabet is used, even though the language is not of the Romance family. The exception to this rule is Rumania, where the religion is Orthodox, but the Roman characters are used.

Yugoslavia illustrates the influence which religious differences may have on political conditions. The three peoples comprising the majority of the population are the Serbs, Croats and Slovenes, and, as stated in the preceding section, they speak similar languages, but while the Serbs are in the main of the Orthodox faith and have an alphabet derived from Greek, the Croats and Slovenes are Roman Catholic and use the Latin alphabet. These differences add to the difficulty of welding the three groups into one harmonious and firmly knit State.

After the close of the Middle Ages, a number of the States of northern Europe broke away from the Roman Catholic Church, and several Protestant Churches were formed; in determining the distribution of these new Churches the political power of the princes of that time was a greater factor than geographical conditions, and although the religious differences had very important consequences two or three centuries ago, they now count for less when one region is compared with another.

Separate reference must be made to the Jews as a religious community. Although a proportion of the Jews show a facial resemblance by an aquiline nose with a depressed tip and wide nostrils (characteristic of an " Armenoid " ethnic group related to the Alpine race), they have a very mixed racial origin. They have a language of their own—Yiddish—a blend of Hebrew and German elements, but they also speak the languages of the countries in which they have settled. The essential bonds between them are their religion and the traditions associated with it, and their feeling of difference between themselves and other peoples has been greatly intensified in several countries by their being forced into living apart from others. The map shows that they are relatively numerous in the transitional region between eastern and central Europe; here they are largely town-dwellers, engaged in trade, and are not easily

assimilated into States which are mainly composed of peasants. In all Europe, the Jews number nearly 8 millions.

Nationalities.—When a considerable group of people have lived together in one area and feel themselves to be bound by common ties to the extent that they wish to form a Government of their own, they may be said to constitute a "nationality." The ties that unite the members of a nationality are various : belief in a common racial origin (whether this belief is justified by scientific knowledge or not) ; the use of a common language and the enjoyment of a common literature; sharing of a religion ; living in one political state ; association in defence against enemies. Any one or more of these factors may be powerful in creating a feeling of national unity, but any one or more may be lacking among the members of a nationality. Perhaps the most usual indication of a feeling of national unity is the possession of a common language, for this is the result of long association and helps intercourse between those speaking it ; hence the map showing the language of Europe is, as a whole, useful as showing the nationalities of Europe. There are, however, some marked discrepancies ; e.g. the Swiss people certainly form a definite nationality, for they feel among themselves a unity which demands that they form a State independent of any other, yet among them are spoken four official languages—German, French, Italian and Romansch.

If a nationality is able to form a self-governing State, it is fortunate ; if it cannot, it may become a minority within some State in which it is held against its will, and in that case its discontent may be a danger to peace.

Political States.—A State is an association of persons living under one Government and inhabiting a definite territory. The reasons for the existence and extent of a particular State are generally complicated and reach far back into history ; it is clear from what has already been written that the members of a State are not necessarily bound by all the ties which have been discussed, though a feeling of a common nationality usually unites a considerable proportion of the subjects of a State. In the case of Switzerland we have an example of a State coinciding exactly with a nationality, but the Russian Empire as it was in the early part of the present century comprised a number of different nationalities.

It is important to consider the relation of States to geo-



FIG 26 —STATE BOUNDARIES BEFORE AND AFTER THE WAR OF 1914-18.

Note.—The various shadings show the extent of the States before the war of 1914-18; the thick In 1938 Germany incorporated Austria and the north-western margins of Czechoslovakia, and smaller areas of Czechoslovakia were lost to Hungary and Poland.

graphical conditions, and an examination of a map of the political units in Europe shows that they seldom bear any close relationship to natural or geographical regions (see the end-paper map at the front of this book). Indeed, there is a strong tendency to the contrary, for a State may be tempted, if an opportunity arises, to make itself stronger by extending its territory into a region which is of a different type and possesses resources which it has hitherto lacked. A desire to be self-sufficing, or to secure access to trade-routes by which commodities can be secured from abroad, has in many instances been a factor in advancing the frontiers of States across regions of contrasting geographical character.

For this reason, political frontiers seldom coincide with the boundaries of geographical regions, although well-marked natural features, such as rivers or water-sheds, maybe adopted as convenient and definite limits of States ; this is particularly the case when such a frontier offers a useful means of defence.

The difference between geographical and political units is brought out still more clearly when one thinks of the great and sudden changes which the States of Europe have undergone during the last few hundred years : old ones have disappeared, new ones have been formed, and others have expanded or shrunk to various degrees. In the last quarter of the nineteenth century—during the lifetime of many people now living—the Balkan States were carved out of the former Ottoman or Turkish Empire. In the present century, the political map of a broad belt running from north to south of the continent, and overlapping Peninsular Europe on the west and Trunk Europe on the east, has been completely transformed. There is no certainty that political conditions are yet stable in Europe, particularly in this " belt of political change."

The present-day geography has been greatly affected by the alterations brought about by the war of 1914-18; these are shown in Fig. 26. Particular attention must be drawn to the break-up of what were two of the greatest States of Europe before 1914, viz. the " Dual Monarchy " of Austria-Hungary, in which the Austrian Empire and the Kingdom of Hungary were united under one sovereign, and the Russian Empire. Under the strain of war, these great Powers fell to pieces, and several of the nationalities which had been unwillingly included obtained independence.

In the case of Russia, the Finns, Ests, Letts and Lithuanians set up the new States of Finland, and the three "Baltic States" of Estonia, Latvia and Lithuania, and the Poles of Russia united with those of Austria and Germany to re-create an older State of Poland.

Over most of the remaining part of Russia, after a period of revolution, there was formed the "Union of Soviet Socialist Republics" (U.S.S.R.), comprising eleven republics, which may be arranged in four groups on a geographical basis, (i) The "Russian Soviet Federated Socialist Republic" includes the greater part of European Russia, and all the northern and eastern portion of Asiatic Russia; it is the predominant partner in the Union, and at its capital, Moscow, is centred much of the administration of the whole of the Russian territories, (ii) The White Russian Republic (capital Minsk) and the Ukrainian Republic (capital Kiev) make up the remaining portion of Russia in Europe (see the map of eastern Europe in Chapter 17). (iii) The three republics of Georgia, Azerbaijan and Armenia together form the Russian territory of Transcaucasia, (iv) Across the Caspian Sea, in the south of Asiatic Russia, is another group—the Turkmen, Uzbek, Tadzhik and Kirghiz republics.

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When the Austro-Hungarian Monarchy fell to pieces, the hitherto subjected Czechs and Slovaks formed the new State of Czechoslovakia in the north, the Slovenes and Croats united with Serbia and Montenegro to form Yugoslavia in the south, the Rumanians of Transylvania were united to those of independent Rumania across the Carpathians. Thus the previously dominant peoples, the Austrians and the Magyars of Hungary, shorn even of parts of lands they themselves occupied, were left in 1919 to constitute the new small States of Austria and Hungary. Nineteen years later, in 1938, Austria was taken into the German Realm, "Deutsches Reich," and became one of the provinces of Germany.

In thinking of the relation between natural and political units, it must be borne in mind that States may have considerable influence on the geographical conditions of the regions they include, and in particular they may modify economic activities. Thus, in later sections of this book instances will be given of the way in which traffic may be diverted from natural routes because of political frontiers. Here special mention must be

made of the policy of "self-sufficiency" adopted very widely after the war of 1914-18.

With a desire to help their own subjects, and often to assure within their boundaries supplies of food and of materials and armaments which would be required for warfare, many Governments adopted measures such as giving bounties to the producers of particular commodities, and erecting "tariff walls" around their territories; by this latter method duties had to be paid when certain goods passed the Customs barriers at the ports or along the frontiers, and thus such goods were prevented either partially or entirely from entering the country. By such means States have stimulated certain forms of production at the expense of others, and have thus modified the natural economic development of the regions they comprise.

QUESTIONS

1. How can the "race" of peoples, as related to their descent from a common stock, be determined? Illustrate by reference to the Nordic race.

2. What is the "Mediterranean race"? Why is it so called, and in what ways might the term be misleading?

3. What are the Romance languages? Give an account of their spread in southern and western Europe.

4. To what extent does the extension of the German language correspond to the distribution of people of Nordic race?

5. Which peoples may be termed "Slavs"? Give reasons for your decisions, and comment upon any doubtful cases.

6. Magyars and Finns may be grouped together as regards their language. To what extent are they alike (a) in their speech, and (b) in other respects?

7. The Roman Catholic and Orthodox faiths have a markedly contrasted distribution over much of Europe. How is this distribution related, either as cause or effect, to geographical conditions?

8. Show how the entry of Mohammedanism into Europe was connected with the physical geography, and how it has affected the human geography.

9. Distinguish between (1) "language group," (2) "nationality," and (3) "State," quoting examples from Europe.

10. Discuss what truth, if any, there is in the statement that the people of European Russia are more Asiatic than European.

PART II

THE REGIONS

CHAPTER VI

THE NORTH SEA LOWLANDS

THE traveller from England to the Continent, crossing the Strait of Dover towards Calais, sees before him the chalk cliffs of France which are the counterpart of the North Downs. As he nears the coast, however, he observes that his boat passes to the east of the chalk country and approaches a low shore which stretches eastward as far as the eye can see.

Calais marks the beginning of a great lowland region, which forms the north-eastern corner of France and extends behind the North Sea through Belgium, Holland and northern Germany, and along the western side of Denmark (see Fig. 30).

With occasional breaks there is a coastal strip of dunes, and this has behind it a belt of natural marsh-lands, much of which is now transformed into polders, interrupted by shallow inlets of the sea. Behind the marsh-lands is a rather higher area, partly sandy country to which the term "geest" is applied, and partly fertile agricultural plains or low plateaus. Near the uplands of central Europe which form the boundary of the lowlands occur coal deposits, and associated with the mining of the coal are important industrial areas (compare the map in Fig. 80 with the section in Fig. 27). Thus the whole of the North Sea Lowlands region is composed of a series of belts running in a general south-west to north-east direction as far as the south-eastern angle of the North Sea; here, in the peninsula of Jutland, the coastal belts change their direction and run from south to north, while the belt of fertile plains is no longer to be observed, but gives place to another type of country near the Baltic Sea. The North Sea Lowlands region has characteristics marking it off from the neighbouring areas, and it may therefore be regarded as one of the sub-regions of the "Developed Lowlands and Wooded Uplands" of Temperate Europe (marked "2" in Fig. 21).

The surface conditions of the region are in the main due to its position on the south-eastern margin of the shallow depression now invaded by the waters of the North Sea. To this depression rivers drain through the North Sea Lowlands from all the surrounding regions: the Schelde (Scheldt or Escaut) and its tributary the Lys from the scarp-lands of northern France; the Meuse (Maas), the Rhine and the Weser from the Central Uplands of Europe; the Elbe from the South-west Baltic Lowlands and the Central Uplands. Consequently these rivers deposit alluvium in the marsh-lands of this lowland. The sea, too, plays its part in the building up of the coast; strong tidal currents drag sand eastwards along the shores, and the prevailing and occasionally stormy westerly winds heap it up to form the belt of dunes.

In the past, however, conditions have been different, particu-

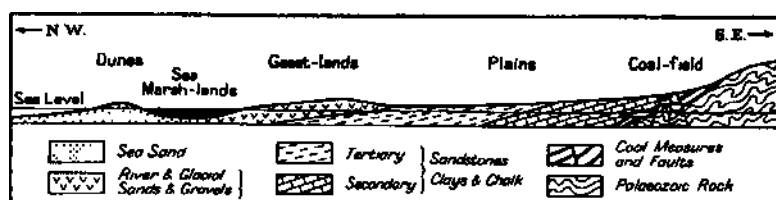


FIG. 27.—DIAGRAMMATIC SECTION THROUGH NORTH SEA LOWLANDS.

larly because of changes in the relative levels of land and sea. During parts of the Secondary and Tertiary Eras, the sea covered much of the region, and beneath its waters were laid down marine clays and sands, and in parts even chalk, which now constitute the fertile interior plains. In the later part of the Tertiary Era, moreover, the rivers accomplished much more work than they do at present: they deeply dissected the uplands to the south, and with the eroded material they built up the huge accumulations of sand and gravel which form much of the geest type of country.

Oscillations of level have characterized also the later geological history of the region. Thus at the close of the Ice Age the land was relatively higher, and the present area of the North Sea was above the sea-level. Since then, however, there has been a general rising of the sea-level, and in early historical times the waters had advanced to the line indicated by the islands and dunes on the outer edge of the present coast. Here

was a continuous line of dunes behind which lay marshes broken only by one great lake in the Zuider Zee hollow. These marshes were gradually drained and occupied by men, but Nature has worked against them: the alluvium tends to consolidate and settle down, and very possibly a relative sinking of the land occurred, and in consequence in the Middle Ages the sea broke in; moreover, wars caused the neglect or destruction of the defences, and altogether some thousands of square miles were lost. In modern times the work of protection has been resumed, and now, in spite of occasional and local floodings, the struggle goes in favour of man.

The position of the region determines its climate, which is broadly similar to that of eastern England, although its continental situation gives it rather colder winters, particularly in its eastern portion (compare the temperature statistics for London and Brussels, given in the table on p. 26). Consequently, the farming possibilities of the North Sea Lowlands are in general like those of eastern England, and differences in production are due largely to soil or economic conditions. We will now consider in turn each type of country constituting this region.

The Dune-lands.—The sand is least in amount in the French and Belgian part of the region, where the available material is mainly that which has been driven through the Strait of Dover, but becomes far more abundant by accumulation towards the east. Moreover, the dunes are highest and broadest where a stretch of north-to-south coast directly faces the westerly winds, as in Holland and in Denmark. The line is, however, broken at areas of relative depression, and channels are kept clear where the currents due to the high tides of the region sweep up and down the entrances to the great rivers.

Where the sand-dunes form a protection against the flooding of the marsh-lands, they have been strengthened by the planting of grass, shrubs or trees and by the construction of groins. Upon the dunes have been built fishing villages and health resorts, e.g. Scheveningen near The Hague in Holland, and Ostend in Belgium; the latter town is also a port with rapid communication across the North Sea to England. Similar ports, but with much more traffic, are Calais, which has the shortest crossing, and Dunkirk (Dunkerque), for these are the French outlets of the industrial area which depends on the coalfield of north-eastern

France. Farther east are " out-ports " at the entrances to the great rivers, e.g. in Holland are Flushing by the *Sehelde*, and the Hook of Holland by the Rhine.

In Germany, the dune-lands are represented only by the Frisian Islands, but in the Danish part of Jutland they again form part of the mainland. Here has been constructed the port of Esbjerg, connected by railway with the east of the country in order to facilitate the rapid transit of its dairy produce, especially to England,

Throughout their extent, the dune-lands are of similar origin and characteristics, and they therefore constitute a distinctive though small region, to which we give the term " tract." It must be observed, however, that this tract is not continuous, as most others are, because it is broken by the waters ; it may therefore be regarded as a " discontinuous tract."

The Marsh-lands.—Behind the line of dunes and islands, the shallows are constantly covered by water only over a relatively small extent. There are other areas, particularly marked behind the various Frisian islands, which are mud-flats at low tide, but water-covered at high tide. These are known as *watten* or *wadden*; they may be regarded as land in the making, and the natural deposition of mud and sand is aided by fences built out from the land, the resultant accumulation being used for summer grazing as soon as it is covered by vegetation.

The Sea-marshes.—Much more work has been required to form the polder-lands. Near the coast are the sea-marshes, which in Holland are even below the mean sea-level, and everywhere are liable to inundation at high tide or in times of storm ; farther inland are the river-marshes, which, though well above sea-level, need protection from flooded streams.

Reclamation of the sea-marshes is still going on. The *Zuider Zee* (the name " South Sea " was given by Frisian fishermen) is now shut off by a dyke across its mouth, and four polders with a total area of about 800 square miles are being formed on its margins, the water area being limited to a central " IJssel Lake " fed by the waters of the IJssel distributary of the Rhine, as shown by the broken lines in Fig. 30.

The utilization of the polder-land varies partly according to the nature of the soils, sometimes clayey and sometimes sandy, and partly according to the traditions of the people or the economic demands of the neighbouring regions. In the small

strip of the French marsh-lands behind Calais and Dunkirk there is intensive cultivation of industrial crops, mainly beet, flax and chicory, which is associated with the manufacture of their products, sugar, linen and chicory ; wheat and barley are also grown. In the Belgian strip similar crops are produced, though cattle-rearing assumes some importance. In the broader polder-land region of Holland, there are again the cereal and industrial crops, but pastoral work predominates, and butter, cheese and milk are the main objects of the farming.



[Netherlands Information Bureau.

FIG. 28.—VIEW NEAR HAARLEM.

Note.—The polder-land has been adapted for the cultivation of bulbs by drainage (note the canal), and by making the clay lighter by mixing sand from the pine-clad dunes shown in the background.

In Holland are two areas of special character. In a narrow strip behind the dunes near Haarlem the sand has been mixed with the muds and clays of the marsh-lands to produce a soil exceptionally well adapted to the cultivation of flowers. The horticultural industry, like several others, began when the Netherlanders were one of the foremost maritime peoples of Europe ; tulips, hyacinths and other plants were brought from the East, and centuries of experience and organization have made the growing and export of many kinds of bulbs, flowers, shrubs and fruit an important occupation. The proximity of the port

of Rotterdam, with its rapid communications, has been a significant factor, and now a neighbouring aerodrome offers still quicker facilities for transport.

Farther south, the shelter of the dunes allowed woods to grow in past centuries, and here the counts of Holland had a hunting-box. This became their residence and was called " s'Graven - hage "—"the Counts' Hedge," in its English form, The Hague ; it has now grown into a city of nearly half a million inhabitants, for it is the capital of Holland, and is also the seat of the International Court of Justice.

In Germany the marsh-land again narrows to a belt bordering the coast and the estuaries of the Ems, the Weser and the Elbe, while in Denmark it is not quite continuous but appears as areas surrounding lagoons. (These lagoons are known as Fjords, but like the neighbouring Lim Fjord, they are shallow depressions quite unlike the Fjords of Norway.) In the eastern part of the North Sea marsh-lands cattle rearing is the main occupation, and supports a less dense population than the more intensive farming common in the central and western polder-lands.

The River Marsh-lands.—Although lying above sea-level, these areas are subject to inundation by the rivers ; in some parts they have needed reclamation, but in other parts they require only protection by dykes from occasional floods. These floods generally occur in winter, for most of the rivers have a " regime " in which the flow of water is greatest in the winter season, after the relatively heavy rainfall of autumn and when the run-off into the streams is least reduced by evaporation and the demands of the plant-covering of the land. The Rhine has a more uniform regime than that of the other rivers, for its head-waters come from the Alps, where the melting of the snow in the upper part of its basin provides additional water in summer; consequently, the main stream brings down a summer supply which balances the winter maximum of the tributaries of the middle and lower parts of the basin, which are dependent upon the rainfall.

Parts of the river flood-plains are used for tillage similar to that of the sea-marshes ; elsewhere are long stretches of grassland, absolutely flat with their uniformity broken only by the dykes ; here villages and even houses are rare.

Waterways and Ports.—Much of the importance of the North Sea Lowlands region is due to the rivers which direct into it-

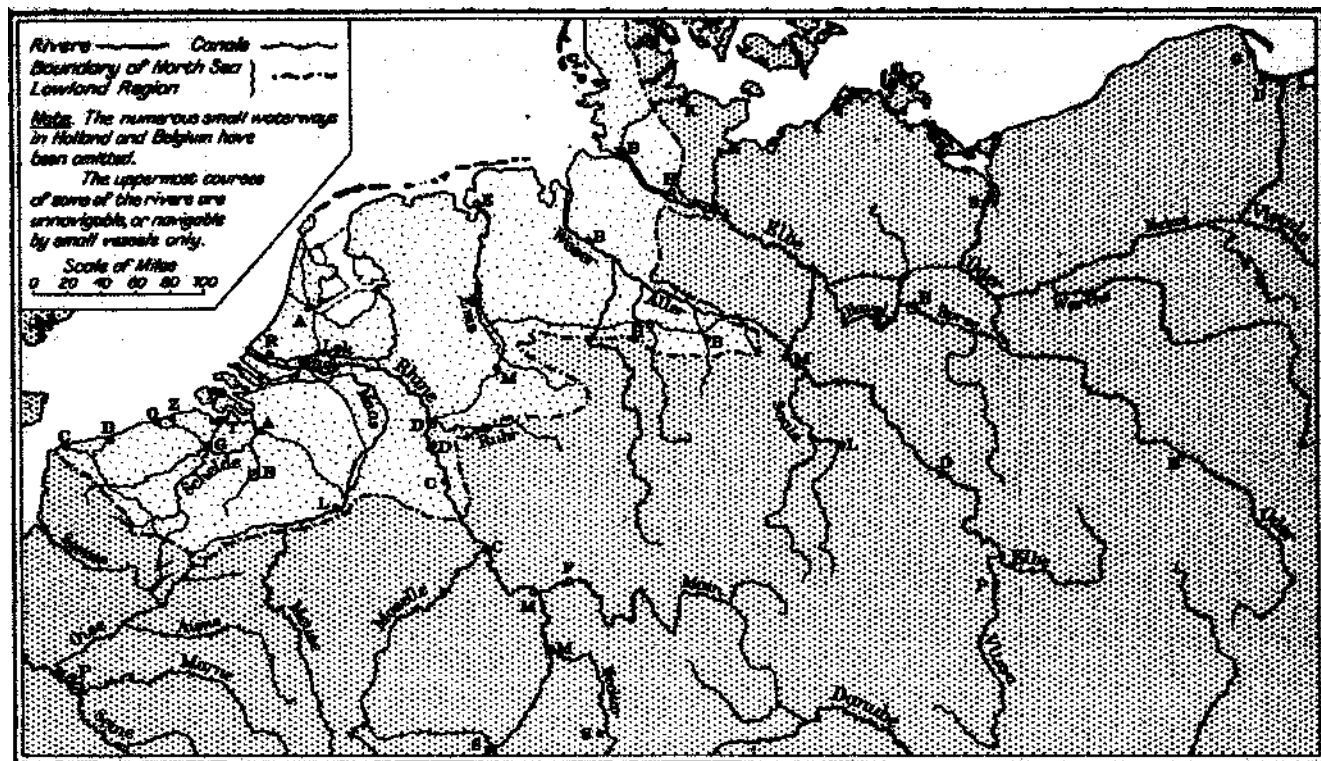


FIG. 29.—WATERWAYS LEADING TO THE NORTH SEA LOWLANDS.

communications from and to a great part of central Europe ; consequently, at or near the mouths of these rivers have grown up several great ports which make the region by far the most important commercial area of the continent of Europe (see Fig. 30). Moreover, most of these ports have been developed at points on the waterways where higher land forming suitable sites for settlement adjoins the marshes ; these sites are mainly at the inner margin of the marshes on the geest lands or the fertile plains, but at the western end of the region they are at the outer margin adjoining the dunes.

The greatest of the ports is Hamburg, on the Elbe estuary, which brings ocean liners 70 miles inland from the North Sea, Fig. 29 shows that while the main stream gives communication with the industrial areas of Saxony and of Bohemia in the Central Uplands region, the Havel tributary leads from the Spree and Berlin ; also a system of canals links the Elbe to the other great rivers of Germany and Poland in the south-west Baltic region. Moreover, a little above Hamburg the Elbe-Trave Canal leads to Liibeck on the Trave, and from Brunsbiittel, near the mouth of the Elbe, the Nord-ostsee (i.e. North-Baltic Sea) Canal leads to Kiel and carries most of the traffic between the various Baltic Sea ports and the outer world.

With such a large hinterland, Hamburg has an amount of trade which makes it rank with London and New York as one of the greatest ports of the world. Its imports consist of all kinds of commodities, while its exports are mainly of manufactured goods ; shipbuilding has developed, and also manufacturing in many forms, particularly the working up of imported materials* Consequently, the conurbation which includes Hamburg and Altona on the north bank of the river, and Harburg on the opposite side, is one of the largest in Germany, and numbers nearly one and a half millions.

Bremen, on the Weser, is nearly as far from the sea as Hamburg ; it is in the river-marsh area, and its trade is chiefly remarkable in that it is the greatest tobacco market in the world ; its population is more than a quarter of a million. At the mouth of the Ems is Emden, but this port is of comparatively little importance, although the river is joined to the Ruhr industrial area by the Dortmund-Ems Canal ; the traffic of the Ruhr region mainly goes by the Rhine to the chief markets and the sources of raw material.

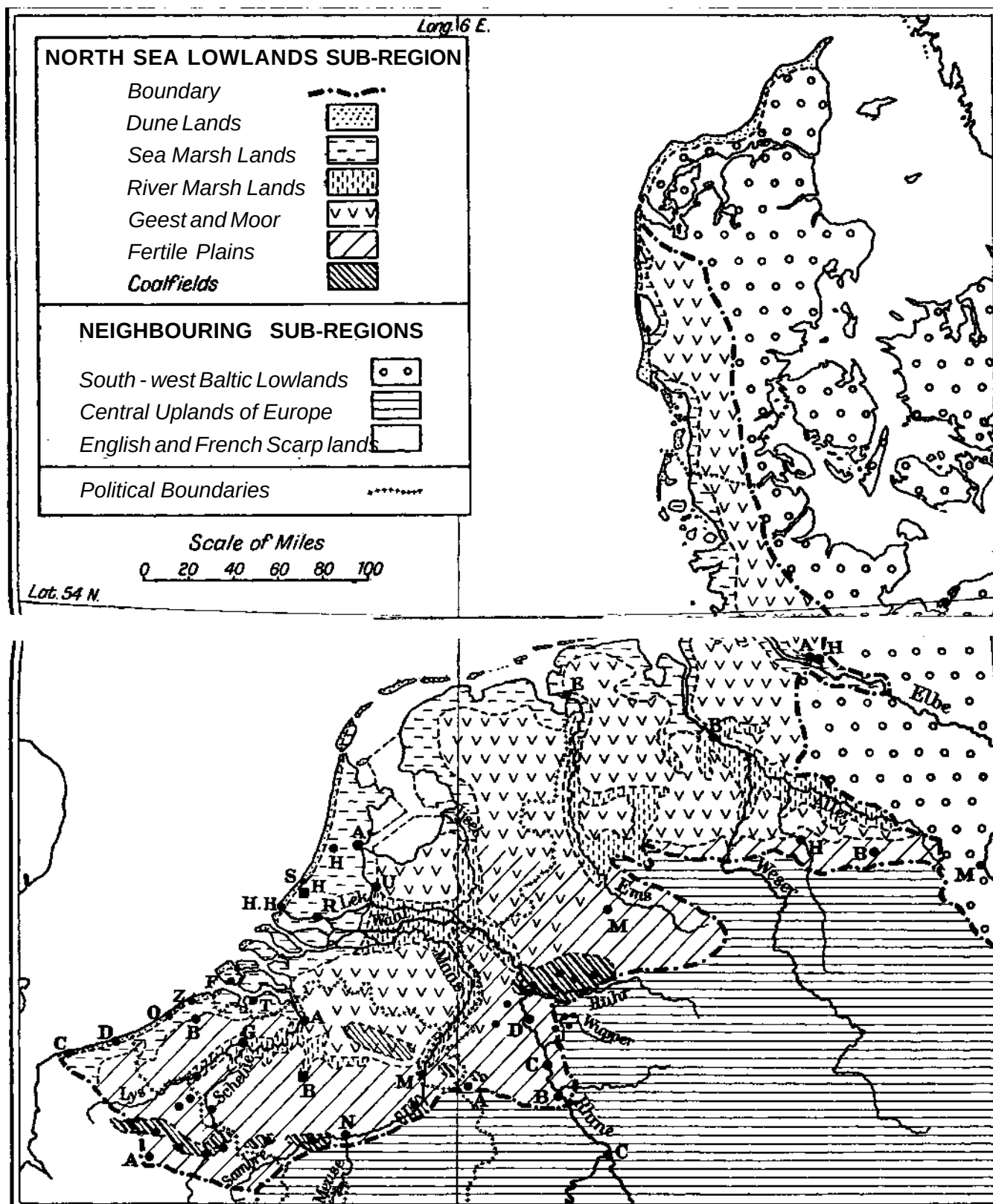


FIG. 30.—REGIONS OF THE NORTH SEA LOWLANDS.

From near the junction of the Dortmund-Ems Canal with the Ems River, another canal leads east near the margin of the North Sea Lowlands (see Fig. 29). This is the Mittelland (Midland) Canal; it crosses the Weser and its navigable sub-tributary, the Leine, on which Hanover stands, and is now continued north of Brunswick to join the Elbe at Magdeburg. By its completion a through route of inland waterways connects eastern Germany and Berlin with the Rhine-lands.

The Rhine is incomparably the most important waterway of Europe. It is navigable for small vessels from Basel downstream, but its great amount of traffic is in the North Sea Lowlands region between the Ruhr and the sea ; while there are river ports of considerable size in German territory, the chief port of transshipment between ocean and inland transport is Rotterdam. This is the one striking exception to the rule that the great ports are on the margins of the marsh-land ; unlike the others it is of recent growth, and became important only when in the latter part of the last century the increase of German trade made it necessary to improve the navigation of the Rhine estuary. Then the " New Waterway " was cut : a deep channel was made from the North Sea at the Hook of Holland, and where the waters of the Waal and Lek were led into this channel at Rotterdam, in the middle of the marsh-lands, great wharfs and basins were constructed, and the port rapidly developed. Of the goods transhipped from sea-going vessels, the greatest amount goes inland up the Rhine, and most of the remainder by the system of canals which forms a network throughout the Netherlands and is without parallel in the world. Railway transport counts for little, one reason being because the traffic consists mainly of heavy and bulky imports, such as iron and other ores and metals for the industrial regions higher up the Rhine and grain for the food-supply of the dense populations of the Netherlands and Germany. With manufactures associated with the imports, particularly for use in Holland, Rotterdam has grown till it has a population of over half a million.

Amsterdam rose to importance centuries ago when the protected waters of the Zuider Zee gave access to the interior of the polder-lands of Holland, but the increasing size of ocean-going vessels made this shallow sea useless ; first the North Holland Canal was constructed through the peninsula to the entrance of the Zuider Zee, and later the North Sea Canal gave a direct

approach available for ships of any size. Thus Amsterdam, although rather off the main lines of communication, has been able to retain a certain amount of ocean traffic, and it affords an example of geographical inertia by the fact that it still remains the chief centre of the organization of the commerce (as distinct from the actual handling of the traffic) and of the financial business of the Netherlands. It also has industries which are traceable to its pre-eminence in trade in the days when Holland was a great colonial power, e.g. cigar making and tobacco preparing, sugar refining and diamond cutting. Moreover, Amsterdam has remained a professional and residential centre, and with more than three-quarters of a million inhabitants it is the largest city in Holland.

The lower Maas is inconvenient for commerce, for being without Alpine tributaries, it is subject to very low water in summer and to floods in winter ; its middle course, however, is connected by a canal in Dutch territory from Maastricht to the Rhine estuary, and in Belgian territory by a canal from Liege to Antwerp on the Schelde (see Fig. 32).

The estuary of this latter river is the entry to a very considerable system of waterways which traverses all parts of Belgium and is joined to the rivers of north-eastern France. Where the Schelde enters the sea-marsh region Antwerp has grown up. This city has a population of more than a quarter of a million ; it is the chief port for Belgian commerce, and its transit trade, mainly for Germany and Switzerland, is of about equal importance. Like Amsterdam, Antwerp has developed industries connected with its import of " colonial " wares. At the junction of the Lys and the Schelde is Ghent, a centre of local trade and small textile manufactures ; from it one canal runs northward to Terneuzen in Dutch territory on the " West Schelde " inlet, and another leads westward to Bruges on the inner edge of the sea-marshes. Bruges was once a port, but its outlet has been silted up, and it is now joined to the sea by canals which cut through the dune belt to Zeebrugge and Ostend.

The canal which runs through French territory roughly parallel with the national boundary shows the influence of political conditions. While the natural waterways would direct traffic from the French coalfield to the Schelde and Antwerp, the desire to keep the trade within France has been an important factor in the construction of the canal which leads to Calais

and Dunkirk; the growth of these ports must therefore be ascribed in part to political causes.

The Geest and Moors.—Behind the tract-group of the Marshlands, extends another and strongly contrasted series of tracts, from near Antwerp north-eastwards to the borders of the Baltic

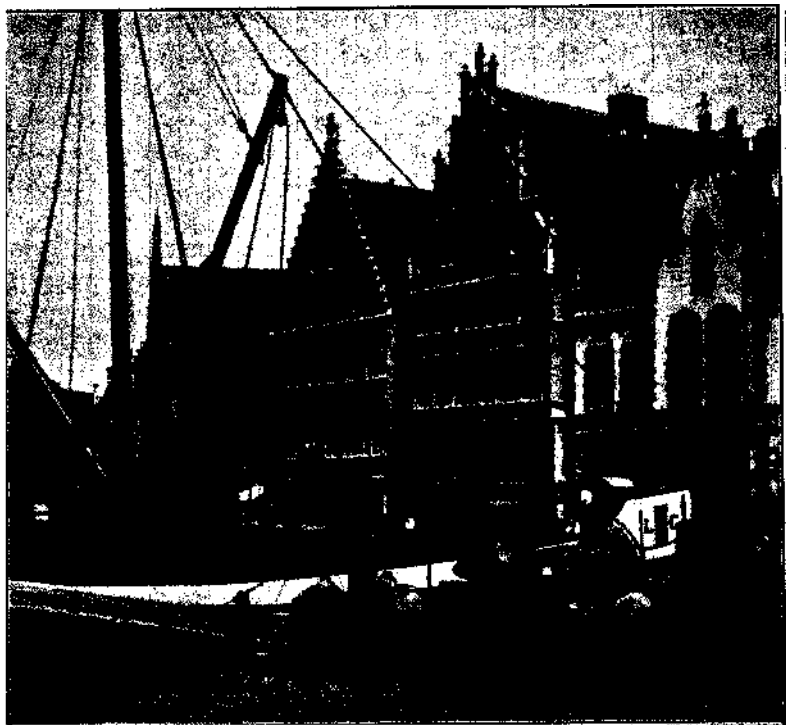


FIG. .31. --VIEW IX GHENT. [Belgian Railways & Marine.]

Note.—The steeply gabled high houses are typical of Flemish-town architecture. The view shows the "Quai aux Herbes," by one of the small waterways, carrying barge traffic, largely used in Belgium and in Holland.

Lands. These areas are in the main wide stretches of heath-land known to the Germans as geest. In the west of the region from near the mouth of the Schelde to about the lower Ems, they have developed upon masses of gravels and sands which were brought down by the Rhine and Maas until the deposits formed a great fan-like plateau. The plateau was highest near the centre of its inner margin, dipping north-westward to the sea (see Fig. 27). Later it was dissected by streams, and great valleys were cut across it. The largest of these valleys are the

two now occupied by the parallel courses of the lower Maas, Waal and Lek and by the Ijssel; consequently, the sandy plateau is divided into three masses : (1) the Campine or Kempenland, which overlaps the boundary of Belgium and Holland within the curve of the Maas ; (2) the Veluwe, between the Lek and the Ijssel; (3) the West Frisian Geest, between the Ijssel and the Ems.

The words " Veluwe " and " Geest " both mean " barren land " and, apart from some woodland on the slopes, the vegetation cover of most of the area consists of coarse grasses and shrubby growths such as heather; the surface is dry and infertile, while in parts the finest sand is blown into small dunes. In other parts iron in the sand has formed a pan of impermeable rock upon which drainage is poor, and moors have developed with marshes, peat bogs and pools of stagnant water.

Reclamation of these lands, for long almost uninhabited, is going on, and " Fen colonies " grow potatoes, beet and some rye and oats. Yet these lands remain scantily populated, and the larger settlements are generally on their margins.

East of the Ems the geest is formed mainly of sands washed away from the morainic material deposited by the ice-sheet which extended from northern Europe, as shown in Fig. 3. The greatest of the moraines are shown on the map, and it is to be observed that they mark out the eastern limit of the North Sea Lowlands region.

Streams brought sandy material from the Baltic morainic areas into the eastern part of the North Sea Lowlands region, where it is widely spread and is the basis of the geest-lands of this part; moreover, among the dry sands occasional sheets of boulder clay play a similar part to that of the iron pans in the western geest-lands and give rise to similar wet moor districts. Reclamation of this type of country has gone on in Germany, but to a less extent than in the Netherlands.

In Jutland, the strong westerly winds have blown the sand from the dune belt inland to combine with that of glacial origin and form a broad belt of dry, infertile country ; the Danes have recently begun to afforest and cultivate the sandy heath-land, but this western part of Denmark remains by far the least valuable part of their country.

In the western part of the geest-land, however, there is another resource which may be developed ; beneath the Campine are

deeply buried coal deposits : a " spur " from the belt of coal-fields of the southern margin of the North Sea Lowlands. The Campine field has a width of about 8 miles and a length of about 40 miles ; working has commenced near the Maas, but whether economic conditions will make a great extension profitable is uncertain.

The Fertile Plains.—To the south of the tract-group of the geest-lands, sedimentary soils of Tertiary and Secondary age emerge from beneath the marshy alluvium and the sandy accumulations (again see Fig. 27), and form plains of relative fertility, while in certain parts this fertility is actually great, due to a superficial deposit of loess.

Owing to the complicated way in which the older rocks of the Central Uplands were faulted, raised and depressed, they project irregularly northward into the lowlands ; consequently, the fertile plains of the latter are in some parts narrow, but in other parts form wide embayments between the upland masses. Thus in the North Sea Lowlands region, four main tracts of generally fertile plains or low plateaus may be observed.

(i) In the easternmost tip of the region is a strip in which the towns of Brunswick and Hanover are situated and which narrows westward where it is crossed by the Weser. This *Loess belt of Hanover and Brunswick* is noted especially for its production of sugar-beet and other industrial crops as well as cereals. Along it run ancient roads and modern railways which skirt the uplands and connect Berlin with the cities of the Netherlands and of northern France.

(ii) *The Westphalian Embayment*, which may be called the Plain of Munster from the town which is its natural centre, is of mixed soils and varied production. On its north-eastern and southern boundaries it is well defined by the edge of the uplands • on its north-western side it passes into an area which gradually becomes more like the geest; in the map of Fig. 30 this area is shown as transitional in its character, by the overlapping markings of both types of country. On the south-west of the Westphalian embayment the agricultural land of the plain is being invaded by the mining of the coalfield of the Ruhr region.

(iii) *The Cologne Embayment* is well defined on its southern and eastern sides, but on the north-west passes into transitional-geest country. The population of the Cologne embayment is great, for its agriculture is intensive, particularly upon a loess

covering in the south, while on the west side of the Rhine near Cologne there are deposits of lignite, or brown coal, a mineral which has been greatly developed in Germany in recent years (see Fig. 32). The Rhine, however, gives the region its greatest significance, for as a waterway it enables sea-going ships to reach Cologne, while its valley provides the most important route between southern and northern Germany and, indeed, between the Mediterranean and northern Europe.

Bonn marks the entry of the Rhine into the lowlands, but Cologne, a Roman "colonia," is a far more important focus of trade, for here the great traffic route which skirts the Central Uplands crosses the river. With industries utilizing both the lignite from the neighbouring deposits and the coal from the Ruhr, Cologne has grown into a city of about three-quarters of a million inhabitants. Farther downstream is Diisseldorf, the river port for the industrial area of Wuppertal immediately to the east in the adjoining upland ; at and about Diisseldorf a population of nearly half a million has congregated. Other centres of industry have developed west of the Rhine, e.g. Munchen-Gladbach and Crefeld, famous for textile production.

(iv) West of the Cologne embayment the fertile belt narrows between the Ardennes area of the uplands and the Campine, and here, near Maastricht, it includes the small southern prolongation of Dutch territory. Beyond the Maas the fertile belt widens to form the *Plains of the Schelde*, a region drained mainly by that river. In central Belgium this forms a low undulating plateau. In this area, again, sedimentary strata have a covering of loess, and there is intensive agriculture yielding wheat and oats, industrial crops, and roots grown as fodder for considerable numbers of cattle. This type of country extends into France.

Farther north, between the Lys and the sea marsh-lands, the plains of Flanders are less productive by nature ; here sandy soils predominate, and arduous toil, involving thorough cultivation and the use of manures, has been necessary to obtain fertility. Cereals are not so widely grown ; moreover, rye is in parts more important than wheat. The predominance of rye over wheat is fairly common on the poorer sandy soils of this section of central Europe, for climatic conditions make both crops possible and the determining factors are the dryness and relative infertility of the soil.

On both the Belgian and the French sides of the political

boundary south of the Lys, a rather scattered form of industrial development has persisted from the days when wool was produced, spun and woven in this region. Other forms of textile manufacture have grown up by "transferred inertia," the traditional skill being adapted first to the working of linen and then to that of cotton. Domestic manufacture still continues, sometimes as a necessary supplement to the scanty earnings of agriculture when winter gives spare time, but most of the work is carried on in a number of towns of moderate size situated to the north of the coalfield: in Belgium are Courtrai and Tournai, and in France are Roubaix and Lille; at these last two towns textile and other machinery is made.

By far the greatest city is Brussels, the capital of Belgium, conveniently situated in the centre of the lowland part of the State. It is at the end of the marsh-land of the Senne, a tributary of the Schelde, and grew up at the head of navigation; now it is connected by canals to the coalfields area to the south, and it has become also a centre of railway communication. As the capital of the country, the seat of much financial business, and the site of manufactures of many kinds, it has grown until its conurbation includes a population of nearly a million persons.

The Coalfields.—Fig. 27 shows in a very simplified manner how Coal Measures, formed in the upper part of the Palaeozoic rocks, have been worn away from the uplands region but outcrop at the surface where this descends to the lowlands, and are buried at increasing depths under the plains. The coal was mined, therefore, first on the inner margin of the lowlands, and the pits were later extended northwards till the deep working became too costly.

The section might suggest that there is a continuous belt of coal-mining all along the edge of the plains, but the geological structure is actually more complicated and the Coal Measures have not been preserved throughout the border of the lowlands; in consequence the coalfields form a series of disconnected patches. The actual mining areas are shown on the maps on Figs. 30 and 32. The most important of the coalfields is in the neighbourhood of the lower Ruhr where the river leaves the uplands to join the Rhine. Here the Ruhr district has become an intensely industrialized region. The industries, like those of the somewhat similar South Pennine coalfields of England, began in the valleys of the adjoining uplands, [where](#) water-power

from the streams was used for an early iron and steel industry which obtained ore and limestone from the uplands and fuel from the forests which clothed their slopes. In some of these valleys geographical inertia has allowed the industries to persist with the aid of the coal from the neighbouring Ruhr field ; thus in the basin of the Wupper, the tributary of the Rhine situated a few miles south of the Ruhr, the towns of Remscheid and Solingen have long been famous for fine steel products, while

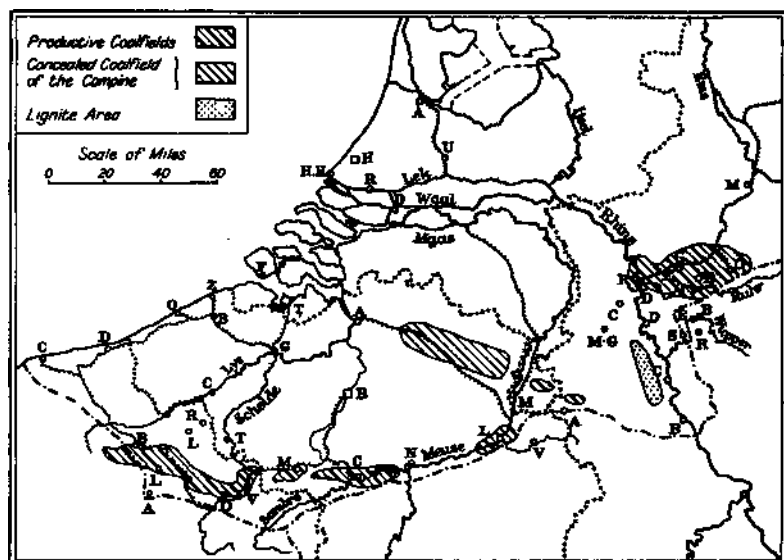


FIG. 32.—COALFIELDS OF THE NORTH SEA LOWLANDS.

a textile industry has persisted, working first wool, and later also cotton and rayon, into many fabrics, notably at Elberfeld and Barmen. These two towns became crowded together into the narrow steep-sided valley of the Wupper above Solingen, and have now been incorporated into one long municipality known as Wuppertal (i.e. Wupperdale) in which nearly half a million people are so packed that the railways have been tunnelled below the houses and elevated above the river and streets.

It is in the plain, however, that the greatest industrial development has occurred. On the Ruhr coalfield a number of towns have grown up, and have so spread that they form an almost unbroken sea of houses north of the river, stretching for about

50 miles eastwards from the Rhine. Where the Ruhr enters the Rhine it is joined by a canal connecting it with the Dortmund-Ems Canal; here a group of river-ports, including Duisburg and Ruhrort, carry on a great traffic in export of coal and import of ore and raw materials, and here are also metallurgical works.

The greatest aggregation of works is at Essen, where, within the municipal boundaries, live two-thirds of a million people, while adjoining it on the east are Gelsenkirchen and Bochum, each of which is about half the size. Several other large towns have sprawled over the coalfield, and the whole region has an unparalleled production of iron and steel goods, among which may be mentioned railway equipment, shipbuilding material, armaments, constructional steelwork, and machinery for manufacturing and agriculture. From the coal are obtained coke and by-products, including tars, dyes and other chemicals. Power stations furnish electricity for the grid system, which, fed also from other centres, distributes power to almost all parts of Germany. Textiles, leather goods and many other commodities are produced, while Dortmund is a centre from which great quantities of coal are sent inland by rail.

West of the Cologne embayment, the coal appears again : a little is mined near the German town Aachen, and also in Dutch territory, where an increasing amount is being obtained east of Maastricht.

The Belgian group of coalfields has a large production. The eastern mining area is in the Meuse valley around Liege, the greatest industrial centre of Belgium ; the conurbation has a quarter of a million inhabitants and, owing to an early exploitation of ores of zinc, copper and lead, as well as of iron, metallurgical industries are very varied. In a neighbouring valley of the uplands, at and near Verviers, the manufacture of woollen goods has survived.

West of Namur, the line of the Meuse valley is continued by that of the Sambre, and here around Charleroi is another coal basin and metallurgical industry. Farther west the next outcrop of the Coal Measures occurs north of the river near Mons. Like Charleroi, Mons is itself but a small town, and it is characteristic of these western coal areas of Belgium that much of the mining and the associated work is carried on in groups of numerous small settlements set in rural surroundings.

Just across the French frontier is the last of the series of coal-

fields ; this stretches in a long and narrow belt from near Valenciennes, past Denain, Douai, Lens and Btethune, until its tip ends beneath the chalk sheet of north-eastern France. As in Belgium, there is no large city, but in and around a string of small towns and villages there is a considerable population engaged in the production of coal, coke and chemicals, steel and machinery. A great deal of coal is sent away, much of it northward to the French industrial area or the ports, and the rest southward by water or rail to Paris and elsewhere.

The belt of coalfields of the North Sea Lowlands may be regarded as a discontinuous tract; it supplies by far the greatest part of the coal-supplies of Germany, France and Belgium, and it includes some of the most densely populated areas of these countries.

Thus, with the coalfields of the inner margin and the ports of the outer margin, the North Sea Lowlands is a sub-region with an economic and political importance scarcely equalled in the world.

QUESTIONS

1. Show how the nature of the coastal areas of the North Sea Lowlands has influenced the manner of life of the inhabitants.
2. Show how the rivers of this region have influenced (*a*) the physical conditions, and (*b*) the economic development.
3. Compare and contrast the situation and the functions of three large ports of this region.
4. Write a reasoned geographical account of the Ruhr industrial area.
5. Describe and account for the differences between the farming of various parts of the North Sea Lowlands.
6. State and explain the main facts of the distribution of population in this region.
7. Briefly state how men have transformed three different types of country in the North Sea Lowlands.

SOUTH-WEST BALTIC LOWLANDS

EAST of the North Sea Lowlands is a region which, because of its position, is different as regards its climate, its surface conditions and its relations with other parts of Europe.

Climate and Vegetation.—As was explained in Chapter I I, in summer the temperatures of the lands south of the Baltic Sea are very similar to those south of the North Sea ; but in winter the conditions are more severe. Broadly speaking, the Baltic Lands have a mean January temperature below freezing-point and as one goes eastward still lower temperatures are experienced. As a consequence, the harbours of the Baltic Sea unlike those of the North Sea are normally ice-covered in winter, the period increasing eastwards, e.g. about two months at Stettin and nearly four months at Königsberg; during this period the ports have to be kept open by ice-breakers.

The gradual eastward change to a continental type of climate is also expressed, though less clearly, in the amount and character of the precipitation ; the annual total decreases, mainly due to a lessened amount in the winter half of the year (compare the figures for Brussels, Berlin and Warsaw in the table on p. 26). Moreover, at this season, with the greater cold the precipitation takes the form of snow, and this commonly remains for weeks upon the ground. Yet the sun is often bright, and clear skies are more often enjoyed in the Baltic regions than in the neighbourhood of the North Sea. Because of the above facts the South-West Baltic Lowlands region is included in the " Interior Temperate " climate region.

The natural vegetation shows changes which accord with the shorter period of vegetative growth towards the east. In the region here called the Baltic-Entry Lands the beech is dominant; from the neighbourhood of Lübeck eastward to the lower Vistula the deciduous beech and the evergreen coniferous pines form the " mixed " forest cover; from the lower Vistula to the lower Niemen pines and spruce are the most common trees, but with them are some beech and oak; beyond the

Niemen the length of the winter does not permit the growth of the beech.

The eastern limit of the beech is broadly taken as the boundary of this region, but the precise course of this boundary will be indicated later.

Surface Forms.—The surface conditions of the region are to a large extent determined by the effects of glaciation, e.g. the occurrence of great areas of boulder clay deposited as ground moraine under the ice, broken by great lines of hills formed by the terminal moraines, which have a general east and west direction and are composed of clay, sand and gravel and boulders of all sizes (see Fig. 33).

Beyond the successive margins of the ice-sheet, the water resulting from the melting formed large rivers, which occupied valleys probably existing in some form before the Ice Age ; they are known to German and Polish geologists as "primitive valleys." Along these valleys the great ice-water rivers drained westward, deepening and broadening them, and depositing in them masses of sand and gravel. Now that the ice has gone, the valleys are occupied only by smaller rivers coming from the south, and at a number of places these break through the morainic accumulations northward to reach the Baltic Sea, or in the case of the Elbe to reach the North Sea. Hence the primitive valleys have wide expanses of deposit in which there are either relatively small streams or none at all.

Consequently, in the northern part of the region there are three main types of country : (i) In the *Baltic Entry-lands* behind the line of terminal moraine which almost bisects the Jutish Peninsula is a ground-moraine area in which boulder clay predominates. These lands form the region marked (I) in Fig. 33. (ii) Farther east are the *Baltic Plateaus* (marked II), on which varied morainic material is thickly heaped, (iii) South of this belt is that of the *River Lowlands* (III), where the terminal and ground moraines of the earlier stages of the Ice Age were cut by the waters from the ice in the later stages ; here the primitive valleys are important elements in the geography.

Finally, in the south, beyond the limits of all but the earliest extension of the ice, and therefore where glaciation has had relatively little effect, the underlying rock formations have a greater influence on the geography ; here are the relatively fertile *Interior Plains and Plateaus* (IV). These areas in some

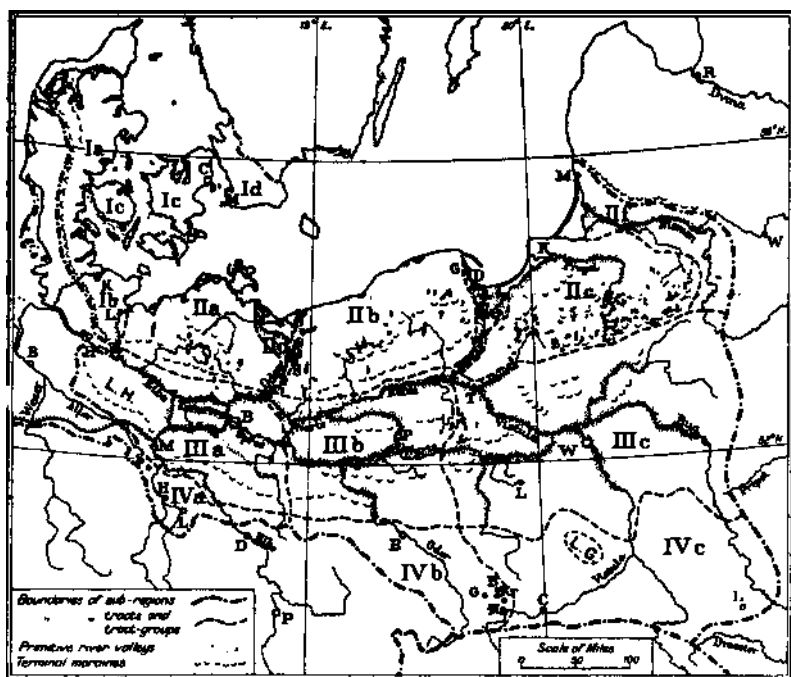


FIG. 33.—REGIONS OF THE SOUTH-WEST BALTIC LOWLANDS.

ways resemble the fertile plains in the south of the North Sea Lowlands. Moreover, adjoining the Central Uplands which form the southern limit of the South-West Baltic Lowlands are some coal deposits, though of less extent than those of the North Sea Lowlands.

The eastern limits of the South-West Baltic Lowlands have been drawn in Fig. 33 as follows : the northern belt of Baltic Plateaus ends where, on the north-eastern side of the lower Niemen valley, a line of terminal moraine (the " Baltic Border-moraine " of Lithuania) marks the beginning of a rather different type of country in the East Baltic area; the River Lowlands belt ends with the basin of the Vistula, beyond which are the great Pripet Marshes of East Poland and Russia ; the Interior Plains and Plateaus end at the water-parting between the Vistula and the Dniester, which drains to the Black Sea. Together these boundaries approximate to the eastern limit of the beech, and so correspond with the change to the Sub-boreal climate region.

The Baltic Entry-lands.—The terminal moraine which almost bisects the Jutish Peninsula forms a narrow belt of hilly country, a few hundred feet above sea-level, mainly covered with beech and oak trees. Behind this, on the eastern side, the boulder-clay country is low, sloping down to inlets of the Baltic Sea, which represent former glacial lakes, now "drowned" by a slight sinking of the whole area, or by an equivalent rising of the sea-level.

This change of level has also changed earlier river valleys into the three Baltic entries which now separate what was previously one area of almost uniform character; hence the present similarity of all these Baltic Entry-lands, marked I in Fig. 33, including Scania, the extreme southern tip of Scandinavia. Throughout the region beech woods alternate with the fields and meadows. The main aim of the farming is the keeping of cattle, pigs and poultry, and the consequent production and export of butter, bacon and eggs. The land is therefore utilized mainly for obtaining grain, roots, clover, grass and hay for the animals and to a much smaller extent for growing crops for human use, especially barley, oats and beet; closely associated with the agricultural production and keeping of animals are small industries of making sugar, brewing beer and dressing leather.

Along the north coast of Jutland the sand-dunes have been drifted as far as the point Skagens Horn, and the northern part of the peninsula is in parts sandy rather than clayey, but apart from this there is much similarity throughout the Baltic Entry-lands. Scania (Id) differs very markedly from the rest of Scandinavia, fundamentally because along its north-eastern boundary are a series of faults which have let down and preserved sedimentary rocks on the south-western side, while crystalline rocks of the Baltic Shield form most of the country on the north-eastern side. How this has influenced the farming is shown by the fact that on the south-western side 80 per cent, of the land is cultivated, while the proportion on the north-eastern side is less than 30 per cent. ; a population map shows a correspondingly sharp contrast. Climatic factors, too, play some part in bringing about the difference, for southern Scandinavia as a whole has the Sub-boreal type of climate, but in Scania the beech can thrive.

In addition to relatively favourable conditions of climate and soil, the Baltic Entry-lands, as the name implies, have a favour-

able commercial situation. This was more important in the past before railways, good roads, and canals diverted traffic from the seas, but there are still several ports at the eastern end of the Baltic. In the German part of the region (marked lb), Ltibeck is an " old-world " town, once the chief seat of the Hanseatic League dominating the trade of the Baltic lands ; it is now eclipsed by Kiel, a naval fortress at the end of the North-Baltic Sea Canal. On the Danish portion of the Jutish



FIG. 34.—VIEW ON THE ISLAND OF FUNEN.

[Danish Tourist Bureau.]

Note.—The ground-moraine landscapes of Eastern Jutland and the Danish Islands have numerous low rises and small hollows, many of the latter being occupied by lakes or ponds ; by the coasts the " drowning " has converted these into small inlets. As in this view, the farms are commonly set among pastures and beech-woods ; in the foreground the foliage of a beech tree can be recognized.

Peninsula (marked la), there are only smaller ports, but on Zealand, the largest of the islands (marked le), is Copenhagen. It is situated on the Sound, the shortest route between the Kattegat and the Baltic, though its growth to a great city of more than three-quarters of a million inhabitants is due largely to the fact that it is the capital of Denmark. In Scania, Malmo is connected by train-ferry with Copenhagen ; it is the chief port of this part of Sweden, and in size is the third town of that State.

The Baltic Plateaus.—East of Lubeck, the Baltic coastlands become on the whole higher and form a series of plateaus

sometimes known by the name of the Baltic Heights, which alternate with low and broad river valleys. The Mecklenburg plateau (IIa) is followed by the Oder Valley, the Pomeranian plateau (IIb) by the Vistula valley, and the East Prussian plateau (Iie) by the Niemen valley. The highest parts of each plateau are covered by terminal moraines, rising to several hundreds of feet. These are to a considerable degree wooded, but as a legacy of the ice the drainage is in general poor, marshy areas abound and there are so many lakes that the regions are often referred to as the "lake plateaus." On the northern slopes, boulder-clay areas provide better soils, and agriculture yields crops of rye and potatoes, but the productivity is never high and decreases towards the east. On the southern slopes, outwash sands from the ice form but poor soils, and woods and pastures give a living to a scanty population. The low river valleys are naturally marshy and liable to flood, but where the alluvial plains are protected by dykes there is fertile ground, on which cereals, sugar-beet and other crops are grown, and animals are pastured.

The coasts vary in conformity with the lands behind them. Projecting from the Mecklenburg plateau are islands with low cliffs, as on Riigen, and parts of the coasts of the other plateaus are also cliff-edged. The valleys end in funnel-shaped estuaries in which the rivers have built deltas; sand drifted from the west has formed spits which almost shut in lagoons and, where the coast faces west, there are high sand-dunes.

These river and sea deposits hamper navigation, which also suffers from the formation of ice in winter, but ports have grown up at the mouths of the largest rivers. By the Oder is Stettin, which has some importance from the trade of Berlin, with which it is connected by canals.

At the end of the Vistula valley are two ports: Danzig is a German settlement which, situated by an old mouth of the river, has for centuries been the outlet for the trade of the Vistula basin; Gdynia, away from the river itself, is a new creation of Poland constructed to give that country an independent port at the end of the "Polish Corridor" which runs between East Prussia and the rest of Germany.

At the mouth of the smaller River Pregel is Konigsberg, a large German city; its development was in part due to trade from Russia, which came here in preference to the more easterly

ports because of the shorter time during which ice prevented navigation.

At the far east of the region is Kaunas (Kovno), the capital of Lithuania, where the Niemen, or Memel, River turns westward, and the port Memel is situated where the river leaves its lagoon.

The River Lowlands.—Not all this region marked **III** is low, for there are lines of terminal moraine forming belts of hilly country ; these are, however, neither so high nor so wooded as those farther north, and frequently form heath-land, e.g. the Liineberg Heath west of the Elbe (marked L.H. in Fig. 33). More extensive are the areas of ground moraine, generally covered by a relatively fertile loamy soil, on which corn, especially rye, sugar-beet and potatoes are grown.

The characteristic areas of the region, however, are the broad, primitive valleys. One series is just within the northern boundary of the region ; with the aid of canals it connects the Vistula above Thorn with the Netze and Warthe tributaries of the Oder, and a short reach of that river with the lower Elbe. The second important line of valleys runs along the middle of the region ; it joins the Bug tributary of the Vistula to the upper Warthe, and this river by the Spree to the Elbe. The Elbe above Magdeburg flows in another glacial valley, but below the town the river breaks off to the north ; its earlier valley is continued westward towards the Aller and is occupied by the new Mittelland Canal.

These and other glacial valleys have facilitated water communication, but they did not easily lend themselves to other use, for they are partly marshy and the natural vegetation-cover is commonly heath on the drier sands and dense thicket in the damper parts. But now considerable areas have been drained and dyked and transformed into fields and meadows.

Of the three areas comprising this River Lowlands region, that drained by the Elbe (marked **IIia**) is particularly important because Berlin has grown up within it. The rulers of the district around Berlin, the " Mark," during several centuries increased their power until they became Kings of Prussia and, at last, Emperors of Germany ; Berlin was the seat of their Government and is now the capital of the German State. Its position in the centre of the waterways is shown on the map, and when railways were constructed they were made to centre upon the city. Its development as an administrative and com-

mercial metropolis aided the establishment of many forms of industry, until it is now the largest manufacturing city of Germany. It is also the chief German centre of education and of many professions. As a consequence it has spread until it occupies an area of over 300 square miles and the city itself has a population of about 4½ million persons; it is thus the greatest city on the continent of Europe. Magdeburg is a large town which owes its growth mainly to its position on the Elbe.

The Oder Lowland (IIlb), has been less developed than the Elbe Lowland; it is a rather sparsely populated rural region, and has smaller towns. The most considerable of these is Poznan, formerly known by its German name, Posen.

In the Vistula Lowland (IIlc), with which part of the upper basin of the Warta is here included, the terminal moraines are less developed, and in addition to the wet river valleys, even the areas of ground moraine have large marshy spaces. There are other districts of woods and heaths, and in general the amount of cultivated land is less than in the more westerly lowlands. In the centre and on the Vistula is Warsaw, the capital of Poland, with about 1½ million inhabitants. The Polish Government, and before that the Russians, aided manufacturing in this region by customs barriers. Consequently, industries which here lack any special natural advantages are carried on in several towns, including Warsaw and the large manufacturing city of Lodz, which has more than half a million inhabitants; metal goods and machinery are made, but the greatest development has been in connexion with textiles, and especially cotton goods.

The Interior Plains and Plateaus.—It has already been suggested that this most southerly belt of the South-West Baltic Lowlands, with its less-marked glaciation and its greater fertility, may be compared with the "Fertile Plains" belt of the North Sea Lowlands.

This is certainly true of the area which is drained to the Elbe, and may be called the *Leipzig or Saxon embayment* (IVa), for it resembles the Cologne embayment in several respects. The sedimentary rocks are covered with loess in the southern part, and the region as a whole has intensive agriculture, in which the growing of industrial crops is important. Moreover, there are great deposits of lignite, extending from near Magdeburg southwards past Stassfurt, Halle and Leipzig, which supply power for local industries. These industries are aided, too, by

the occurrence of common and potassium salts in the districts adjoining Stassfurt and Halle, where there are great chemical works. At Leipzig there are varied manufactures which have grouped themselves around an older commercial settlement; this grew up because here an ancient east-west route avoiding the Saxon Uplands found a convenient crossing-place in the otherwise marshy valley of the River Elster, by which Leipzig stands. The city is also noted as a centre of printing and publishing. It has become one of the most important railway junctions of central Europe, and its population is now about three-quarters of a million people.

Farther east, the broad upper valley of the Oder forms the *Silesian Embayment* (IVb). While the south-eastern part of this hollow is covered with sandy and rather infertile glacial deposits, the lower north-western part has more clay and loess or loamy soils on which industrial and other crops are grown. On the Oder is the large city of Breslau, with over half a million inhabitants—another of the commercial centres which have arisen where land routes which skirt the uplands cross riverways leading to the lowlands and the seas.

At the south-eastern end is the Upper Silesian coal basin, of which part is in the Oder valley, and part drains to the Vistula. Coal is not actually mined in all parts of the basin, but iron, zinc and lead deposits are worked in the area ; as a consequence there are considerable metallurgical industries. The Upper Silesian coalfields are shared by three States, as shown in Figs. 78 and 80. In Germany there is a large industrial population in and around the towns of Beuthen, Hindenburg and Gleiwitz ; in Poland there are three smaller manufacturing areas, one at Krolewska Huta and Katowice, a second at Rybnik, and a third between Teschen (Cieszyn) and Moravska Ostrava ; in Czechoslovakia there is a much smaller district in and adjoining Moravska Ostrava.

The South Polish Plateaus.—This region (IVc), mainly drained by the Vistula, rises from the River Lowlands southward to the Carpathian Mountains. As a whole, it consists of a number of plateau-like areas, but the upper courses of the Vistula and its tributary, the San, flow through lower country, while north of this upper Vistula valley the land rises in the Lysa Gora (marked L.G.) to a height of almost 2,000 feet. This variety in the relief corresponds to a variety in structure, for the greater part of

the region is formed of limestones and other sedimentary strata of Secondary or Tertiary Age, much dissected by the rivers, but faulting of the earth's crust has resulted in the emergence of blocks of more ancient and more resistant rock in the Lysa Gora area. Surface conditions, too, vary considerably, for in parts glacial deposits cover the sedimentary strata, while in some areas, especially in the southern part, there is a thick mantle of loess in which streams have cut canon-like valleys.

With the variation in relief and soils, the fertility and the utilization of the land vary, but in general it is an agricultural region suited to the growth of grains and industrial crops, and noteworthy, as compared with the more northerly Baltic lands, for a relative importance of wheat production. The southern portion of this region forms part of Galicia, which extends also into the Carpathian Mountain region, and the famous salt-mines of Galicia are at Wieliczka, near Cracow (Krakow).

Cracow is situated where the Vistula was crossed by an old route following the northern side of the Carpathians, and another old commercial centre with a somewhat similar position is Lwow, or Lemberg. This latter city, however, is unusual in being situated on no large river; it is on the water-parting between the streams draining to the Baltic on the one hand and to the Black Sea on the other. Its significance is due to the fact that it is near the meeting-point of several natural regions, and therefore at the focus of routes by which products of different character are interchanged.

In this neighbourhood, we reach the limit of Temperate Europe, and therefore return to deal with the lands situated on the Atlantic side of the North Sea Lowlands.

QUESTIONS

1. Compare and contrast the south-west coasts of the Baltic Sea with the south-east coasts of the North Sea.
2. Show how the glaciation of the South-West Baltic Lowlands has influenced land-utilization in that region.
3. Give an account of the inland navigation system of North Germany, with reference to physical conditions and economic developments.
4. Write a systematic account of the geography of Denmark, relating the facts as closely as possible.
5. Make a comparative study of the situation and development of the three capitals : Berlin, Copenhagen, Warsaw.

NORTHERN FRANCE

The North French Lowland.—West of the North Sea Lowlands rises a belt of chalk country which reaches the Strait of Dover in Cap Blanc Nez, the counterpart of the cliffs of Dover. From this cape southward to the Central Plateau of France, and extending from the Central Uplands of Europe in the east to the Breton Peninsula in the west, is the North French Lowland (see Fig. 35). In its build this sub-region resembles the English Lowland: it is formed in the main of low plateaus, which are cut by river valleys, are sometimes edged by escarpments and sink in parts to low basins or marshy plains.

From the geological point of view, the North French Lowland occupies a great hollow known to geologists as the Paris Basin. Within the hollow the land is composed of strata lying one above another upon a platform of ancient rock which rises in the east to form the Ardenne and other parts of the Central Uplands of Europe, and in the west to form the Breton Peninsula, while on the southern side it is upthrust in the Central Plateau (see the section in Fig. 08, and note that the succession of the strata is set out in Appendix I). Broadly speaking, the lower sedimentary layers outcrop near the margins of the basin, while the uppermost ones appear in the central part.

The strata of the North French Lowland, like those of the English Lowland, differ markedly from one another in their composition, and thus give rise to differences in the relief, in the soils and in the utilization of the land; hence the structure largely determines the varying conditions within the region.

The North French Lowland has a more southerly and a more continental position than the English Lowland, and consequently its summers are warmer and its-winters rather colder, as may be seen by comparing the temperature figures for Paris and London in the table on p. 26. There is not much difference in this respect between the districts near the two sides of the Channel, but in the more southerly part of the French region the greater heat in summer becomes more marked and makes pos-

sible the growth of plants, particularly the vine, which cannot ripen their fruit under normal conditions in England. Such differences, allied to traditional differences between the English and French people in the modes of cultivation, lead to considerable contrasts in the appearance of the landscapes and the mode of life of the population in the two countries.

The Ile de France.—The central part of the North French Lowland (marked I in Fig. 35) lies around the capital, Paris, towards which the streams draining the area converge. Here, in past centuries, was the heart of what was then the Kingdom of France, its eastern side being protected by a cliff-like line of escarpments¹ which raised it, island-like, above the surrounding lowland ; hence this central region became known as the " Ile de France."

It is a group of tracts consisting of gently inclined table-lands, rising in the eastern escarpments to about 800 feet above sea-level, and in parts deeply cut by the valleys of the Seine and its tributaries.

The strata of which the lie de France is formed differ in composition, and as they are slightly tilted, they outcrop in various parts of the region and hence lead to differences which mark out the respective tracts. For example, south-west of the Seine is Beauce, which has characteristic features due to the subsoil being a layer of permeable limestone ; the country is a flat, monotonous and rather dry plateau, though a thin, loamy soil allows cultivation of great quantities of wheat. Usually water can be obtained only by boring deep wells ; these are therefore costly and not numerous, and around them the farm-houses are grouped in large villages, whence the treeless fields of the whole community spread out to considerable distances.

Between the Seine and the Marne is situated another wide and generally level tract, Brie, where the subsoil consists of a lower sheet of limestone of a siliceous, " millstone " type and includes clay, which prevents downward drainage. Consequently the surface is often wet, there are groups of trees, and the characteristic occupation is the keeping: of cattle and the production of milk and cheese ; with no difficulty in obtaining water, the farms are conveniently situated within their fields and the population is of the dispersed type.

¹ These escarpments, and also geological faults in other parts of France, are shown in Fig. 86 by symbols which are explained on the map in Fig. 44.

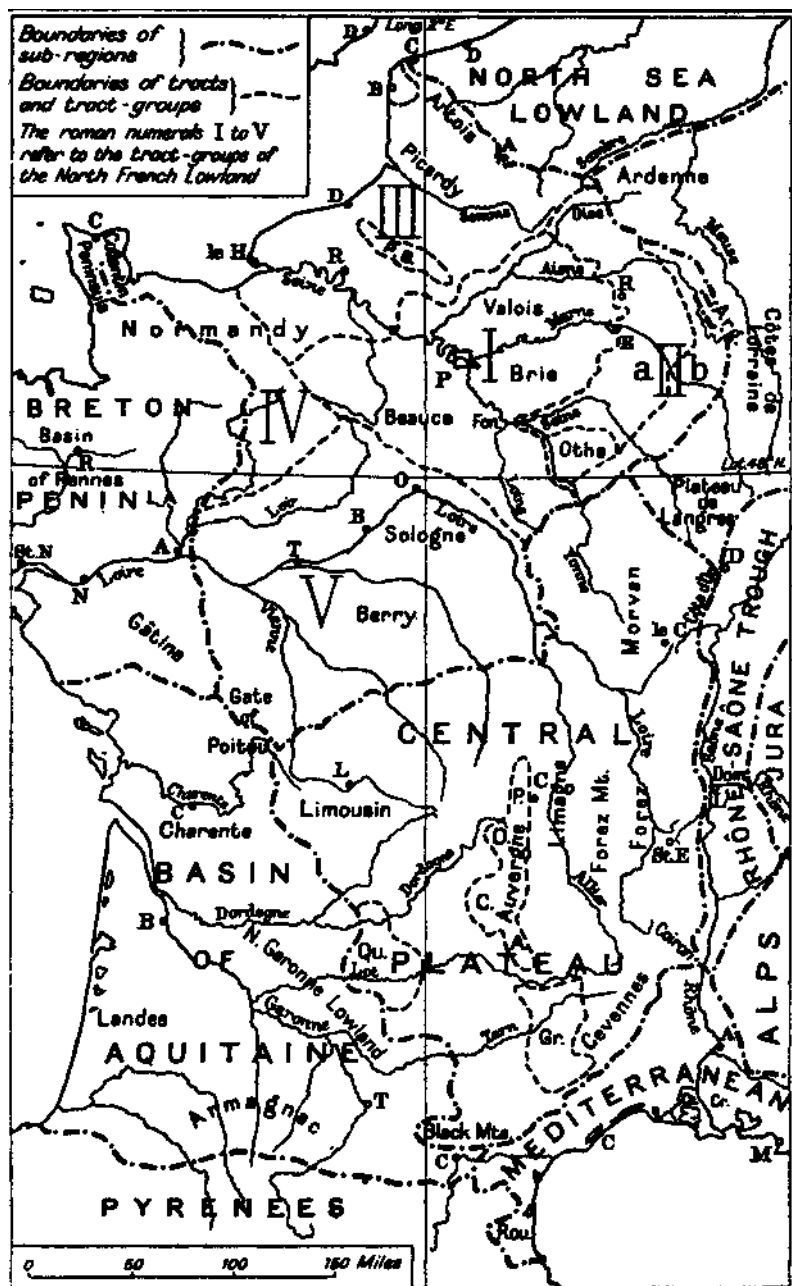


FIG. 35.—REGIONS OF CENTRAL FRANCE.

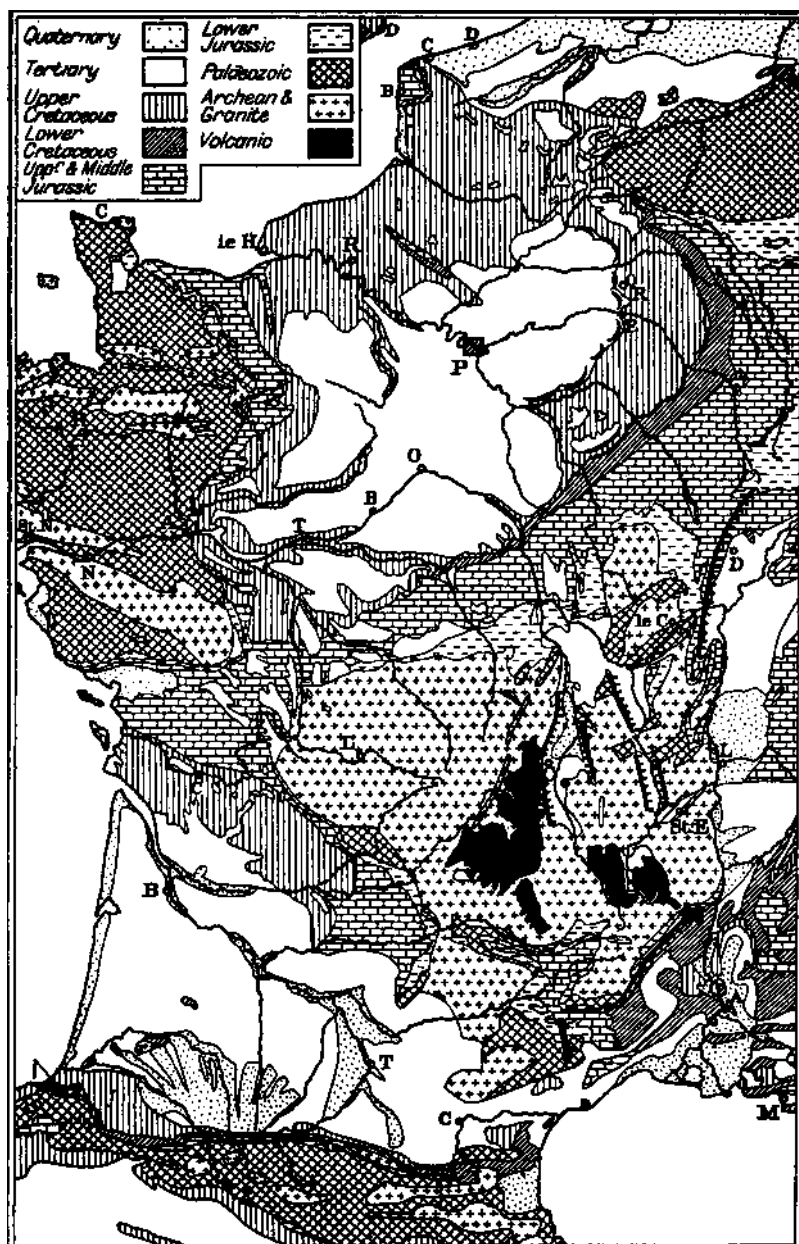


FIG. 36.—STRUCTURE OF CENTRAL FRANCE.

Between the Marne and the Oise is another tract, Valois, distinguished by the occurrence of a still lower stratum of limestone, generally covered with a fertile loam, but there are also patches of sand on which are woods. Elsewhere, too, in the lie de France wooded, sandy or clayey layers outcrop ; e.g. the forest of Fontainebleau (Fon.) is on a sandy stratum situated between the limestones of Beauce and Brie.

The plateaus are separated by broad and often marshy

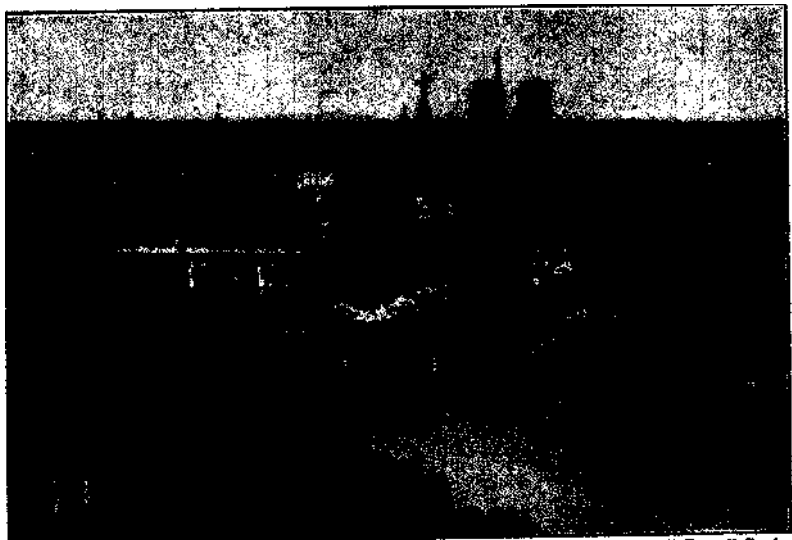


FIG. 37.—VIEW IN PARIS.

"Yoon," Paris.

Note.—The photograph was taken looking up-stream to the island in the Seine, the "He de la Cite," the nucleus of Paris; on the island are to be seen the towers of Notre-Dame. The view shows the shorter bridges spanning the Seine on either side of the island as compared with that across the undivided river; below this bridge are a few of the many barges which load and onload on the quays of Paris.

valleys, and in that of the Seine Paris grew up at a site where an island facilitated the bridging of the river. The position of Paris ensured its future importance : a north—south route here crossed another leading from east to west down the Marne and the lower Seine ; further, its central situation in the He de France early made it the natural seat of the kings of France, and with the development of the French territory it became the capital of the modern State.

As the seat of the Government and at a meeting-place of routes, it became a trading and residential centre, to which new roads were made and railways were built from all parts of France,

and indeed from all western Europe. Also, the River Seine is now navigable between the sea and the capital, and from the neighbourhood of Paris canals complete the natural communications of its tributaries : the Oise is joined to the North Sea Lowlands, the Marne to the Rhine valley, the Yonne to the Saône valley, and the Loing to the Loire valley. With this increase in its commercial significance and with the accompanying growth of its population, Paris was in a most favourable position for manufacturing and for the production of goods of almost all kinds; it is famous for articles of clothing or adornment for which skill and artistic taste are required. Paris is the artistic and intellectual, as well as the political, capital of France, and its great treasury of art, the Louvre, draws visitors from all parts of the world.

Paris now has a population of nearly three million persons, while the whole conurbation of which it is the centre has spread along the neighbouring valleys and on the adjoining plateau areas, absorbing many outlying towns, until the total population exceeds four millions.

The east-facing escarpment of the He de France has a peculiar importance, for on its lower slopes limestones with a covering of vegetable humus provide a suitable soil for the vine, and where there is a favourable exposure are the famous vineyards from which champagne wine is obtained. Also the Marne has here cut through the escarpment and formed a wide valley, into the opening of which the champagne vineyards extend. At this opening is the town of Epernay, and some miles to the north, at the foot of the escarpment, is Reims (Rheims); these two towns are the great wine centres of the district. At the base of the escarpment of Tertiary rocks, the chalk of the Upper Cretaceous comes to the surface, and at and near Epernay and Reims it has been hollowed out into great labyrinths of caverns ; here, where the underground temperatures remain even, the wine is matured.

The " Dry " and " Wet " Champagne Regions.—The term champagne as applied to wine comes from the name of the old French province, which included this vine-growing area. The province, however, extended far to the east, where it comprised the greater part of two markedly contrasted geographical regions; these have long borne the names Champagne pouilleuse and Champagne humide, indicating the beggarly and dry nature of the one **and** the wet condition of the other.

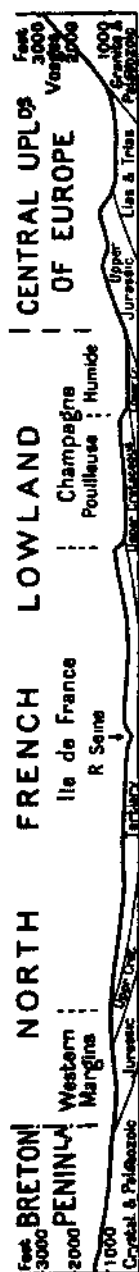


FIG. 38.—SECTION THROUGH NORTHERN FRANCE.

The contrast is due directly to the Secondary strata which rise from below the Tertiary escarpment of the He de France (see the section in Fig. 88). Immediately to the east the Upper Cretaceous chalk comes to the surface, forming at first a low belt of country, but then rising to the bare plateau of the "Dry" Champagne (IIa in Fig. 85); here there is little cultivation, and poor pasture lands on which sheep feed are the chief resource of a small and scattered population. At the northern and southern ends of this chalk plateau, coverings of Tertiary deposits give rise to more wooded landscapes; the southern area, that within the great westerly bend of the Seine, is the Forest of Othe.

Eastwards the chalk forms an escarpment, beneath which outcrop the Lower Cretaceous clays to which the character of the "Wet" Champagne (lib) is due. Although naturally forested and marshy, when drained its soils are capable of producing crops and rich pastures, and now it is a tract of agriculture and cattle rearing. This low Champagne region is bounded eastward by the wooded heights of the Argonne (Arg.) and by the more gradually rising uplands of the C6tes de Lorraine; these may be regarded as the beginning of the Central Uplands of Europe.

The Channel Plateaus.—From beneath the Tertiary layers of the He de France, the chalk emerges northward to form a series of plateaus (III in Fig. 85); these extend to the coast of the Channel, largely in the form of low cliffs, though where the coast faces westward between Dieppe and Boulogne the westerly winds have built up sand-dunes.

At the north-eastern end the chalk is bent up into the "swell" of Artois, which is a lower continuation of the Wealden Uplift of south-eastern England. Adjoining the channel the anticline is sufficiently great for the chalk top to be worn off,

as it has been in the Weald; the underlying strata, among which is a good deal of clay, have been exposed and worn down into a lower area around Boulogne known as the Bas Boulonnais. This low country is a relatively wet, cattle-rearing district, while the surrounding chalk regions of the Haut Boulonnais and the hilly Artois are drier.

This Artois plateau is not, however, poor country like the Champagne pouilleuse, for the chalk is largely covered by deposits of loam or loess with a fertile soil producing much wheat, fodder crops such as clover, colza, from which oil is obtained, and beetroot; after the harvests sheep are turned out to graze on the fields. Continuing the Artois tract to the south-west is Picardy, essentially similar in character; here the folds of the chalk, almost parallel to that of the Wealden-Artois anticline, give rise to an undulating country with the trends running south-east to north-west, and in the same direction the rivers drain to the Channel, the largest being the Somme. On the south-western border of Picardy, one of the anticlines is so marked that the chalk top has been worn away, and the resultant long and narrow Pays de Bray ("P.B." on the map) is a relatively low tract much like the Bas Boulonnais.

South-west of the Pays de Bray the chalk appears again in the low plateaus of Normandy; much of it is covered with "clay with flints," or, south of the lower Seine, with Tertiary deposits, often loamy in composition. While the plateau areas show much open cultivated country, the valleys have more trees and pasture; as a whole, Normandy is a province of varied productions and varied relief. The most marked features of the relief are seen in the valley of the Seine; here the river has been incised deeply into the plateau.

Near the head of the tide on the Seine is Rouen, and here is much interchange of goods from sea-going vessels to inland barges; here, too, was the lowest bridge-place on the river. Now Rouen has a greater amount of traffic than any other port of France. In and around the city are many factories in which cotton and other textiles are manufactured, while there are also other industries in the neighbourhood; Rouen is consequently one of the larger cities of France.

The coasts of the North French Lowland are on the whole not such as to facilitate maritime activities, but the easy crossing to England has given rise to the ferry ports of Boulogne, which

is also an important landing-place for fish, Dieppe and le Havre. The foreign trade of le Havre is very considerable ; it is the outport of Paris and Rouen, specially constructed to accommodate the large vessels which cannot proceed up the Seine ; it imports the cotton for Rouen and the other manufacturing towns of North France, and through it passes much of the foreign produce needed for Paris and for the North French Lowland in general.

In the *Western Margins* of the North French Lowland (marked IV), there is a gradual change to a more diversified region. Here the Cretaceous and Jurassic strata which rise to the surface are not so thick nor have they the same clearly contrasting characteristics as in the east, though limestones, sandstones and clay still bring variety to the country; the strata, however, rise in parts to greater elevations than are found elsewhere in the North French Lowland. Near the coast is the dry limestone plateau of Caen ; elsewhere fields alternate with heaths and woods, and the general appearance of the landscape suggests a transition to the adjoining Breton Peninsula.

The Middle Loire Basin.—The River Loire, between its exit from the Central Plateau and its lower course across the region of the Breton Peninsula, traverses and drains a broad and generally low area which continues the structure of the North French Lowland. This Middle Loire Basin is marked V on the regional map.

Here are all the strata found elsewhere in the North French Lowland region, but they are generally thinner and have narrower outcrops, and also they have been less upraised than in the more northern parts of France ; consequently they do not form wide plateaus, nor have they been etched out into such marked escarpments. Moreover, the Middle Loire Basin includes in the south a part of the belt of Jurassic limestones which, farther east, have been raised to form part of the north-eastern projection of the Central Plateau and also the C&tes de Lorraine (compare the regional and geological maps). Here in the Middle Loire Basin, on the western side of the Loire, the belt is lower and the limestones form the dry plains of Berry.

Although there are not marked differences in the relief of the Middle Loire Basin, its varied structure expresses itself in a diversity of scenery and productions, so that it is difficult to give a short summary of the characteristics of the region from

these points of view. But the generally low altitude and the more southerly situation of this part of the North French Lowland result in relatively high summer temperatures, and of these the people have taken advantage to grow great quantities of vines in the valley of the Loire and its southern tributaries.

Agriculture is the predominant occupation of the region, which as a whole is of moderate fertility. Cereals, especially wheat, are the main product; in addition, fodder for animals is grown, for on the better watered areas cattle are largely kept and sheep in drier parts, such as the open lands of Berry and also in the Soioigne, once marshy but now drained.

In past centuries the basin of the Loire was relatively a more important part of France than it is at present; Orleans at the nearest point to Paris served as a link between the metropolitan region and the centre of France, and from Orleans down the valley there is still to be seen a succession of finely built castles, e.g. at Blois, Tours, Saumur and Angers.

At its south-western end the basin of the Middle Loire narrows to the Gate of Poitou, which leads to south-western France.

The Breton Peninsula.—By comparison with the broad open fields of the North French Lowland, the Breton Peninsula is shady country, with small fields enclosed by hedges and with a good deal of tree growth. The distinction is largely due to the irregular relief of the land and to the abundant surface water, and these characters are themselves the result of the occurrence of older and impermeable rock and the heavier rainfall of the region. Hence the boundary between the North French Lowland and the Breton Peninsula is drawn where the impermeable rocks of Palaeozoic and Archaean age emerge from beneath the sedimentary strata already described, and project westward between the Channel to the north and the Bay of Biscay to the south. Since the greater part of this area formed the old province of Brittany, the name Breton Peninsula is here used, although the region includes the western part of others of the old provinces, notably Normandy and Maine. The peninsular position of the region gives it the equable and rainy climate which marks it out as part of the Atlantic Margins minor region of Temperate Europe. The contrast between the conditions at Brest and at Paris are shown by the figures on p. 26.

Moreover, the structure of the Breton Peninsula, one of the " Hercynian " uplands, distinguishes it from the neighbouring

regions of France and, together with the climate, makes it resemble the Devonian Peninsula of England in many respects.

The plateau was raised a relatively little distance above sea-level, and rivers have etched out the less resistant rocks, leaving the more resistant ones as ridges or bosses of moderate height. The direction of these elevations corresponds with that of the old mountain systems : in the north from west to east, and in the south a tendency to the south-east; consequently the present triangular-shaped region shows, at the Atlantic corner, parallel ranges near the north and south coasts with a narrow low belt between them, while on the continental side of the triangle there is a broader northern upland area forming the heights of Normandy and Maine, then a wide lowland through which the Loire enters the sea, and in the south the Gatine upland trending south-eastward before it disappears under the Gate of Poitou.

Uplands versus Lowlands.—The structure is the main cause of the differences between the uplands and the lowlands of the Breton Peninsula—one of the three great contrasts which the region offers to the observer.

The uplands, both those near the western extremity and those near the eastern margin, reach 1,000 feet and more above sea-level ; frequently they are in the form of long ridges composed of Archaean crystalline rocks, such as gneiss or quartzites, or of resistant sandstones ; in other cases they are broader and more rounded in form and composed of granite. On these rocks poor stony soils have developed, and the wind-swept, rainy uplands generally bear a heath-land type of vegetation ; in parts water collects in the hollows of the impermeable rocks and forms pools, while marsh plants grow in a peaty soil.

Between the uplands the lowlands have been worn down in the less-resistant slates or shales ; here clayey soils have been formed, and though naturally ill-drained and wet and once densely forested with oaks, they have proved capable of utilization. There are meadows on which many cattle are reared, largely for the production of milk and butter ; there are fields in which cereals and vegetables, especially potatoes, are grown ; there are orchards from which large amounts of apples are obtained, and in this part of France cider made from the apples takes the place of wine. The most extensive lowland area is the "Basin of Rennes," in the centre of the region, situated between

the generally higher elevations of the western extremity and the eastern margins.

The mineral resources of the region are very small, and apart from some iron in the north-east margin in Normandy, the chief products are granites and slates, quarried where they can be transported easily by water.

East versus West.—Because of the triangular shape of the Breton Peninsula, the narrow and projecting west is much more exposed to the influence of the sea than the broader east which adjoins the North French Lowland ; the former is wetter and more wind-swept, although more equable, while the latter has warmer and drier summers. Moreover, there is a greater extent of the clayey areas in the centre and east, and consequently the more valuable crops of wheat and oats are obtained in these parts, while buckwheat and rye are grown in the west.

Because of its remoteness from the rest of France, the people of the west have been more isolated, and this feature of their lives is increased by the method of farming: the peasants mostly live in scattered houses, surrounded by their patches of arable land, pasture, and vegetable and fruit garden, enclosed by hedges and trees, and connected with the outer world only by a muddy cart-track. Old ways and old ideas tend to persist, and Breton is still widely spoken.

Coast versus Interior.—The Celtic word " Armor " meant the -coastal belt, in opposition to " Archoat," the wooded country of the interior, and the life of the region has been greatly affected by the character of the coast itself.

The breaking up of the old massif led to the broad outlines of the present peninsula, but the numerous bays of moderate size are due to more recent changes of sea-level, involving the " drowning " of the earlier valleys ; in the far west the hollow between the northern and southern ridges has been deeply invaded by the sea, and the great bays of Brest and Douarnenez are the result. This irregularity of the coast has been accentuated by the wearing action of the stormy seas, which have fretted the shores, wearing them back into cliffs and detaching the outstanding parts of headlands to form rocky islets.

Such a coast, although at times dangerous to shipping, gives abundant harbourage, and fishing and trading have been encouraged. From the north coast fishermen go as far away as the Newfoundland and Iceland cod fisheries, and on the south

side tunny fishing and more especially sardine fishing is important ; everywhere there are fishing villages, and in the larger centres preserving and canning are important industries.

No other region of France has such a coast, and from the people of the Breton Peninsula a large part of the personnel of the French fleet is recruited ; moreover, Brest, with its position at the entrance to the Channel and its situation in a land-locked harbour with deep water, is a naval station of great importance.

The far west, however, is so remote from the rest of France that it has not an advantageous position for import and export. The north-east and the south-east parts of the coast on the other hand, have more commercial significance. At the end of the Cotentin Peninsula is Cherbourg, which is a port of call for liners from Southampton and the North Sea on their trans-Atlantic passages, as well as a naval station. More important is the trade from the Loire estuary : Nantes is the old-established port of the Loire Basin, situated where roads from either side converged at the lowest bridge-place on the river. When larger vessels were built, Nantes could not be reached by them, and St. Nazaire became its deep-water outpost; still more recently, engineering works have forced the waters of the Loire to scour the channel, and once again Nantes can receive liner traffic. Now both ports share the trade and subsidiary industries, including shipbuilding.

The coastal belt of the Breton Peninsula has another advantage over the interior in that its mild winter climate and its facilities for rapid export have enabled it to develop a great production of early potatoes, cauliflowers, artichokes and peas. Agriculture is helped in yet another way by proximity to the coast, for the soils have been greatly enriched by manures obtained from seaweed gathered at low water, and also from banks of sand formed of shells, which give valuable material for plant food.

With this variety of natural opportunities of getting a living, the population along the Breton coasts is much greater than that in the interior, and indeed is greater than that of most of France, with the exception of the manufacturing areas of the north-east and the districts near the great cities.

(Questions are given at the end of the next chapter.)

SOUTHERN AND CENTRAL FRANCE

The Aquitaine Basin.—The latitude of south-western France accounts for its higher temperatures both in summer and in winter, as compared with those of the Paris region (see the figures for Bordeaux on p. 26), and the direct exposure to the Atlantic winds accounts for heavier rainfall. These conditions make possible a widespread cultivation of maize, which becomes more important than wheat as a cereal crop in the south, and there is a wider extension of vine-growing in the Aquitaine Basin even than in the Middle Loire Basin. On the adjoining Central Plateau and the Pyrenees fall heavy rains, and from these the rivers bring down great quantities of water, particularly to the Garonne, which is in consequence subject to great floods. Moreover, the bottom of the great trough between the two highland areas has been largely filled in with material brought down in the past, and alluvium is still being deposited in the valley of the Garonne and is rapidly filling up the Gironde, the common estuary of the Garonne and the Dordogne. The Garonne is not navigable above Bordeaux, except for small boats, and large liners have to use outports near the mouth of the Gironde if they serve this region at all.

Indeed, in spite of the long coast-line, the natural conditions do not favour maritime activities, for in this angle of the Bay of Biscay the currents sweeping southward have accumulated sand, which has been heaped up by the prevailing westerly winds into an almost continuous belt of high dunes. These are known as the *Great Dunes of Gascony* and are shown on the geological map as among the Quaternary deposits. The belt of sand has enclosed a number of lagoons, all except one now being completely shut off from the sea.

Moreover, behind these coastal barriers is the tract of the *Landes*, consisting of great flat plains of wind-blown sand, below the surface of which iron has cemented the sand into an impermeable pan. The region was therefore a marshy heath-land with innumerable pools ; in these, mosquitoes bred and carried

malaria among the few people who kept sheep on poor pastures.

Now, however, the inland drift of the sand has been checked by planting grasses and trees on the dunes, and the drainage has been improved by breaking through the pan and by cutting dykes ; then, some thousands of square miles were planted with

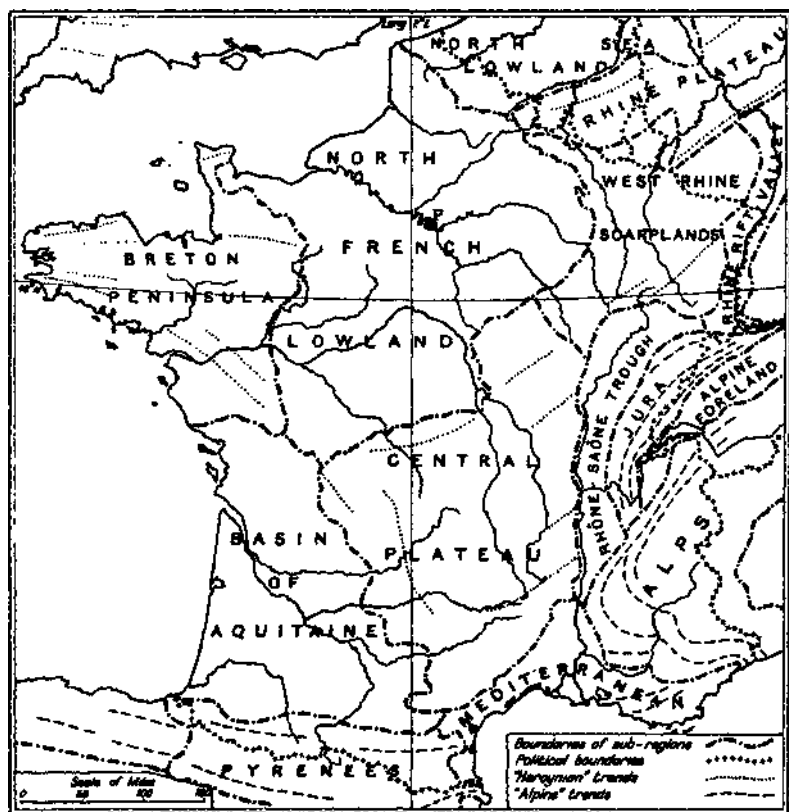


FIG. 39.—REGIONS AND STRUCTURAL TRENDS OF FRANCE.

the maritime pine, which yields timber, resin and turpentine,, while improvements in pasturing have allowed many more sheep and also cattle to be reared on the Landes.

The other tracts of the Aquitaine Basin are much more productive. The country which adjoins the Gate of Poitou is called the *Charente Region*, for it is drained by the River Charente to the Bay of Biscay. The soils are fertile, producing

wheat and maize, and along the whole course of the middle and lower Charente there are vineyards; from the wine a great deal of brandy is obtained—a famous kind is that known as Cognac, from the town in the centre of the district.

The *Garonne Valley* is another important vine-growing region. " Bordeaux wines " is the general name given to the wines made in the lower part of the area, but far up the courses of the river and its tributaries there are also extensive vineyards ; some of the more choice wines are exported, but by far the greatest amount is consumed in the country. In general, the Garonne valley is the most productive and the most populated part of Aquitaine. Wheat and fruit trees are grown throughout the area, and on the wide plains of Toulouse, below that city, maize and early vegetables are important productions ; tobacco is also grown in some parts of the Garonne valley.

Bordeaux is the port of the whole Basin, with about a quarter of a million inhabitants. Toulouse is not quite as large ; it is the trading centre of the upper part of the region, and is a focus of routes up the valleys of the Pyrenees and through the Gate of Carcassonne to the Mediterranean region of France.

Between the Garonne valley and the Central Plateau is a region which may be called the *North Garonne Lowland*. Its characteristic features are due to the subsoil being largely formed by Tertiary deposits known as " mollasse "—sandy and clayey accumulations worn down from the Pyrenees during and after the upraising of those mountains ; it was spread out over almost all the Basin, although now covered by later deposits on the Pyrenean side of the main valley. The region has a rather monotonous appearance, for on the mollasse have developed gently undulating plains, remarkably uniform except for the river valleys that have been cut into them. Wheat and fruit, especially plums, and fodder for cattle, characterize the agriculture.

Between the great curve of the Garonne valley and the Landes is an almost semicircular region rising gradually to the Pyrenees ; the name of the central district, *Armagnac*, may be adopted as a convenient label for the whole region. Here an immense alluvial fan has been formed of material brought down from the mountains : first the mollasse, then later Tertiary gravels, sands and clays, and on top of all Quaternary sediments.

Into this broad " cone " the rivers have cut valleys spreading out fan-like and draining either to the Garonne or to the angle

of the Bay of Biscay. In their upper parts these valleys are deeply cut into the plateau of the higher country where heathlands pasture sheep during their annual passage between wintering on the lowlands and spending the summer in the mountains. In the lower parts the valleys are wider and the climate is warmer and drier; here maize is widely grown, fruit trees and the vine become increasingly important as the region becomes lower, and Armagnac brandy is one of the well-known exports of the district.

Thus the Basin of Aquitaine, taken as a whole, is a sub-region of predominantly agricultural character and of a markedly southerly type; with a lack of mineral wealth and almost shut in by mountains and a difficult coast, it has had very little industrial or commercial development, and in consequence its population is not great and is mainly scattered in isolated farms or in villages and small towns.

Between the Pyrenees and the Central Plateau is the broad Gate of Carcassonne, whose fortified walls and castle still bear witness to its strategic importance in past centuries.

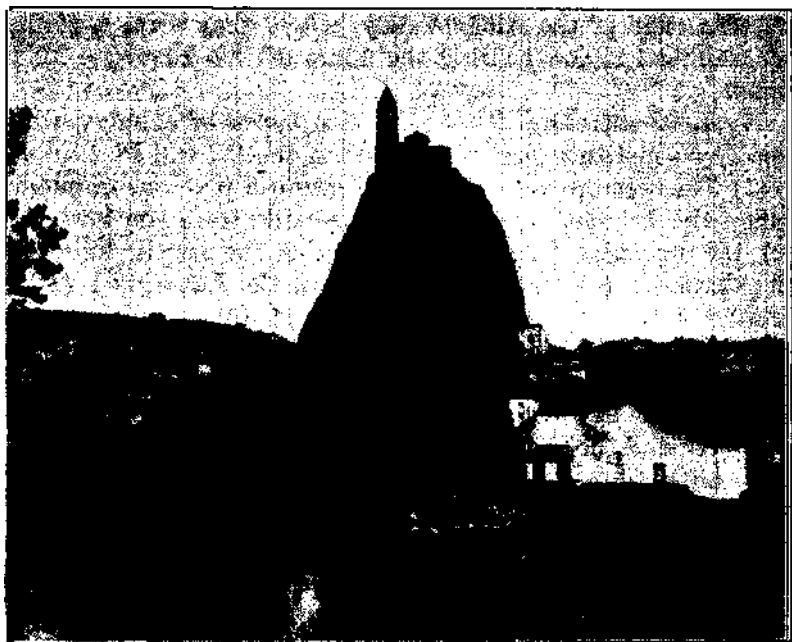
The adjoining region of the Pyrenees has a greater extension in Spain than in France, and will be dealt with in the chapter on the Iberian Peninsula.

The Central Plateau.—Although this region, frequently called the Massif Central by French geographers, appears on a relief map as an upland with few breaks in its continuity, it includes areas of extraordinarily contrasting character. Even where the surface shows little change in altitude, the appearance of the country and the mode of life of the people may change suddenly with the occurrence of a different bed-rock; hence, the geological structure is the key to the geography.

In this Hercynian Upland, the structure is complicated, for the "Armorican" foldings, with a north-west to south-east direction, approach the "Variscan" foldings, which run from south-west to north-east.

Moreover, in the upraised massif of the Central Plateau, marginal areas of Secondary sedimentary strata were incorporated. These areas can be seen by comparing the limits of the region as shown in Fig. 85 with the occurrence of the various strata as shown in Fig. 86; of special interest are the masses of Jurassic limestone in the regions of the south and south-west marked "Gr." and "Qu." on the regional map.

Another most significant feature of the Central Plateau is the existence of many great faults. Of these, one series forms the steep eastern margin of the region where it overlooks the Rhone-Saone trough.¹ Consequently, while in general the Central Plateau rises gradually from the west, its eastern boundary is almost mountain-like, and its high south-eastern edge, reaching about 4,000 or 5,000 feet, is known as the Cevennes.



(French Railways—National Tourist Office.)

FIG. 40.—VIEW AT LE PUY.

Note.—"Puy" is a common name for a summit in the Central Plateau, and it has been adopted as the name of the town "Le Puy" in the volcanic region west of the Upper Loire. North of the town rises the volcanic rock named "Rocher d'Aiguille," shown in the view; it is nearly 300 feet high, and on the top is a chapel built in the tenth century.

Another series of faults has produced two marked valleys in which flow the upper Loire and its tributary the Allier. That of the Allier is called the Limagne; it is a rift valley between faults running in a general north-to-south direction, and in it have been preserved Tertiary deposits and material worn down from the surrounding upland. The corresponding valley of the Loire takes the form of two down-faulted basins, also filled in

¹ In the geological map in Fig. 86 all these faults could not be shown without obscuring other features.

by Tertiary deposits ; the southern is known as the Forez Basin. The narrow upland left between these valleys of the Allier and the Loire is called the Forez Mountains.

Still another important element in the structure of the Central Plateau is associated with these dislocations, for through such cracks volcanic material was forced out and accumulated on the other rocks. In this region such recent volcanic rocks are found in great amount near the head-stream of the Loire, and on the western edge of the Allier Valley, where they form a distinct geographical region bearing the name of the Auvergne Mountains.

We may therefore distinguish five types of country which together constitute the greater part of the Central Plateau.

(1) The western crystalline and granitic plateau, frequently called the Limousin, which rises gradually from the lowlands ; (2) the upraised limestone plateaus of the south, known as the Causses ; (3) the volcanic region of the Auvergne ; (4) the faulted valleys of the Allier and Loire ; (5) the high eastern margin of complicated structure, including the Cevennes in the southern part and certain coalfields in the northern part. To these may be added two projecting spurs, the broad Morvan in the north and the Black Mountain in the south. These regional units differ from one another considerably in structure, altitude and position, and consequently in climate and utilization.

Limousin.—Where this plateau rises from the North French and Aquitaine Lowlands it is about 1,000 feet above sea-level, and it slopes gradually upwards towards a higher eastern part, frequently known as the Plateau de Millevaches, which gains an elevation of nearly 8,000 feet.

The lower western area has an equable, and on the whole warm, climate with a moderate rainfall, and its crystalline rocks have weathered to soils which have been improved by long manuring and by bringing chalk up from the neighbouring lowlands. There are arable lands, on which wheat and buckwheat are grown, but most characteristic are meadows, generally irrigated and cut for hay twice in the year, and plantations of edible chestnut trees. The farming is concerned mainly with cattle-rearing, and the chestnut trees yield both timber and also the nuts which form an important part of the people's food.

On the higher eastern part of the plateau the climate is colder and more cloudy; there are heavy rains and in the winter

frequent snowfalls. On the rounded heights are granitic tors, also hollows filled with waterlogged sands ; heaths abound, and there are woods of oak and beech. There is little cultivation, though some rye is grown, and cattle are bred to be sent to lower areas for fattening and sale.

The settlements in the Limousin are generally small; Limoges, on a tributary of the Loire, is the natural centre and market town of the lower plateau, and at this town are pottery and porcelain works having the advantage of kaolin from granite quarried in the neighbourhood.

The Auvergne.—This region, named after an old French province, consists of four main tracts, all volcanic, but of different origin, appearance and use.

In the north, overlooking the Limagne, is a relatively narrow belt marked P. on the regional map. This is formed of a considerable number of relatively recent cones, known as " Puy " ; the best known is the Puy de Dôme. Though the volcanoes are extinct, their forms are still fairly well preserved, and on some of the lava fertile soils have developed. At their general elevation of nearly 3,000 to 5,000 feet, however, these lands have a comparatively severe climate and the heavy precipitation commonly takes the form of snow. Hence only such hardy crops as potatoes and rye can be produced, and, as on the neighbouring plateau, pastoral work is the main resource of the scanty population.

Farther south the belt widens to the mass of Mont Dore (D.), formed by the eruption of material from many neighbouring vents ; here the volcanic accumulation reaches its greatest elevation, over 6,000 feet. Farther south again is the widest area, the Cantal (C), once a volcano of still greater elevation than the Mont Dore mass, but of older date and now worn down to a rather less height. On these mountains the snow may lie for half the year, but their sides are deeply eroded, and in the lower parts of the valleys there are good soils and abundant water, and here fields, fruit trees and villages are found.

The " tail " of the Auvergne is the Aubrac (A.), an enormous stretch of bleak lava flows, of little value except as a summer pasture for cattle from farther south.

The Allier and Loire Valleys.—The two great head-streams of the Loire system derive their waters from a region where the melting of the winter snows frequently coincides with heavy

rains ; hence they are both subject to enormous floods in spring, in striking contrast with very low water in the usually dry summer. Moreover, at all seasons they are liable to great rises, for upon the surrounding highlands rain-water is not absorbed by the impermeable rocks, but rushes rapidly down the steep slopes into the two great valleys.

In Tertiary times these depressions were occupied by lakes, now drained, and upon the deposits of that period much alluvium has since been spread. The low altitude of the resulting plains, only about 1,000 feet above sea-level, gives them a relatively warm climate which at midsummer may indeed be hot, and the bordering uplands give them shelter. Consequently, where the soils are favourable, they are extremely productive and have attracted relatively dense populations into the heart of the Central Plateau. The Limagne is exceptionally fertile, for the proximity of the volcanic region long ago caused ash to descend upon it, and since then debris of mixed composition has provided material for the development of rich soils. Upon these soils wheat, various fodder crops and sugar-beet are grown, and the numerous villages are almost hidden by great orchards of pear trees, walnut trees and even apricot and peach trees, while vines are grown on the lower slopes of the valley sides.

Towns have grown up, the largest being Clermont-Ferrand on the edge of the valley almost underneath the Puy de Dome ; here have developed manufactures, aided to some extent by a small local coal-supply, but depending almost entirely upon imported material. The central position in France of Clermont-Ferrand would seem largely offset by its situation within highland barriers, but it has risen to considerable importance in connexion with the motor-car industry and there are great rubber factories and also engineering works of various kinds.

The valley of the Loire is less productive, for the crystalline rocks above it have furnished sandy material which renders the Forez and other basins less productive than the Limagne; wheat and potatoes are the chief crops. There is a cotton-spinning industry in the Roanne basin below the Forez, but no industrial development comparable with that of the Allier valley.

The Causses.—The name is derived from an old south French word for limestone, and the permeability of the rocks is the

fundamental factor in the characteristics of the regions. There are two main areas, the Grandes Causses (Gr. on the regional map), situated chiefly in the upper basin of the Tarn, and the Causses of Quercy (Qu.), cut by the middle courses of the Lot and Dordogne.

The Grandes Causses are limestone plateaus at elevations of between 2,500 and 3,500 feet above sea-level; they are separated



[E.N.A.]

FIG. 41.—VIEW ON THE RIVER TARN.

Note.—This shows part of the gorge cut into the limestone of the Grandes Causses. At one place the river-level is more than 1,500 feet below that of the neighbouring plateau. The limestone walls sometimes overhang the stream, where they represent the subterranean tunnels and caverns of an earlier stage of development.

from each other by the deep valleys of the Tarn, its tributaries, and other rivers draining either to the Atlantic or to the Mediterranean. Although the rainfall on these heights is great, the surface is usually dry and rocky; there is little soil except in the hollows or the valleys, and generally vegetation is very sparse and sometimes practically non-existent. The water sinks into the limestone, and collects in cracks, which are widened by solution and corrosion till underground channels

are developed, widening in parts to caverns. In course of time the tunnels become very deep and their roofs may give way; the rivers are then exposed at the bottom of narrow canons in some cases hundreds of feet in depth.

These valleys effectively separate the Causses from each other, and greatly impede communication, which, moreover, is often impossible in the valleys themselves. Surface streams upon the plateau are rare and sometimes suddenly disappear in swallow-holes, perhaps emerging in a canon-like valley far away. Landscapes like that of the Causses are said to be of the " Karst " type, the name being derived from the similar Karst upland near the head of the Adriatic Sea.

With the lack of vegetation, the only considerable resource is the grazing of sheep on the poor pastures, and from the ewes' milk " Roquefort " cheese is made. Conditions of life are hard, especially in times of drought, when water may have to be carried great distances from the larger streams. Necessarily, the population of the Grandes Causses is extremely scanty and, settlements are limited mainly to parts of the valleys where soil has accumulated and water can be obtained.

The Causses of Quercy are essentially similar, but they are of much less elevation, being little more than 1,000 feet above sea-level. Hence the valleys are less deeply cut, and the climate is less extreme ; consequently the pastures are better, life is not so difficult and the population is rather greater.

The Black Mountain and Morvan Spurs.—In the extreme south the Central Plateau almost meets the Pyrenees in the spur of the Black Mountain, a crystalline mass which derived its name from the dark forests still covering it in part.

In the extreme north is the Morvan, whose highest part is of more complicated structure, but of generally similar appearance ; from this it bears the Celtic name Morvan, which meant Dark Mountain. Around this height upraised sedimentary rocks, largely of Lias clay and Jurassic limestone, form a transition both to the North French Lowland and also to the Plateau of Langres, which continues the high ground to the C6tes de Lorraine and the Central Uplands of Europe.

The Eastern Margins.—Here is an area of great complexity which in one part or another includes all the types of country found in the Central Plateau. In the south the Cevennes, deeply scored by rivers running rapidly to the lower Rh6ne

or the Mediterranean, descend from heights of over 5,000 feet and show a zonal arrangement of vegetation as they reach lower altitudes and have higher temperatures : pastures on the heights give place to beech forest, and this yields to great plantations of chestnut trees before the mountains pass into low foothills and plains of "Mediterranean" character. On the edge of the Cevennes, faulting has let down and preserved the small coal basin of Ales, or AJais, and farther to the north-east a projecting spur of volcanic basalt, the Coiron, brings the plateau close to the Alps.

More important coal basins are found on the Central Plateau between the Loire valley and the Rh6ne-Saone Corridor. The direction of the Variscan folding is shown on the geological map by belts of Palaeozoic rock running from south-west to north-east, and in these are productive Coal Measures ; moreover, the rocks have been worn down into hollows which facilitate communications between the Loire and Rhone river basins. There are three such coalfields, and of these the central one has the advantage of neighbouring iron ore ; here are the great armament and other iron and steel works at le Creusot. The southern one is the basin of St. Etienne ; its valley of over 30 miles in length has been described as a "long and infernal street" in which metallurgical industries of all kinds, glass-making and the manufacture of silk and artificial silk goods are carried on. From this coalfield coal is sent to Lyons, where it is used in power-plants when the water-power upon which they normally depend fails during the dry seasons.

Reviewing the characteristics of the Central Plateau, it will now be realized that its geological history has welded into close proximity very different types of country ; consequently it is not a simple sub-region, like the North French Lowland, in which there is much uniformity, but a composite sub-region with little more than its elevated situation in the heart of France as a common characteristic.

The Rh6ne-Saone Trough.—This great hollow is the result of the Alpine disturbances which produced both the folded ranges of the Jura and the Alps on the eastern side and also the faultings which separate it from the Central Plateau and its continuation, the Plateau of Langres, on the western side. At the northern end of the Sa6ne trough are strata of Secondary age, but the

greater part of the hollow is floored by marls and other Tertiary deposits, and glacial material was brought down in great amount where the Rhone enters from the Alpine highlands.

The soils in the hollow are therefore varied, but where they are fertile the region is very productive, for the climate is favourable to cultivation. Because of the almost enclosed situation of this relatively low region, the temperatures approach the "continental" type, as is shown by the figures given for Lyons on p. 26: the July mean of 70° F. and the annual maximum of 95° F. are markedly high as compared with the January mean of 36° F., and the annual minimum of 10° F.; no other part of north-western Europe shows such extremes. The rain is abundant, due to the proximity of the great highlands.

The northern and central part of the broad Saône valley is a fertile country, with great stretches of wheat and maize, sugar-beet, hops and fodder crops for dairy cattle. Especially productive is the zone at the foot of the western hills, part of which goes by the name of the Cote d'Or; all along these slopes are vineyards and orchards of cherry, peach and other fruit trees. The wines are known by the general name of "Burgundy," from the old province of which this zone formed part.

The area of the Dombes (marked "Dom." on the regional map) in the angle east of the Saône and north of the Rhône is very different, for here the morainic material is spread out in broad, terrace-like formation, and on these levels there are impermeable clays. Consequently there is naturally bad drainage, and this area is the least populated of the whole region.

Farther south the trough narrows to the "Rhône corridor." Here fertility is again considerable, and vineyards stretch along its borders, while besides fields of maize there are great plantations of mulberry trees grown for the food of silk-worms; in this way the agriculture is related to the silk industry carried on in a number of small centres, in addition to the great works in and close to Lyons.

The greater part of the silk required for the industry in Lyons, however, has to be imported from abroad; moreover, though the machines are mainly driven by electricity derived from water-power from the Rhône itself and the neighbouring Alps, the chief advantage for the industry lies in the position of the

city in relation to distant sources of raw material and distant markets for the finished goods. Great quantities of silk are brought from the Mediterranean countries and the Far East through Marseilles ; for the disposal of manufactured silk and other goods, the Saône valley gives relatively easy routes in two directions : the first is north-westward to the Paris Basin and the Channel ports by way of Dijon and the railways over the Plateau of Langres, and the other is north-eastward to the Rhine Lands and the North Sea ports by way of Belfort in the Burgundian Gate between the Vosges and Jura Uplands.

With other routes, such as the St. Etienne valley westward and the Rhône valley eastward, Lyons has a most marked nodal position, and it is not surprising that it has developed into a very important commercial centre. Naturally, to the same city have been attracted a number of other industries, including the production of chemicals and machinery. With its population of over half a million, Lyons is the third city of France.

The River Rhône is practically unnavigable, for the masses of water which it receives from the heavy rains on the surrounding uplands and from the melting snows of the Alps make it liable to floods, which occur at various times in different parts of its middle and lower course, and its current is usually too swift for boats to go upstream; it is the valley, not the river, which is so important for commerce.

Mediterranean France.—The traveller proceeding southward through the Rhone corridor, after passing the narrow gap between the Coiron and the western-most Alpine chains (again see Fig. 35), observes a different landscape, for before reaching Avignon above the Rhône delta, he sees extensive olive-yards as well as vineyards and orchards of fruit trees, and as a striking contrast thorny shrubs with bare, stony soil visible between them. The south-eastern corner of France belongs to a different major natural region of Europe.

Yet as it is on the northern margin of the Mediterranean, its climatic conditions differ somewhat from those farther south (refer to the figures for Marseilles on p. 26). In particular, the winter temperatures are lower than is common for places near the sea-level, and the annual minimum is exceptionally low. This is due to the cold "Mistral" which arises when depressions pass along the Mediterranean basin and draw in,

from the chilled Central Plateau, air which descends the Rh6ne valley in bitter blasts. As a consequence, the growing of oranges and lemons is restricted to such parts as the extreme east of the French coast away from the Rh6ne valley.

The varying conditions of climate, relief, soils and opportunities for trade lead to considerable differences in the areas which together constitute the Mediterranean sub-region of France.

Constituent Areas: (i) *Bas Languedoc*.—The western part of Mediterranean France is formed mainly of the lower part of the old province of Languedoc ; it comprises three tracts : (a) Inland is a hilly area largely formed of limestones, on which there are plantations of vines, olive and mulberry trees, though large parts are poor garrigues used only for winter pasturing of sheep sent up to the Central Plateau in summer, (b) Nearer the sea are alluvial plains devoted, to an unusual extent, to vineyards yielding almost half the total amount of wine of France, though its value is not proportionally so great. Such a " one-crop " form of production has its dangers, and this region has suffered greatly from the phylloxera disease of the vines, and also from periods of low prices for wine, (c) The coast is being straightened by material washed from the Rhone delta by the counter-clockwise currents of the Mediterranean Sea ; dunes enclose brackish lagoons, from the waters of which salt is obtained by evaporation. The old port of Aigues Mortes at the edge of the delta is now inland and Cette (Sete), farther west, has an artificial harbour.

(ii) *The Rhone Valley and Delta*.—The formation of deltas is facilitated by the almost tideless nature of the Mediterranean Sea, and the delta of the Rh6ne occupies a considerable area. Near Aries, the river divides into two branches ; between these is the Camargue, the " wet delta," in which drainage is now making pasturage possible, while to the east is the Crau, the " dry delta/' formed largely of pebbly deposits brought down from the Alps by the Durance. Here irrigation is necessary, and with protection from the Mistral by wind-breaks, there are winter pastures for sheep from the Alps, and some cultivation.

The greatest significance of the lower Rh6ne valley is in affording an easy route connecting northern Europe with the Mediterranean Lands and, behind them, the Far East. This

route has been important for more than 2,000 years ; the towns of the Rh6ne valley, such as Avignon, Ntmes and Aries, still have in their buildings the evidence of Roman occupation : fortresses, arenas, temples and aqueducts, and the great commercial city Marseilles is of even earlier origin, for it began as the site of a Greek colony.

Marseilles is not actually in the Rh6ne valley, but is placed by a bay at the side of the delta which is safe from the silting action of the currents, and the harbour has the advantage of deep water. The bay is open, however, and artificial shelter has had to be provided, while to cope with the traffic a great canal has been tunnelled through the ridge north of the bay into a lagoon adjoining the delta. The Rh6ne itself is not navigable, and only a small canal leads by the side of the river to Aries.

Traffic has therefore to go northward from Marseilles by rail, and the greatest amount of the imports is destined to serve the needs of the people and the industries of the Rh6ne valley itself; most of the trade of Marseilles, indeed, is between south-eastern France and the French Colonial possessions in North Africa and southern Asia. From north-western Europe, however, there is much passenger traffic, which takes advantage of the quick railway route to the Mediterranean as compared with the long sea journey *via* the Bay of Biscay and the Strait of Gibraltar.

Round the port of Marseilles industries have developed, particularly those requiring imported material, such as the making of soap, margarine and chemicals, and the refining of sugar ; the population of Marseilles is now over three-quarters of a million, and it is therefore the second city of France.

(iii) *Basse Provence*.—The old French province, Provence, extended from the Alps down to the rocky coast, and that part which is within Mediterranean France is largely upland. In this easterly part of Mediterranean France, the Alps to the north give more protection from cold winds, and the pleasant, indented coast has proved attractive to visitors seeking warmth and sunshine ; this is the beginning of the Riviera coast, which is further dealt with in the chapter on the Italian lands. The same favourable climatic situation which has led to the growth of large and fashionable resorts such as Nice and Cannes has also favoured a large-scale cultivation of flowers for export and for the making of scent.

In an almost land-locked bay has been established the great arsenal and naval port of Toulon, by which shipbuilding yards have been constructed; its situation on the direct routes between France and her overseas possessions makes it, politically and strategically, an important feature of Mediterranean France.

QUESTIONS ON CHAPTERS VIII AND IX

1. Consider on broad lines the similarities and dissimilarities between the lowlands of South-eastern England and those of North-eastern France.

2. Discuss to what extent the geological structure, apart from other geographical factors, has determined the characteristics of the North French Lowland.

3. Give a reasoned account of the distribution of the main occupations of the people in North-eastern France (including the part in the North Sea Lowlands region).

4. Examine the situations of the larger towns of North-eastern France, and classify these situations in relation to the physical geography.

5. Examine (*a*) the common characteristics, and (*b*) the internal differences, of the Breton Peninsula.

6. "The Breton Peninsula of France resembles the Devonian Peninsula of England." How far is this true?

7. Contrast the lowlands of South-western France with those of North-eastern France, and account for the differences.

8. Write systematic notes on the wheat and wine production of France.

9. State, and briefly describe, the differences in the landscape to be observed on a journey from the Saone valley near Dijon to the Mediterranean Sea.

10. Examine the statement: "The Central Plateau has little more than its elevated position in the heart of France as a common characteristic."

11. Write an essay on the ports of France.

12. Test the truth of the dictum that river basins are not natural units, by reference to the rivers of France.

CHAPTER X

THE CENTRAL UPLANDS

THE complexity of this part of Temperate Europe is due to the "Alpine" disturbances which, north of the Alps themselves, produced (1) the long, upraised belt of the Alpine Foreland; (2) the folded ridges of the Jura; (3) the upthrust Hercynian massifs of the Harz Mountains (marked "H"), the Rhine Plateau

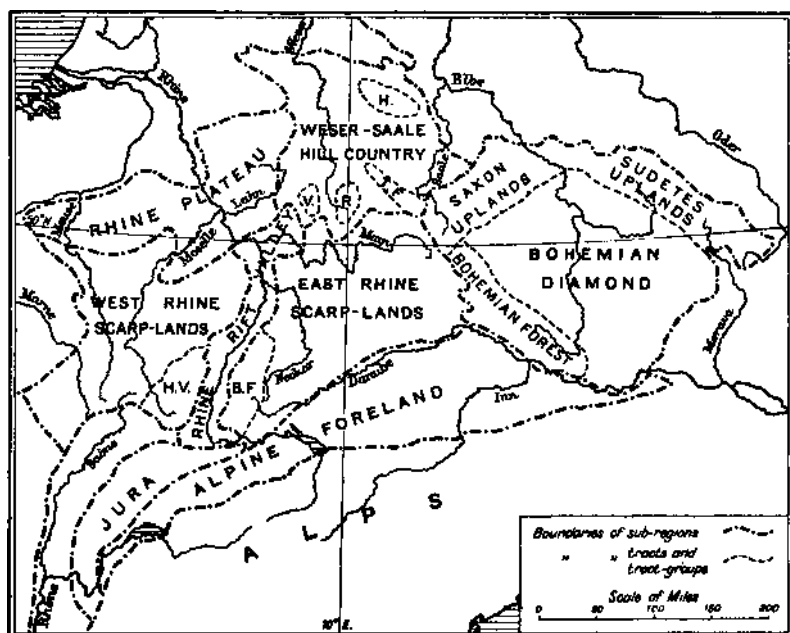


FIG. 42.—REGIONS OF THE CENTRAL UPLANDS OF EUROPE.

through which that river runs between Bingen and Bonn, the Thuringian Forest ("T.F."), the High Vosges, the Black Forest, and the Bohemian "Diamond" and its margins, the Bohemian Forest, the Saxon Uplands and the Sudetes Uplands; (4) the tilted areas of sedimentary strata between the Hercynian fragments, viz. the East Rhine Scarp-lands, the West Rhine Scarp-lands, and the Weser-Saale Hill-country; (5) the sub-

sided Rift-valley of the Rhine; (6) volcanic masses such as the Vogelsberg and the Rhon ("V" and "R").

These structural units, either singly or in a group, form the sub-regions which we will now consider in turn.

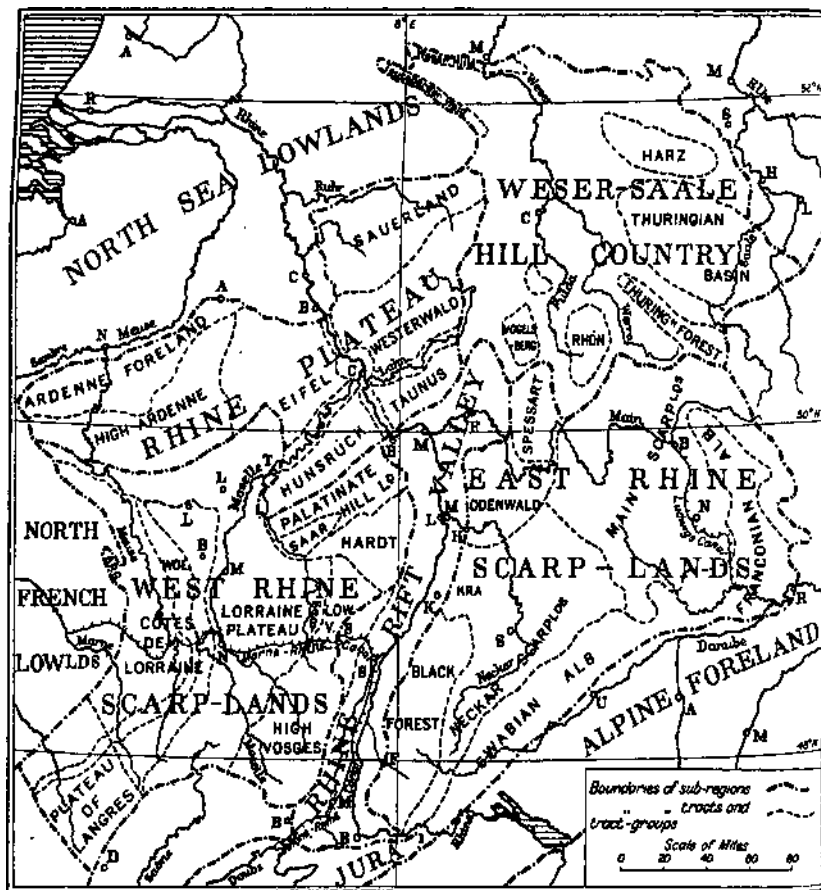


FIG. 43.—REGIONS OF THE RHINE UPLANDS.

Note.—Ludwig's canal is now replaced by the Rhine-Main-Danube canal.

The Rhine Plateau.—This massif is mainly composed of resistant slates, sandstones and quartzites, and in the north of less-resistant limestones, of Palaeozoic Age (refer to Figs. 48 and 44). It has been more or less faulted on all sides, and upraised most markedly on the south-eastern side, where its

gentle meanders, and its tributaries, the Moselle (named Mosel in Germany) on the west and the Lahn on the east, had similar courses. All these streams have continued to cut their valleys into the massif, and their meanders have become incised into the upland. Hence they have very winding courses, and the steep sides of the narrow valleys face in turn towards almost all directions as they overlook the meanders of the rivers.

North of the Moselle and Lahn valleys, the uplands are partly formed of volcanic rock in the Eifel and the Westerwald areas. In the Eifel, a mass of basalt rises to well over 2,000 feet, and there are small volcanic cones and lakes giving variety to scenery which attracts tourists.

Because of its elevation the Rhine Plateau has a markedly different climate from that of the adjoining North Sea Lowlands. The temperatures are lower, the precipitation is greater and the winds are frequently stronger; consequently the winters are severe, heavy snowstorms occur and a snow cover which is commonly some feet deep may last for weeks. The melted snows and rain cannot drain through the impermeable rock of the plateau, and the surface is often wet; many of the wide hollows are marshy or peat bogs. Large areas of the upland and the ridges bear deciduous forests or plantations of conifers, though lower parts of the plateau have been turned into cattle pastures, and some of the land has been ploughed for the hardier cereals, oats and rye, or dug for potatoes, while on the limestone areas of the northern margin even some wheat and beet are cultivated. On the whole, however, the region has not proved remunerative to farming.

In some parts of the north, industries were long ago based upon the occurrence of ores, mainly of iron, worked by fuel from the forests and water from the rapid streams near the edge of the upland. To some extent these industries have survived, importing coal from the adjoining coalfields of Germany and Belgium, but as a whole the plateau areas support few people.

In the deeply cut valleys of the Rhine, Mosel and Lahn, however, conditions are very different. The warmer and sheltered situation allows cultivated fields and rich meadows where the rivers have left fertile deposits beside their meanders, and there are orchards and vines on the slopes which face the sun. The Mosel valley is particularly renowned for the wine which is the main product of that region, and in this and in the

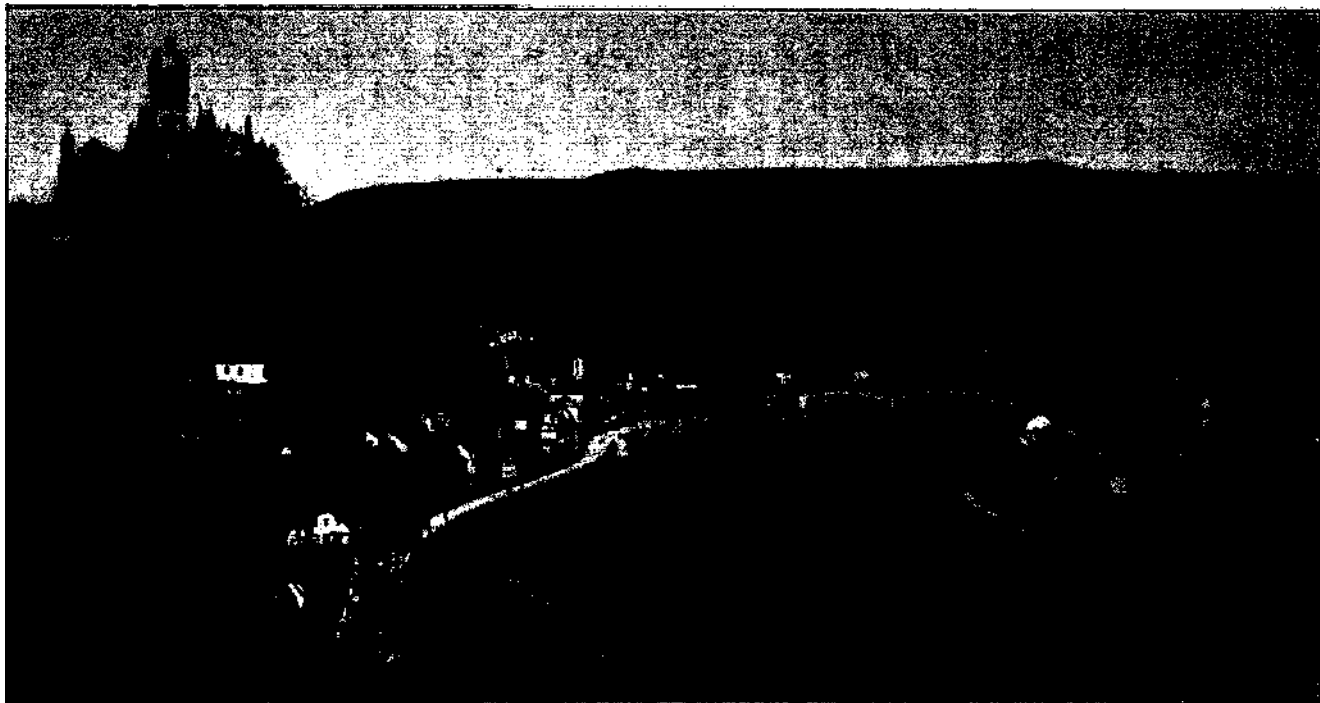


FIG. 45.—VIEW ON THE MOSEL.

German State Railway.

Note.—The flat top of the Rhine plateau is clearly shown ; on the outer side of the incised meander of the Mosel there is practically no lowland, and the road has had to be built up at the river's edge, but on the inner side a small flood-plain has been formed. The castle of Oochem crowns the height remaining between two side valleys; where the larger one (beyond the castle) enters the main valley the town of Cochem has grown up, and the Mosel has been bridged. The view is taken approximately from the south, and the warm south-facing slopes appear light where they have been cleared for vineyards; the darker patches are the woods still remaining on the upper levels, and even on the lower north-facing slopes, as shown on the extreme right. Field cultivation appears only on the small flood-plain area.

other larger valleys **are a** number of small towns depending upon the local trade which uses both the rivers and the roads along their banks.

The Rhine valley is of the greatest importance as a route for commerce, for with this exception the plateau bars the way between north and south. River steamers, railways and motor-cars carry a great deal of traffic through the valley, but there is no large river port in the region ; Coblenz, in a widening of the valley and at the confluence of the Moselle and Rhine, is an ancient town with a famous cathedral, but it has not grown into a great modern commercial city.

The Rhine Rift-valley.—An almost complete contrast to the Rhine Plateau is shown in this down-faulted trough, for it has a drier and sunnier climate, wide areas of fertile land and large cities on or near the river banks. Within the valley itself, differences are mainly due to the various strata which have been relatively recently deposited in the great hollow or on its margins, and we may note four types of constituent areas, working back in our description from those most recently formed to those of earlier origin.

The Flood-plain of the Rhine.—This is shown in the map in Fig. 46 and the section in Fig. 47. It is situated immediately by the river, and would still be subject to inundation were it not for the embanking which, together with the straightening of the stream, has been carried out during the past century.

(i) Above Basel (Bale) the river is too rapid for navigation (though improvements are projected), and has cut a relatively deep and narrow valley. Basel is at the head of navigation on the Rhine and has some trade on that account, but its greatest importance is due to its position at a gap between the upland areas where routes from the north lead towards passes across the Alps. Because of its nodal position it has become one of the main entries to Switzerland, and with a population of about 200,000 people it is the second city of that country.

(ii) Below Basel the river enters the broad valley, and as far as the neighbourhood of Karlsruhe the stream deposits more material than it removes. Enormous amounts of gravels and sands are brought down from the Alps, particularly during great summer floods, and near the stream the water-level is always near the surface, which is therefore frequently wet; even after improvements there remain extensive "moors" and alder-

woods, and the chief use of the flood-plain is for pasture. Strasbourg, a few miles up the 111 tributary, is a centre of inland waterways, for most of the lower Rhine traffic stops here, and between the 111 and the Rhine the Rh6ne-Rhine Canal goes up the valley to cross the watershed west of Basel to southern France ; another waterway, the Marne-Rhine Canal, leaves the 111 at Strasbourg to cross the West Rhine Scarp-lands into northern France.

(iii) North of Karlsruhe the Rhine meanders through a flood-plain which is drier and more capable of utilization than farther up-stream. Moreover, the more regular regime and the greater depth of the river allow navigation of larger boats, traffic is greater and there are busier river-ports. The greatest of these is Mannheim, at the head of navigation for large barges, and here and at Ludwigshaven, its twin-port across the river, are considerable industries; together these cities have a population of nearly 400,000 people.

Where the Rhine turns under the edge of the Taunus, it receives its tributary the Main, and at the junction is Mainz, another river-port and industrial centre.

The Rhine Terrace-lands.—On either side of the flood-plain rise the terrace-lands, formed of older deposits of sands and gravels now situated above 20 feet above the river. They are dry and generally infertile, and in parts there are still great pine-woods. At some points, however, cities have grown up: Mulhouse, in the extreme south where the 111 and the Rh6ne-Rhine Canal enter this region, has important textile industries, and so has Colmar, close to the 111 farther down its course ; between the two towns mines are driven through the surface to reach potash and other salts in the deeper strata of the valley, and the chemicals obtained from these salts aid chemical and dye works connected with the textile industries of the towns.

On the right-bank terrace is Karlsruhe, where a mediaeval castle, guarding routes along and across the valley, aided the growth of a town which has now become a modern commercial and industrial city.

The Foothills and Marginal Plateaus.—Behind these past and present river deposits rise areas formed of sedimentary rock of Tertiary or even older date. The faulting which produced the rift was complicated, and there are large areas which have been let down half-way, as it were, and lie between the lowest parts

EUROPE: THE REGIONS

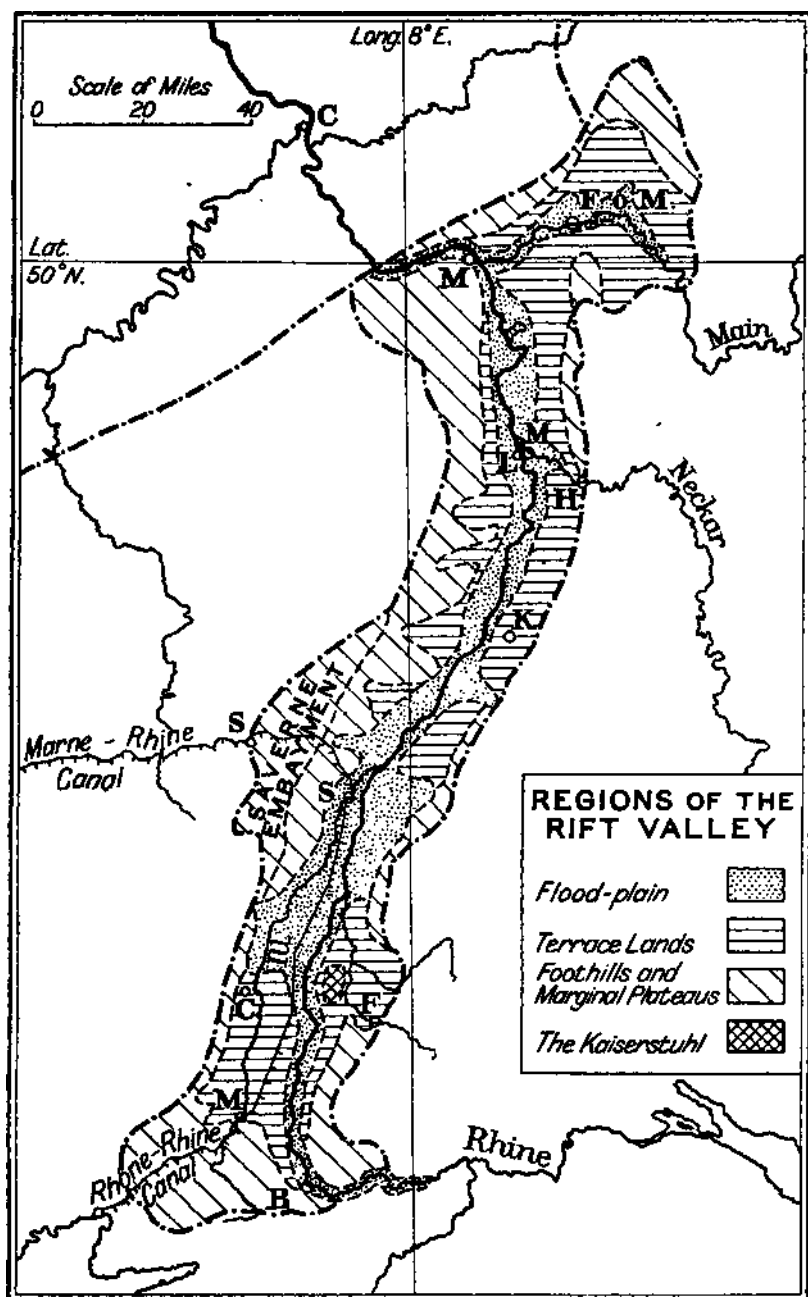


FIG. 46.—REGIONS OF THE RHINE RIFT-VALLEY.

of the valley and the scarp-lands beyond it. Such an area is the Saverne embayment, west of Strasbourg ; it is named after a small town in a side valley through which passes the Marne-Rhine Canal, as well as railway and road.

The Rift-valley in general has a relatively low rainfall and much sunshine, and because of its southerly latitude as well as its low and sheltered position it is the warmest part of central Europe ; its summers may indeed be called hot. Moreover, almost all the foothills and marginal plateau areas were covered with a mantle of loess in the post-glacial period.

Consequently these marginal areas of the Rift-valley are exceptionally fertile. They yield wheat and maize ; fruits, including peaches, apricots and even almonds ; industrial crops of chicory, beet and tobacco ; in addition, there are vineyards

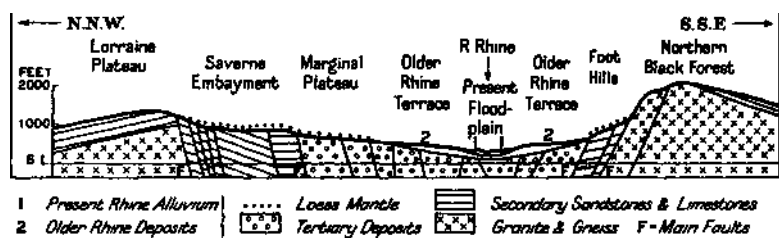


FIG. 47.—SECTION THROUGH THE RHINE RIFT-VALLEY.

which make this the most important wine-producing region of central Europe.

Hence there is a considerable population even in the rural districts, and there are also a number of important cities, particularly where routes enter the valley, e.g. Freiburg and Heidelberg ; Frankfurt-on-Main is at an important nodal position at the north-eastern corner of the Rift-valley where traffic from north to south crosses the Main ; it is the chief commercial, financial and industrial centre in the south-west part of Germany.

The Kaiserstuhl.—Overlooking the Rhine near Freiburg stands a small, fairly flat-topped plateau rising about 1,000 feet ; it is the remains of a great volcanic mass of Tertiary date, called the Kaiserstuhl—the Emperor's Chair. The lava has weathered to fertile soil, and even the steep slopes are terraced for vines.

Thus the Rhine Rift-valley, as shown in Fig. 21, is a lowland sub-region within the Central Uplands.

East Rhine Scarp-lands.—It appears that as a result of the Alpine thrust towards the north-west the whole area now comprising the Rhine Rift-valley and its bordering East and West Scarp-lands was bent up into a dome-like form, the highest part being over the present site of the Rift, and the strata dipping down on either side.

The central strip of the dome foundered and formed the great valley, but the bordering uplands remained ; their tilted strata on either side are therefore of similar structure and dip away from the Rift in each case. The section in Fig. 48 shows this arrangement, and the broken lines suggest how the layers once continued to join over the central area. As the dome-like uplift was highest over the southern part of the Rift-valley, the bordering scarp-lands are here highest, and here all the sedimentary strata have been worn away, leaving granites and gneiss to form the uplands of the Black Forest and the Vosges Mountains. Farther to the east and west respectively the sandstones and limestones remain, but have been worn into scarp-lands whose steeper sides look inward while the more gentle slopes dip outwards.

The two wings of this formation differ, however, in several respects, and we will first describe the East Rhine Scarp-lands.

The Black Forest—In addition to the main eastward tilt of the strata of the scarp-lands, there has been a downward warping north of the Black Forest, and consequently the granites and gneiss of the highest part of that area dip down beneath a cover of Bunter sandstone which forms the surface of the lower and northern part of the Black Forest.

The granitic masses in the south have weathered into rounded heights, such as the Feldberg, which reaches nearly five thousand feet. The rainfall is, of course, considerable, and as the tree-line is at about 4,000 feet, the highest parts tend to be moors, heaths or rough grazing-grounds ; cattle are sent up to them when the snow melts in May and remain till about October, and the chief product from these summer pastures is cheese.

Lower than these highest parts in the south-west, and covering much of the sandstone area of the rest of the region, are great forests of spruce and fir, to the distant appearance of which the name Black Forest is due. Although in the valleys there

is some cultivation of oats, rye and potatoes, and there has been some plantation of cherry and edible chestnut trees, the main resource of the Black Forest is the timber, either exported as such or used as the material for the carved products of domestic industry or as fuel for glass-making. In summer many tourists visit the region, but on the whole it is very scantily populated.

Odenwald and Spessart—North of the Black Forest, the Bunter sandstone dips down below the limestones and marls which form the surface of the scarp-lands east of Karlsruhe, but it rises again still farther north and north-east; here, because of its relatively greater resistance and granitic outcrops, it forms the uplands of the Odenwald and Spessart. These are rather like the Black Forest on a small scale, but they do not rise above the tree-line, the forest-cover consists mainly of oak and beech and there are wider areas of cultivation, although most of the

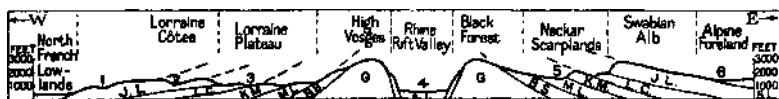


FIG. 48.—SECTION THROUGH RHINE SCARP-LANDS.

Note.—The section is drawn from west to east, south of the latitude of Strasbourg, to Tülm on the Danube. The figures 1, 2, 3, 4, 5 and 6, indicate the valleys of the Marne, Meuse, Mosel, Rhine, Neckar and Danube. The strata are indicated by the following initials: A.T. = Alluvium and Tertiary deposits in the Rhine valley; J.L. = Jurassic Limestone with interbedded clays; L.O. = Lias Olays with some limestones, etc.; K.M. = Keuper Marls and Sands; M.L. = Muschelkalk Limestone; B.S. = Bunter Sandstones; G. = Granite, Gneiss, etc., of the Vosges and Black Forest.

country is mainly dependent upon forestry. They are essentially one region, though separated by the valley of the Main, which cuts right across the upland, while the Neckar similarly cuts through the southern part of the Odenwald,

The Neckar-Main Scarp-lands.—The upper courses of these rivers drain country which they have etched out of the layers of Muschelkalk limestone, Keuper sandstones and marls, and Lias clays, marls and weak limestones. In general, the marls and limestones have been worn down to plateaus at an elevation of about 1,000 feet, above which the more resistant sandstones stand with scarps rising another 500 or 700 feet. The climate varies according to altitude, and the lower lands grow wheat and fruit, even the vine in the valleys; in the inner part of the Main basin the best hops in the world are claimed to grow. The higher sandstone scarp-lands, however, are less fertile; they bear extensive woodlands with both deciduous and coniferous trees.

The Swabian and Franconian Alb.—The easternmost part of the scarp-lands is formed by the massive strata of resistant Jurassic limestone which overlook the Neckar-Main area from heights reaching over 8,000 feet above sea-level in the western or Swabian part and rather less in the eastern or Franconian part. The word "Alb" has the same meaning as "Alp," i.e. summer pasture, and the higher parts of this region, bare and bleak, still deserve the name, though where the region is lower towards the Danube farming is more remunerative. Yet as a whole this region is relatively unproductive, and the population is scanty.

In the north, the Franconian Alb is faulted down eastward, and between it and the Bohemian Massif is an extension of the Main region.

Routes and Cities.—The lower parts of the Neckar-Main Scarp-lands have a considerable population dependent upon agriculture, and there are several large cities on routes which lead through the region. One such line of communication cuts across the south-west portion from Karlsruhe in the Rift-valley, through the Kraichgau ("Kra." in Fig. 43), the hollow between the Black Forest and Odenwald, crosses the Neckar by Stuttgart and continues towards Ulm, the head of navigation on the Danube; Stuttgart is now a city of over 400,000 inhabitants.

The other important route is in the east of the region: it comes from northern Germany by the head-streams of the Weser to the upper course of the Main, which it crosses at Bamberg. Then it proceeds southwards underneath the heights of the Franconian Alb as far as Nurnberg (Nuremberg), and thence three routes diverge. One goes south-east by a small valley through the escarpment to the Danube above Regensburg, and by this route the small "Ludwig's Canal" joined the Main system to the Danubian system of waterways; its course is now followed by the new and important Rhine-Main-Danube Canal, which allows through traffic by water across the whole of Germany from the north-west to the south-east.

Two other routes lead more directly southward from Nuremberg through valleys of the Alb, to cross the Danube to Munich and Augsburg respectively; thence they enter the Alpine region, make use of the Brenner Pass, and so reach Venice and the Mediterranean. From the time when traffic used these routes

to bring spices, silks and precious stones and metals from the East, the cities on these roads have been famous ; in Nuremberg is found some of the finest architecture of the Middle Ages, together with modern business houses and factories, for it is now an industrial centre with 400,000 people.

The West Rhine Scarp-lands.—This sub-region differs from its eastern counterpart in two important respects. In the first place, it is farther from the Alps, and consequently the Jurassic limestone strata have not been uplifted to any great height; indeed, they dip westward into the great structural basin centred upon Paris.

In the second place, the build is complicated where the region impinges upon the southern tip of the Rhine Plateau ; here, overlooked by the Hunsrück, is an area which makes a transition between the plateau and the scarp-lands. Like the plateau, it is formed by a mass of ancient and relatively resistant rock, but it has not been uplifted to the same extent, and its dissection has resulted in a hilly rather than a high plateau type of country ; it may be called the *Palatinate Hill-land and the Saar Basin*. This region is economically important because in its south-western part, the Saar Basin, are preserved Coal Measures which have given rise to the Saar coalfield. With the aid of this coal, iron ores from the Lorraine deposits farther west are worked and an iron and steel industry has developed.

The remaining parts of the West Rhine Scarp-lands show a broad resemblance to those east of the Rift-valley.

The Vosges Mountains are similar to the Black Forest, particularly in the higher portions, but the east-facing slopes, in Alsace, are relatively dry and sunny and have more cultivation ; also in the lower parts of the valleys, both on this eastern Alsatian side and also on the western, or Lorraine side, are villages and small towns where a small, old-established woollen and linen industry has persisted and led to a more important cotton industry, aided by the water-power of the rapid streams.

North of the mountainous *High Vosges* is the hollow of the *Low Vosges*, still partly forested, while farther north and north-east rises the *Hardt Upland* corresponding to the Odenwald, though without granitic outcrops.

The *Lorraine Plateau* is situated west of the Vosges, the Hardt and the Saar Basin. Here are the same rocks as in the Neckar-Main Scarp-lands, with Muschelkalk giving good soils for

cereal growing, Keuper marls having rich pastures and Lias clays more difficult to work.

These strata in France, however, are at a generally lower elevation than those in Germany, and have not been worn into such marked relief, though the Lias clays have been cut into a rather deep valley belt by the Moselle and its tributaries, the rivers which drain nearly all the Lorraine Plateau.

This valley belt, cut into the Lias clay by the Moselle, lies under the scarp of the Jurassic limestone region which is situated immediately to the west (see Fig. 44), and at the junction of the Lias and Jurassic strata are rocks in which occur iron ore known as minette. The minette ore is mined around the town of Nancy, in and near the Moselle valley, and iron and steel works have grown up in this neighbourhood.

Farther north, on the edge of the Moselle valley, is the fortress of Metz, important because Lorraine has for long been debatable ground between France and Germany.

The Jurassic limestone region which is situated to the west is perhaps most conveniently termed the *Cotes de Lorraine*, for in the east where it is highest the edges of its scarp overlooking the Moselle are known as the *Cotes de Moselle*, and farther west it is again deeply cut by the Meuse, and the resultant hill-slopes are called the *Cotes de Meuse*; overlooking this Meuse valley is the fortress of Verdun. In the south part of the limestone belt the drainage is not to the Rhine, but to the Seine, whose tributaries, especially the Marne, have also cut deep valleys.

The rainfall is fairly heavy on the higher parts of the limestone plateau, which, like the Ardenne, is on the side of the Central Uplands facing the Atlantic winds. The highest areas are much wooded, while the rest of the plateau is rather poor agricultural-country.

The whole region is not an unbroken plateau, for between the upper and lower limestones are clays which outcrop in a belt running longitudinally; this clay-belt has been worn to a relative hollow, and part of it, known as the Woevre (Woe. in Fig. 43), is naturally marshy and even yet has small lakes.

The minette iron ore which is situated at the base of the Jurassic strata is reached in two districts by mining through the rocks which form the edge of the escarpment; one is in the "Briey basin," north-west of Metz, whence the ore is sent

in part to Germany for working, and the other is in the " Longwy basin " at the northern part of the scarp. Here the Jurassic escarpment faces north and almost coincides with the boundary between France on the one side and Luxembourg and Belgium on the other. The iron ore is utilized in all three countries (see Fig. 79 in Chapter XIX); it is of most value to France and Luxembourg and forms an important part of the basis of the economic life of the latter small State.

The western margin of the limestone belt rises fairly definitely from the clays of the North French Lowland which succeeds it to the west, but in one part there is, as it were, a bastion of uplands projecting from the main area. This is the Argonne Forest region, where an admixture of sand with the clay has enabled the stratum to resist erosion, and wooded heights of about 1,000 feet mark the sharpest contrast between the Central Uplands and the North French Lowland.

South of the Marne the limestone belt rises to an area whose escarpment forms the high Plateau of Langres ; this links the Central Uplands of Europe to the Central Plateau of France.

The Weser-Saale Hill Country.—Most of this area is drained by the upper Weser and its tributaries, and much of the rest by the Saale tributary of the Elbe ; for this reason, and because it is very uneven in its relief, a convenient name is the Weser-Saale Hill Country.

The Harz.—One of the most striking features as seen on a relief map is the upstanding mass of the Harz Mountains. This is a typical horst, markedly fault-edged on the north-west, south-west and north-east sides, though its surface descends more gradually towards the south-east. The " Upper Harz " in the north-west reaches over 3,500 feet and is almost completely covered with dark masses of spruce forest, but the " Lower Harz " in the south-east has deciduous woods and also many clearings for agriculture and small settlements. A little mining of copper is almost the only survival of past varied and important mineral industries.

In the *Harz Foreland*, to the north-east and south-east of the massif, potash salts are obtained, which aid chemical works such as those at Stassfurt situated in the neighbouring lowlands near the Elbe ; also, just within the upland region south of Brunswick, there are deposits of high-grade iron ore which have recently been utilized.

The Thuringian Forest.—Very similar to the Harz is the Thuringian Forest; here the main faults which bound it run in a north-west to south-east direction and give it a long and relatively narrow shape with a fairly flat top, reaching over **3,000** feet.

The Weser Hills and Teutoburger Wald.—Almost the same general direction is shown by the two lines of hill country which project north-westward far into the North Sea Lowlands. They are formed of sedimentary rocks of Secondary Age, folded and faulted, but only to a moderate elevation, and the "Wald" or "Forest" has mostly given place to farming.

The Rhon and Vogelsberg.—In the south of the Weser Hill Country rise two great volcanic masses, the Rhon and the Vogelsberg; since they reach elevations of about 3,000 feet, their higher parts are moorland or forest. Other wooded volcanic heights lie on either side of the Fulda tributary of the Weser.

The Fulda Valley offers a useful means of communication from the Rhine Rift-valley to the North German Plain, and this relatively low and fertile country is rather like that of the valleys of the Main and Neckar.

The Thuringian Basin.—Farther east, between the Harz and the Thuringian Forest, is an important area, drained by the Saale. It is formed of the same strata as the Rhine Scarp-lands, bent downward into a syncline forming an oval-shaped basin between the surrounding heights. The outcropping strata have been etched out by the tributaries of the Saale to form a series of low scarps, and the basin as a whole resembles the Neckar-Main Scarp-lands on a smaller scale; it is a well-developed region of productive agriculture.

The Bohemian Massif.—The area drained mainly by the upper Elbe river system may be thought of as largely formed of ancient rock, including granite, gneiss and schists, faulted in two main directions: south-east to north-west, and south-west to north-east (see Fig. 50). Along the faults, blocks have been raised or lowered to produce four main regions:

(i) A central area, sometimes known as the "Bohemian Diamond," of moderate elevation on its south-east side, but lowered towards the north; here it is bounded by the uplifted edges of (ii) the Sudetes Uplands on the north-east, and (iii) the Saxon Uplands on the north-west, while another faulted and

raised area, (iv) the Bohemian and Bavarian Forest Uplands, is the boundary on the south-west.¹

The Bohemian Diamond.—The southern part of this central region is a plateau of resistant rock ; undulating country rises to rounded heights, where it forms the water-parting (shown by a dotted line on the regional map) between the Elbe (known in Czechoslovakia as the Labe), which drains Bohemia, and the Morava, which flows southward to the Danube and drains Moravia.

Most of this Bohemian-Moravian Plateau area is drained by the Vltava tributary of the Labe ; it has generally rather poor soils and its agriculture is not very productive. The main development is in the neighbourhood of the River Berounka, which enters the Vltava just above Prague (Praha), the capital of Czechoslovakia. Here the folding of the carboniferous strata has preserved Coal Measures which are mined in several places from near Pilsen (Plzen) to near Prague, and iron and graphite are also obtained in the neighbourhood. Aided by these mineral resources, industries have grown up : at Pilsen iron and steel goods, glass and pottery are produced, and beer is brewed, and at Prague the range of productions includes these commodities, besides chemicals and various textiles.

Prague is also an important trading and financial city ; situated at the head of navigation on the Elbe-Vltava river system, it was the chief market and the seat of Government of the old Kingdom of Bohemia, and it has become the capital of the modern State of Czechoslovakia, and now has nearly a million inhabitants.

Although Prague is almost in the centre of Bohemia, it is (like many cities) at the meeting of two types of country, for here the Vltava descends from the plateau to the North Bohemian Trough. In this northern corner of the Diamond, the ancient rocks dip down and are covered by sedimentary or alluvial deposits, save where there have been out-pourings of volcanic material under the edges of the great faults which separate the Trough from the Saxon and Sudetes Uplands.

Consequently, apart from such volcanic heights, the North

¹ In Germany, the term " Sudetenlander," i.e. Sudetes-lands, has been applied to a much wider area than the Sudetes Uplands ; indeed, the whole of Bohemia, Moravia and Silesia has been included in the term, and the German-speaking people who now live in Bohemia and Moravia are still commonly referred to as Sudetendeutsch, i.e. Sudeten Germans.

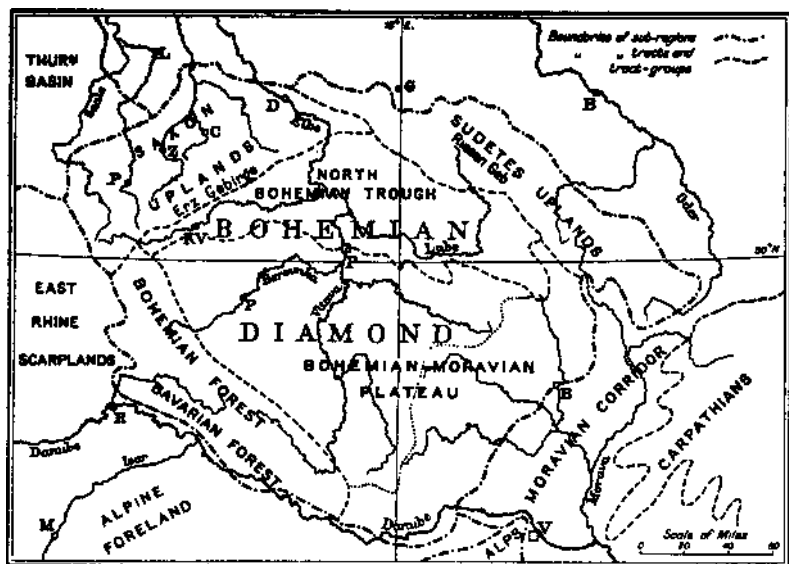


FIG. 49.—REGIONS OF THE BOHEMIAN MASSIF.

Bohemian Trough is lower and warmer than the Bohemian Plateau, its rocks have weathered to fertile soils, and the valleys of the Labe and Eger (or Ohre), which drain it on east and west respectively, are fertile and well populated; beet production and sugar refining are considerable in the Labe area, and fruit and vine growing noteworthy in the Eger valley.

The faulting of the north-western edge has resulted in mineral springs around which have grown up health resorts, such as Karlsbad. Deposits of brown coal or lignite are worked in the Eger valley, and these have aided the carrying on of varied forms of industry, while at the base of the Sudetes Uplands there is cotton manufacturing. Hence there are a number of towns, and because of its agriculture, mining, industries and trade, the North Bohemian Trough is a densely populated region.

The Bohemian and Bavarian Forest Uplands.—The mass of gneiss, granite and schist which forms the south-western part of the Massif has been dislocated along faults, running generally from south-east to north-west. In its south-eastern part, however, it is warped rather than broken, and rises more gradually from the Bohemian Plateau, forming rounded heights of about 4,500 feet above sea-level. The higher parts are almost completely clothed with firs and other coniferous trees, but

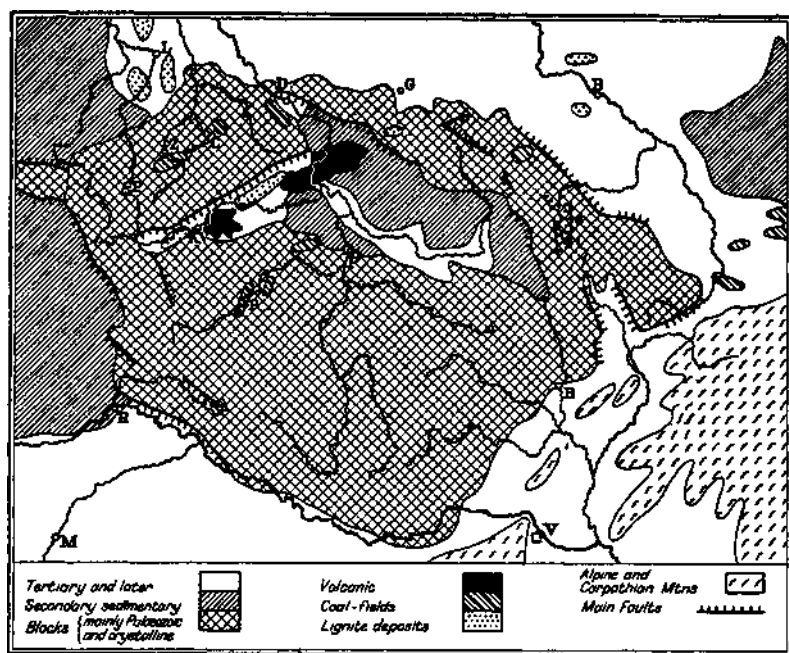


FIG. 50.—STRUCTURE OF THE BOHEMIAN MASSIF.

there are great moors and peat bogs in the broad hollows. A rift-valley separates the smaller Bavarian Forest from the greater Bohemian Forest, and there is thus a double, and almost uninhabited, barrier to communication between the Alpine Foreland and the Bohemian Diamond. In the north-west, the Bohemian Forest is less high, contains small areas of sedimentary rock, which offer more opportunity of settlement, and is more easily crossed.

The Sudetes Uplands.—These have broadly similar structure, relief and vegetation, but have been still more dislocated; consequently, in addition to high areas of crystalline rock, such as the Riesen Gebirge (Giant Mountains) which rise above the tree-line to over 5,000 feet, there are a number of rift-valleys and basins of lower elevation in which sedimentary strata have been preserved. These are farming areas, and also there are two districts which have fuel deposits: one is at the northern edge, south-west of Gorlitz, where lignite is found and utilized to produce power transmitted to the manufacturing districts of Saxony and to the northern plains; the other is the small



FIG. 51.—VIEW IN PRAGUE.

[Czechoslovak Legation,

Note.—The central building is the " Powder Tower," once part of the fortifications enclosing the city; with the growth of Prague, the tower has been surrounded by the modern buildings which form such a striking contrast.

Lower Silesian coalfield south-west of Breslau. In earlier times mineral ores were obtained in the Sudetes Uplands, and there are still small manufacturing districts in which textiles are now the chief products.

At its south-eastern end this upland region forms the most easterly bastion of the Central Uplands ; beyond this the ancient rocks dip below younger deposits in the Moravian corridor.

The Saxon Uplands.—At its north-western end the block of the Sudetes Uplands is separated from that of the Saxon Uplands by an area in which faulting has let down and preserved a mass of sandstone which projects north-westward from the North Bohemian Trough towards Dresden. This sandstone is easily eroded and has been cut into a series of cañon-like valleys by the Elbe and its tributaries. Communication between the Bohemian lands and Germany is carried on by the Elbe, and at the northern end of the gorge of the river has grown up Dresden, a great city of nearly three-quarters of a million people. It has also advantages in developing industries because of the mineral resources of the adjoining Saxon Uplands.

From the northern plain this massif rises gradually southward to the faulted edge which is called the Erz Gebirge (Ore Mountains) because of the occurrence of ores of silver, lead, copper and other minerals (refer back to the section in Fig. 4). These were once mined and led to a relatively close settlement of what was then a forested upland. Now the ores are in large part exhausted (though in a valley of the southern slope a recent development has been the working of radium-producing ores) and the forests which supplied timber for raw material and fuel have been destroyed. Other resources, however, have been utilized : the streams were harnessed first for direct power and later for obtaining electrical energy, and Coal Measures were found in basins extending along a belt of " Variscan " graining some distance up the slope ; consequently in the neighbourhood of this belt several large towns arose, including Plauen, Zwickau and Chemnitz. Little coal now remains in this Saxony coalfield, and the greater part of the electric power on which the industries mainly depend is derived from coal, lignite and water-power outside the area. Clearly, geographical inertia has played an important rôle here and enabled the early metal, wood and textile working to continue, and also transferred inertia has greatly widened the range of production. Moreover, beside

the large-scale manufacturing of the towns, smaller-scale industry has survived in villages and even in the houses of the workers. Consequently, except on the highest parts, the Saxon Uplands region is one of the most densely populated areas of Germany, and indeed of all Europe.

The Jura.—The southern end of the Rhine rift-valley is almost closed by the Jura Upland ; between this and the Black Forest is only the narrow valley of the Rhine above Basel, but between it and the Vosges Mountains is the wider Burgundian Gate, or Gap of Belfort, as it is called from the fortress-town which guards this entry between the Rhine-lands and the Rh6ne-Sa6ne basin.

It is from the Jura Upland that geologists gave to strata appearing here the name of "Jurassic," and geologists frequently illustrate their terms "anticline" and "syncline" from the marked foldings which the limestones have here experienced on

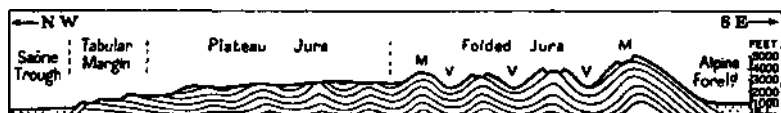


FIG. 52.—DIAGRAMMATIC SECTION THROUGH THE JURA UPLANDS.

the side nearer the Alps, and right across the region in the south (see Figs. 52 and 53). In this region of the "Folded Jura" the structural anticlines correspond with the mountain ridges and the synclines with the longitudinal valleys between them. In Fig. 52 a typical ridge, or "mont," is indicated by M, and a typical longitudinal valley or "val," by V.

The central part of the uplands, however, is of plateau form and is known as the "Plateau Jura." Here the foldings are less marked, and in the past the higher parts of the anticlines were worn down in a process of peneplanation. In the extreme north and north-west are the "Tabular Margins," where the strata have remained little disturbed except when they break down into the valleys of the Rhine and the Sa6ne. The map in Fig. 53 therefore shows three distinct constituent areas of the Jura sub-region.

The Folded Jura.—Considerable parts of the mountain ranges are over 8,000 feet above sea-level, the highest reaching more than 5,000 feet. With heavy precipitation, much of the region

is covered with forests of spruce and silver fir, though above 4,000 feet there are only summer pastures. Forestry and the keeping of cattle are therefore the most widely spread occupations, and Gruyere cheese is a well-known product. In the deep, longitudinal valleys are farming settlements, and for centuries domestic industries have been carried on during the winter. A development of these is the making of watches and clocks; the manufacture is now aided by electricity obtained from the water-power of the streams and is in part organized in large factories; consequently some of the villages have grown into towns, the largest of which is la Chaux-de-Fonds.

Beside these long and fairly wide valleys there are others, the "cluses," which have been worn transversely across the ridges. The cluses are typical narrow limestone cuttings, sometimes with almost vertical sides, and are important as giving a means by which communications are carried on across the great barrier of the Jura Mountains.

The Plateau Jura.—With a general elevation of 2,000-3,000 feet and a dry and infertile soil, this region resembles the Franconian and Swabian Alb; it is mainly a rather bleak pasture-land. In parts, however, glacial deposits from the Alpine ice-sheet give a welcome admixture to the limestone, and woods and the cultivation of barley and oats affords variety to an otherwise monotonous landscape and some additional resources to a scantily populated country.

The Tabular Margins.—This lower area is much more productive and relatively well populated. Indeed, the central part of the north-western margin is such a vine-growing district that it is known as the "Vignoble," while the northern area bordering on the Burgundian Gate and the Rhine valley has industrial development, especially of watch and clock making and of silk manufactures. Besançon, near the exit of the Doubs from this region, is the chief centre of the French horological industry.

The Alpine Foreland.—The Alpine Foreland extends as a unity for about 500 miles in front of the whole northern margin of the Alps, most of it at an elevation of between 1,000 and 2,500 feet above sea-level. Here, between the upraised limestone strata on the north-west, the block of the Bohemian Massif on the north-east and the Alps on the south is a relative hollow,

filled in to a great depth by Tertiary deposits, the "Mollasse," largely sandstones with marls and shales, formed of material worn away from the Alpine strata.

The surface deposits too are mainly of Alpine origin, but of much more recent date, for during the earlier part of the Ice Age, all except the extreme northern angle of the Foreland was covered by the ice and its deposits; the last advance of the ice-sheet, however, with its greater influence on present-day geography, affected only a relatively narrow area nearer to the Alpine margin (see the map in Fig. 53). In post-glacial times the Tertiary sediments of the unglaciated northern angle were largely covered with fertile loess.

The relatively high altitude of the Alpine Foreland is an unfavourable factor, and only the south-western half can be compared with the warmer parts of central Europe. At Geneva, temperatures are very similar to those in the Rhine rift-valley, but at Munich they are almost the same as those of the extreme north-east of Germany (see the table on p. 26). Rainfall is everywhere relatively heavy, reaching about 60 inches on the Alpine margin.

Taking into account climate, relief and surface conditions, we may observe the following constituent regions of the Alpine Foreland: (i) the warmer, south-western portion, which may be termed the *Rhine-Rhone Plateau*, since it is drained by those two rivers; (ii) the *Bavarian Foothills*, the area which was glaciated in the last advance of the ice and now drains to the Danube; (iii) the *Bavarian Plateau*, farther north and earlier glaciated; (iv) the *Northern Danubian Plains* in the angle of that river, and largely loess-covered.

The Rhine-Rhone Plateau is in French territory south-west of Lake Geneva, and is German north-east of Lake Constance, but its greater part constitutes the "Swiss Midland," as the Swiss geographers call this most populated and productive section of their country. Most of the area shows the characteristic morainic scenery with low hills, and its valleys have been fairly deeply cut by post-glacial streams. The hollows once occupied by the terminal tongues of glaciers which emerged from the valleys of the Rhine and Rhone are now filled with the waters of Lakes Constance and Geneva. In the long, narrow trough under the edge of the Jura an earlier glacial extension became filled partly by lakes, e.g. Lake Neuchatel, and partly by the

marshes of the River Aar, now largely reclaimed for farming. The variety in the land-forms and in the soil conditions gives rise to an alternation of fields, meadows and woods, all carefully utilized and supporting a considerable population ; the irrigated meadows give predominance to pastoral work, and on this Foreland Plateau (not in the Alpine valleys) is the main production of the Swiss dairying industry. In favourable situations, e.g. on the south-facing shores of Lakes Geneva and Neuchatel and in the river valleys, wheat and fruit, including the vine, are cultivated.

Moreover, commerce and a considerable amount of industrial work are carried on at nodal points where two sets of routes intersect. In one set are the transverse lines of communication which skirt or cross the Jura to reach the passes through the Alps ; across these run routes along the plateau from southern France to the Rhine and Danubian countries. Geneva is situated at an obvious " gateway " into Switzerland, and in this favourable position it has become the centre of the Swiss manufacture and trade in watches and clocks ; moreover, it has international importance as the seat of the League of Nations, with its many activities in which representatives of most of the nations of the world co-operate. Bern (Berne) in the centre of the Swiss Midland is conveniently placed as the capital; it is situated by the River Aar and on the direct railway route northward from the Simplon Pass. Zurich is at the end of Lake Zurich, which half-blocks the plateau, and through this city passes the route from the St. Gotthard Pass to the Rhine rift-valley; it is regarded as the " intellectual capital " of Switzerland, and has a technical college specially famous for its electrical engineering, for the Swiss have done much to advance science in connexion with the development of the water-power of their country. Both in Zurich and in the smaller towns and villages in the district, water-power is greatly used to carry on the manufacture of silk and other fabrics, chocolate and other foods-tuffs, as well as many forms of metal goods, including machinery.

The Bavarian Foothills.—The irregular relief of this region is due to its covering by the last extension of the Alpine ice-cap,

lakes in the sites of past glaciers, though moors and peat-bogs are common. There are rather poor growths of pine over considerable expanses of the region, the fairly heavy rainfall aids pastoral work rather than cultivation, and on the scanty resources only a small population can obtain a living. At its eastern extremity the region extends into Austria ; here Salzburg, the " salt burgh," situated where the Salzach leaves the Alps, is famous as the birthplace of Mozart, and its concerts attract visitors from many countries.

The Bavarian Plateau.—Not much better favoured than the foothills region is this plateau, which though mainly in the province of Bavaria extends into Wurttemberg on the west and Austria on the east. Here the older morainic material is largely covered by the out-wash gravels and sands from the last ice-sheet. The surface has been cut by glacial and post-glacial streams into a series of terraces, and in the valleys the Alpine-fed rivers bring summer floods and prevent the utilization of the land. On the higher parts there are wide beech forests, and others of pines, spruce and firs. Moors are now being reclaimed for pasture or crops for cattle, but there is little cereal cultivation, mainly of barley for brewing or of rye. Most of the settlements are small and widely scattered, except for two great cities on important routes referred to earlier in this chapter. Augsburg was a Roman settlement on the Lech ; it became great by the trade with Italy, and has still fine buildings dating from that time. Munich is situated where the route crossed the Isar between marsh to the north and forest to the south, and intersected an old " salt road " from Salzburg to Augsburg. Munich has been called the capital of south Germany, for in past centuries it was the seat of the rulers of Bavaria and is still the possessor of museums, picture galleries, opera houses and a great university. In recent times it has developed into the chief commercial city of this part of Europe, and with imported coal and with water-power from the Alps and the Isar numerous industries have grown up, brewing being particularly noted ; it has a population of about three-quarters of a million.

The Northern Danubian Plains.—Here on the almost horizontal, loess-covered sediments of sands and marls, good soils have developed, and the region is favoured by the warmer climate, due to its lower altitude. Cereals, particularly wheat, are an important production, and hops are largely grown ; everywhere

there is cattle-rearing, and the farming supports a moderately dense population.

It may be pointed out that the River Danube, which runs near the northern margin of this region, established its course before the present surface of the country had been developed, and consequently in some parts the river flows through the sediments of this plains region and has a wide and often marshy valley, while in other parts the river is in the adjoining regions of more resistant rocks and has cut a valley which is always narrower and is sometimes almost a gorge ; here, as so often, a river flows athwart the natural regions of the present stage of the earth's evolution.

QUESTIONS

1. Contrast, in as much detail as possible, the upland areas with the river valleys of the Rhine Plateau.

2. " The Rift-Valley of the Rhine is a geographical unit area." How can this statement be reconciled with the differing characteristics of the country comprised within this valley ?

3. Write an essay on the Rhine as an artery of economic life.

4. Describe the country traversed by the Marne-Rhine canal, and assess the value of this canal.

5. Estimate the economic importance of the areas comprising the " Bohemian Diamond " within the Bohemian Forest, Saxon and Sudetes Uplands.

6. Account for the fact that Saxony is one of the most densely populated areas of Europe.

7. Make a regional study of the Jura Uplands.

8. Write comparative notes on the situation and development of any three cities in Southern Germany.

9. Describe and account for the economic development of the Swiss portion of the Alpine Foreland.

CHAPTER XI

THE ALPINE LANDS

General Characteristics.—With a length of some 700 miles, the great curve of the Alpine region extends from the Mediterranean Sea across the southern part of all central Europe, and it adjoins regions which are of different physical character and inhabited by people of varying types. Hence its valleys have been penetrated and occupied by men of several nationalities, and the Alpine Lands are now shared by several States : France, Switzerland, Germany, Italy and Yugoslavia.

Structure.—As was explained in Chapter I, the Alps constitute the highest and most extensive system of folded mountains of Europe. Here the strata were thrust north-westward and northward against the massifs of the Central Plateau of France and the uplands of central Europe until nappes were piled on one another to a height of miles above the present mountains ; strata which had their roots in the southern part of the Alpine region were even pushed across to the northern side (refer back to Fig. 5).

The lower rocks were metamorphosed into crystalline form, and where the upheavals were greatest, that is, along the middle part of the great curve, the overlying sedimentary strata were worn away. Consequently the rocks of the central zone of the " High Alps " (compare Figs. 5 and 53) are mainly of crystalline structure, while the lower margins, or " Pre-Alps," are formed largely either of limestone of Secondary Age, or of the Tertiary sands, marls and clays known as Flysch. The southern zone of sedimentary rocks is missing, however, in part of the western Alps where the crystalline rocks descend steeply to the western side of the North Italian Plain.

In the central zone, besides the metamorphosed and crystalline nappes are areas of older rocks, including masses which are like those of central Europe and show the earlier Hercynian folding. Also in the disturbances in the Alpine region igneous rocks such as porphyry were produced, though recent volcanic outpourings have no important part in the build of this region. These

contrasted elements in the structure considerably influence the present-day geography.

Relief.—In the Alps, however, altitudes are so great that differences of relief are even more important than those of the rock material, and perhaps the best way to appreciate the form of the relief is to study the pattern of the river valleys. Near the outer, i.e. the western and northern, margin of the great curve of the region is a series of almost continuous longitudinal valleys, which accompany the junction between the High Alps and the Pre-Alps along much of its extent (see Fig. 53). This line is well marked in the case of the valley of the River Isère, above Grenoble, and of its tributary the Drac, which meets it at that town ; to the north-east, after a break, it is again clearly seen in the back-to-back valleys of the upper Rhone and the Vorder Rhine ; after another break it is continued by the longitudinal section of the Inn above and below Innsbruck, and by the longitudinal courses of the Salzach and the Enns. Most of these rivers have their origin in the High Alps, and all of them turn from a longitudinal course outward and cut the North-western and North-eastern Pre-Alps into sections which have their own local names. Some of the valleys, too, have such marked individuality and importance that they have long been regarded as regional units and given special names ; e.g. the longitudinal part of the Isère valley is known as the Gresivaudan, and that of the Salzach as the Pinzgau.

Near the inner margin of the Alps which overlooks the North Italian Plain, marked longitudinal valleys are found only in the eastern part. Here are two series, each of less extent than those of the outer margin. One set forms the northern part of the Italian lake region, where, in the Val Tellina, the River Adda flows westward to join Lake Como, whilst farther east are the shorter longitudinal valleys of the Brenta and Piave. The other set lies farther north-east and is within the Eastern High Alps ; it is formed of the Val Pusteria, which is drained both westward by the Isarco to the Adige river system, and eastward by the Drava ; where the Drava leaves the High Alps to cross the Eastern Marginal Pre-Alps, it flows through a broad and deep depression known as the Klagenfurt basin.

While all these series of longitudinal valleys aid movement between different parts of the Alpine region, several transverse valleys are of great importance as permitting communication

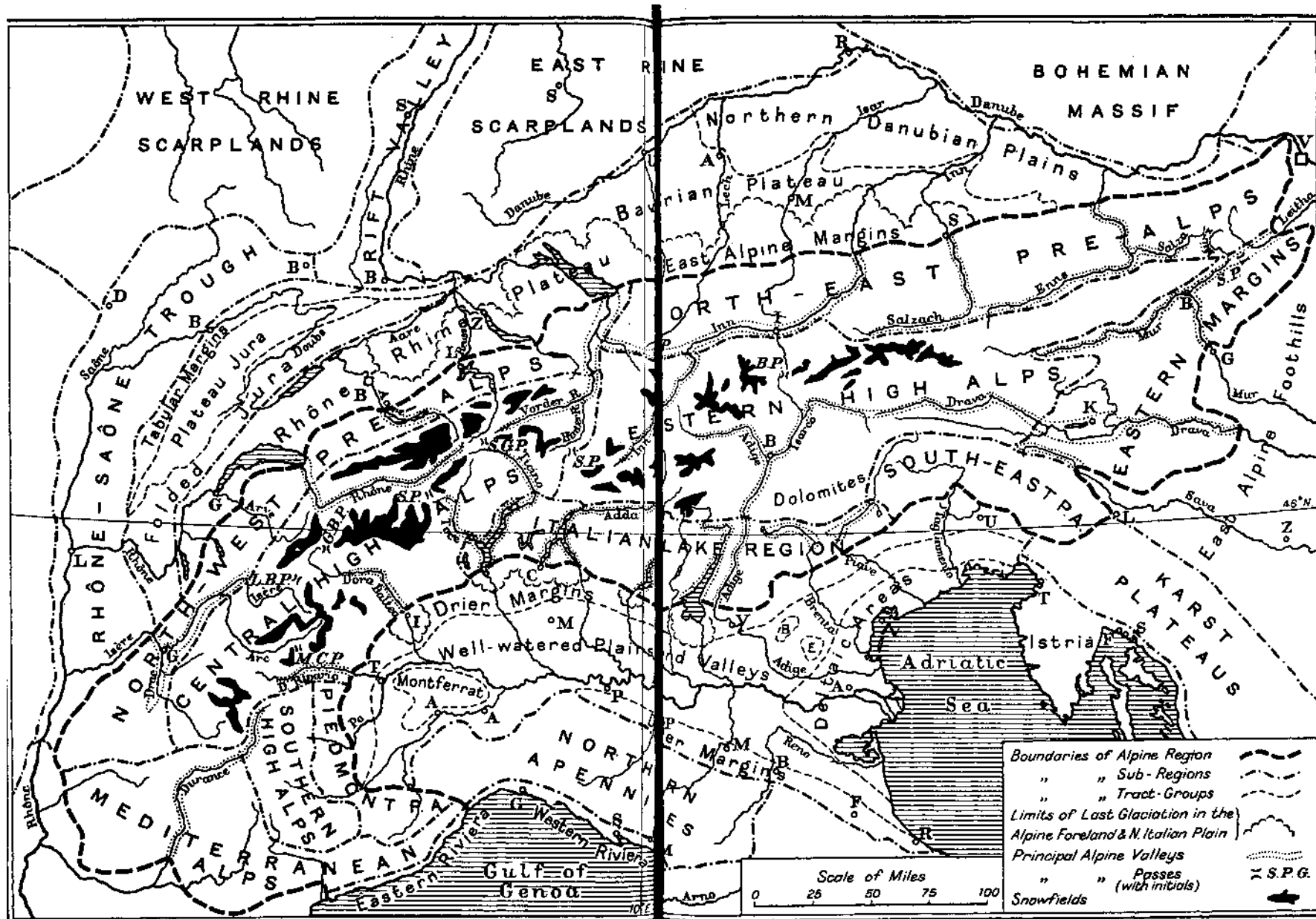


FIG. 53.—REGIONS OF THE ALPES AND NEIGHBOURING LANDS.

Note.—To avoid ambiguity the term "Bavarian Foothills" is used in the text instead of "East Alpine Margins," as printed above south of the Bavarian Plateau.

across the mountain barrier. In the west, from the Italian plain near Turin, the valley of the Dora Riparia leads to the Mont Cenis Pass, and thence to the Arc tributary of the Isère, while the valley of the Dora Baltea leads by the Little St. Bernard Pass to the Upper Isere and by the Great St. Bernard Pass to the Rh6ne. From Lake Maggiore there is access by the Toce valley to the Simplon Pass, and thence to the Rh6ne, and by the Ticino valley to the St. Gotthard Pass, and thence to the Reuss. From Lake Como a northward route leads over the Splugen Pass to the Hinter Rhine. In the Eastern Alps beyond the Splugen, the most marked transverse route is up the Adige valley as far as Bolzano, thence continuing northward up the Isarco tributary to the Brenner Pass, and across this to a tributary of the Inn, which meets the main river at Innsbruck.

In the broad mass of the Eastern Alps there are also several large oblique valley-lines, with a general south-west to north-east direction—for example, the upper Inn flows through the Engadine valley. In the Eastern Margins part of the Pre-Alps the upper Mur flows from south-west to north-east till it turns at Bruck, while beyond this town the same line is followed, though in the reverse direction, by its tributary the Murz; beyond the Murz the line continues across the Semmering Pass to the Leitha tributary of the Danube.

The reasons for the courses of the Alpine valleys can be explained only in part by the present differences of the rock composition; especially in the High Alps their origin may lie too far back in the geological history for its discovery. The form of the valleys, however, and much of their human significance are due to relatively recent glaciation, of which some account will be given later.

Climate and Vegetation.—It is evident that the deeply cut valleys must have climatic conditions very different from those of the intervening highland masses, and these again differ from one another because of their relative elevations; the greater part of the marginal Pre-Alps, for example, is clothed with forests or pastures, while in the central High Alps wide areas rise above the tree line and even to the levels of perpetual snow.

There is, indeed, in the Alpine region a zonal arrangement of climates. The culminating heights which rise above about 10,000 feet form the *snow zone*, and bear no vegetation. The mountain slopes which are below this level, but above 5,000 or

6,000 feet, are in the *alp zone*, snow covered for more than half the year, and with such a short period when vegetable growth is possible that trees cannot exist; low herbaceous plants grow in great abundance, however, flowering brightly in the earlier part of the summer and constituting the valuable alpine pastures.

Below this level the higher valleys and the upper slopes of the lower ones are in the *forest zone*, which extends downwards to about 2,500 or 3,000 feet; in the higher parts of the forest zone only conifers are found, the spruce and larch being common, but at the lower levels there are mixed growths of coniferous and deciduous trees, the beech often giving a lighter colour to the woods in the west, and the oak being more plentiful in the east. Deforestation has, however, taken place over considerable areas, and the trees have given place to pastures.

The lowest valleys which have been cut below about 2,500 feet are in the *cultivation zone*; here fruit trees have been planted and cereals and vegetables are grown. At these lower levels account must be taken of another factor than altitude, for the Alpine Lands have such a wide extent that the different parts adjoin regions with markedly different climates; hence from these contrasting regions, winds of different character penetrate into the valleys and modify their climatic conditions.

With these differences of climate and vegetation necessarily correspond differences in the ways of life of the inhabitants.

Regional Divisions.—Thus, determining the general character of the various parts of the Alpine region are five main factors: the altitude; the composition of the rocks; the situation; the climate; and the utilization by man of the natural resources. Taking all these into account, the constituent sub-regions have been demarcated as shown in Fig. 53, and will now be briefly described in turn.

The High Alps.—By contrast with the marginal Pre-Alps, all this medial belt is "high," but the culminating area is the Central Alpine sub-region between the Splügen Pass marking off the Eastern High Alps and the valley of the Dora Riparia beyond which are the Southern High Alps.

The Central High Alps.—The two factors of great elevation and generally crystalline structure determine much of the character of this region, yet here, as throughout the Alpine Lands, it is the valleys, often floored with recent deposits, that count for most in the human geography* The forms and the

resources of these valleys, and also the scenery of the mountains, owe much to the glaciation of the Ice Age. Deep corries, or cirques, with steep walls, were worn out of the uppermost parts of the pre-existing valleys, and by the development of these cirques mountain masses were cut back into irregular sharp-edged



[French Railways—National Tourist Office.]

FIG. 54.—VIEW OF THE MER DE GLACE.

Sote.—The Mer de Glace is the name given to the lowest part of the glacier which descends north-eastward from the extensive massif of Mt. Blanc ; in this part the tongue of ice occupies a valley to a width of half a mile, and a length of four miles. Above the part shown in the picture the icefield is much wider, and covers the slopes of the massif which rises to the peak of Mt. Blanc, about six miles to the right of the view here shown.

ridges, and the ridges were reduced to jagged pyramids, " horns " or even " needles." The valleys were scoured into troughs of U-shaped section, and in parts were deepened to basins separated by rock-bars or by morainic deposits ; main valleys were worn more deeply than were the side valleys, which were left " hanging " after the ice had disappeared and the form of the valley bottoms had become visible. Much of the magnificent

scenery of the mountains and of the varied charm of the valleys, enhanced by small lakes in many of the basins, is due to past glaciation.

On the greatest heights the Ice Age has remained into the present: on vast snowfields the ice still forms and works its way as glaciers downward into many of the higher valleys. Thus the culminating point of the whole Alpine Highland, the peak of Mont Blanc, towers to over 15,700 feet, and from the icefield of the north-east side of its huge massif the "Mer de Glace" works down to the upper Rhone valley (see Fig. 54).

Few climbers scale the great heights; but to see these, and to enjoy the beauties of the whole region, many thousands of tourists annually visit the High Alps. They are accommodated in hotels built in the upper parts of the valleys, and in the lower parts small towns have arisen which directly or indirectly depend upon the "tourist industry."

Because the Central High Alps are situated between the Mediterranean Lands and north-western Europe, and because here the highland barrier is narrowest, great trade-routes have for many centuries taken advantage of the passes deepened and smoothed by the ice. The modern railways, however, though they use the same valleys, have avoided the steepest climbs by tunnelling beneath the water-partings near the passes.

Thus the most direct railway route is that which goes northward up the Toce valley, but instead of crossing the Simplon Pass, over which the road has to climb to 6,600 feet, tunnels beneath the adjoining ridge for $12\frac{1}{4}$ miles, and rises only to 2,300 feet; this route, after descending into the Rhone valley, further shortens the distance by traversing the Bernese Alps through the Lotschberg tunnel, 9 miles long, to Berne (refer back to Fig. 20). Almost rivalling this crossing in importance, the St. Gotthard route has a shorter tunnel of nearly 10 miles long, but climbs to about 3,800 feet, the road over the pass being nearly 7,000 feet above sea-level. The third of the railways over the Central High Alps has less traffic, for it leads only from the Italian Plain to the middle Rhone valley; it is the Mt. Cenis route and has the additional handicap of a greater climb: the tunnel summit is about 4,400 feet, and the pass, some miles away, is at 6,800 feet.

The railways now use the water-power which is abundantly afforded by the streams fed by the heavy precipitation and melt-

ing snows. Where glaciation has caused a break in the normal smoothed valley profile, as at the exit of the hanging valleys or at the rock-bars in the course of the larger streams, power plants have been erected for the production of electricity; cables transmit the current for use within the Alpine region and, to an even greater extent, for transmission to the neighbouring regions of France, Switzerland, Germany and Italy.

While the transverse Alpine valleys leading to the passes are of great importance as lines of communication, the broader longitudinal valleys are the more suited to human occupation. In the Central High Alps, however, only those of the upper Rhone and the Vorder Rhine have any considerable amount of cultivation or settlement of any size ; most of the valleys are of the higher kind, in which the people live in small villages and are mainly dependent upon pastoral work.

The mode of life of the people is influenced to an extraordinary degree by the altitude of their environment. Their houses are necessarily built in the lower parts of the valleys, where alone the cold of winter can be supported, and where small patches of ground can yield crops, mainly of quickly ripening barley and vegetables, such as potatoes and beans. These village settlements are generally on the " sunny side " of the valleys, for little light and heat fall upon the " shadow side."

The main resource of the people is their herds of cattle, and smaller numbers of sheep and goats. These animals must be fed upon the higher pastures, and consequently systems of transhumance, i.e. seasonal migrations of animals and man, have developed, the particular times and methods varying according to local conditions. A common practice is that in early summer almost the whole population, with the beasts, leave the village and go up to the meadows of the summer alp, the most productive frequently being irrigated glacial terraces.

On these pastures are what appear to be other villages ; they are groups of small summer chalets, which shelter both people and animals. Here is made the cheese which is sent down the valleys for use in winter, or for export; here, too, quantities of hay are gathered for the winter feed of the cattle. As the summer advances, the animals are taken to the high pastures, where they are allowed to graze, accompanied by women or children, while the men reap the hay meadows or the cultivated fields in the lower parts of the valleys. With the coming of winter, the

return migration takes place : the alps are abandoned and the villages are repopulated ; for several months the beasts are shut in their byres and the people largely restricted to their houses.

The winter is a time of almost complete isolation, and until recently, even in summer these interior valleys were largely out of touch with the rest of the world.

Although in the Central High Alps water-power is abundant,



[Swiss Federal Railways.

FIG. 55.—VIEW OF AN ALPINE PASTURE.

Note.—The richer pastures are those, below the "alp zone," made by clearing the forest growth ; this view shows such a pasture area with trees remaining around it. It is on an exceptionally steep slope used, not for grazing, but for growing hay, which is carried down in nets and stored in barns for winter fodder.

minerals are scarce, and in the secluded valleys there has been very little industrial development. Exceptions occur in the Dora Baltea valley and in the valley of the Romanche tributary of the Drac, where there are metallurgical and chemical works based mainly upon the utilization of the local water-power, while anthracite is obtained from a short distance ; also in the relatively broad longitudinal valley of the upper Rhone there are some industrial establishments.

Taken as a whole, however, the Central High Alpine region is one where the natural resources, apart from the attraction

which the scenery has for visitors, can support very few people.

The Southern High Alps.—The structure of this region is similar to that of the Central High Alps, but the altitudes are less, there are no areas of perpetual snow, and the scenery is less attractive ; the climate is drier and the pastures and forests are poorer. Although the passes are lower, they are off the main currents for traffic, and the region is less populated.

The Eastern High Alps.—While in general the characteristic features of the Central High Alps are continued on the eastern side of the Splügen dividing-line, there are certain changes to be observed, which become more marked as the region is traced farther eastwards. There is less precipitation and the altitudes are not as great; consequently there are smaller glaciers to-day and the land-forms show less action of ice in the past.

Moreover, the Alpine barrier does not here lie so directly athwart the great trade-routes as farther west. Hence, in spite of a number of broad valleys and low passes, the Eastern High Alps are crossed only by one route of capital importance, viz. that of the Brenner Pass, which is so low (4,500 feet) that the railway crosses it without a tunnel.

Another feature of the eastern part of the High Alps is that crystalline rocks do not form so large a proportion of the region, and considerable areas are composed of limestone. In some parts, the almost vertical cliffs which frequently characterize high limestone districts provide scenery rivalling that of the glaciated mountains ; this is exemplified most strikingly in the Dolomites area, situated east of the Adige valley below Bolzano (Bozen). Here, upon a great platform of porphyritic rock, forming upland pastures, lie masses of dolomite (magnesian limestone) which reach even into the zone of perpetual snow ; what specially distinguishes them is the way in which they have weathered into the most fantastic shapes of groups of pinnacles, described even as "cathedral-like," and the brilliant colour given to parts of them by veins of minerals.

As in the more westerly parts of the High Alps, mineralization has not in general much economic significance. The deposits of most importance are in the extreme north-east; here the iron ore has given its name to the Eisenerz Alps between the Enns and the Mur. Industrial development has not proceeded so far in the east as in the west, and in the High Alps region the

water-power has been less utilized ; the greatest plants are those in the Isarco (or Eisack) valley, near Bolzano, which produce electric current for use in textile and other industries in the Adige valley, and to a greater extent for transmission to the Italian Plain. Forestry and pastoral work are the main occupations of the High Alps, and these support an even smaller population in the east than in the west.

The Pre-Alps.—Lower altitude is the one characteristic common to all the Pre-Alp sub-regions ; differences in situation, structure, climate and human occupation are the other factors which have determined their respective natures.

The North-Eastern Pre-Alps.—On its inner side this sub-region includes the series of longitudinal valleys of the Inn, Salzach and Enns, north of which rise massive limestone heights, except where slaty rocks take their place north of the Salzach. This limestone belt consists of wide plateaus, often of the karst type, broken by the broad transverse valleys of the main rivers and the narrow and sometimes gorge-like cuttings of the smaller streams. The outer marginal strip is formed of Flysch, with lesser heights and more open valleys. As the climate of the valleys is similar to that of the Alpine Foreland, to which they open, cultivation is less favoured than pastoral work ; this and forestry are the main resources of the region. Copper is mined in the neighbourhood of the Salzach, and in several parts salt is obtained and water-power is utilized, but there has not been much industrial development. Trade follows the line of the longitudinal valleys, which are connected by the Arlberg Pass with the Rhine valley ; traffic from the Brenner Pass crosses this line at Innsbruck, whence it has several outlets to central Europe.

The North-Western Pre-Alps.—Very similar as regards land-forms and structure are the North-western Pre-Alps, but their aspect gives them a milder climate, and their lower lands therefore have better possibilities of cultivation, the broad valley of the Gresivaudan producing wheat and maize, vine and fruit trees ; pastoral work, too, has become very important. Glaciation has had a considerable influence on the region, and the scenery and lakes in several of the valleys, particularly in Switzerland, have been a factor in the development of many pleasure resorts. The industrialization of the Swiss Plateau and the adjoining part of France has stimulated the utilization

of the water-power and an associated development of manufactures, the latter being greatest in the valleys of the Isère and Drac, on either side of Grenoble. This town is a centre of metallurgical and chemical industries, of cement making, and of glove manufacture ; with nearly 100,000 inhabitants, it is by far the largest town in the Alpine region. The trans-Alpine routes already described, together with the longitudinal valleys, give easy access to all parts of the North-Western Pre-Alps, and help to make it the most densely populated sub-region of the Alps.

The Mediterranean Alps.—This term fitly describes all the Pre-Alpine region drained either directly to the Mediterranean Sea, or by the Durance and smaller tributaries which flow to the lower Rhône in "Mediterranean" France, for the characteristic which distinguishes it from the other marginal Alpine areas is a normal condition of summer drought; this is due to markedly less rainfall combined with the considerable summer heat. The forest-cover is almost lacking, garrigues appear, and there are even areas practically bare of vegetation. Deep canons appear in the limestone districts, and the scenery has a savage aspect uncommon in the Alps. The human geography, too, is exceptional, for, although pastoral work is the main resource, it is concerned with the keeping of sheep instead of cattle. In particularly favoured spots are cultivated vines, almond trees and even olive trees. Relatively very little traffic passes through the region and the total productivity of the land is small; consequently the population is scanty. The site of the settlements illustrates the distinctive character of the region, for they are frequently on the shady side of the valleys to avoid the great heat of the sun in summer.

At the eastern extremity, the immediate coast of the Mediterranean Sea, commonly known as the "Riviera," may conveniently be regarded as a separate sub-region ; its characteristics resemble those of the adjoining coasts of Mediterranean France and the Northern Apennines.

The Piedmont Pre-Alps.—As in the High Alps north of the Dora Riparia, so here the more resistant rocks, in part crystalline, descend directly to the North Italian Plain and longitudinal valleys do not appear. The altitudes are not great, and the uplands have been reduced to a series of ridges separated by the deep valleys of the streams which cross the Piedmont belt to converge upon the plains south of Turin. These valleys prolong

many of the characteristics of the plain into the mountain region, and the people have worked their way into them, continuing their mode of life as far as possible. The water-power of the streams is utilized for the use of Turin and Genoa, and in general the life of the region is closely associated with that of the lower lands of North Italy.

The Italian Lake Region.—After a break from the Dora Riparia to near Lake Maggiore, the Pre-Alps are resumed in the region which may be called the Italian Lake Region from the fact that in it lie a number of large and small lakes, occupying almost a network of transverse and longitudinal valleys. Indeed, the lakes, in the formation of which glaciation has played a large part, were once both more extensive as well as more numerous than they are now, and old lake-bottoms afford valuable areas of pasture or cultivation. The structure is complicated, for crystalline and sedimentary rocks are both found, but the distinguishing character of the region is the co-existence of the valleys and of a climate which combines adequate rain with warmth due to the southerly position and aspect. The climate of the region as a whole is not "Mediterranean," in spite of the fact that the olive grows in favoured spots ; more typical are the plantations of vines in the valleys and on the lake-side terraces, and edible chestnut trees on the lower slopes of the mountains, while the higher parts are largely covered with woods of deciduous trees, especially the beech, or with alpine pastures. The care of the vine and fruit trees and the rearing of cattle are the dominant occupations over most of the region ; in the vicinity of the lakes is a considerable tourist industry ; water-power is utilized at a number of places and the manufacture of textiles has extended into several of the valleys. It should be noted, too, that the three most important routes across the High Alps have their southern entrances in this region. In the richness of its natural endowment and the relative density of its population the Italian Lake sub-region may be compared with its north-western counterpart.

The South-Eastern Pre-Alps.—Here limestone ridges and plateaus are the characteristic features, and this region forms a transition to the karst uplands of the Balkan Peninsula north-east of the Adriatic Sea. Yet though the ground is frequently dry, there is quite a heavy rainfall, and forests alternate with poor pastures. Quicksilver is obtained from Idria, but in

general the region is little developed, and its population is small

- *The Eastern Margins.*—The crystalline structures of the Eastern High Alps become lower in the Eastern Pre-Alps and are cut by the valleys of the Mur, Drava and Sava ; in parts of these valleys, and notably in the Klagenfurt basin, are sedimentary deposits of Tertiary date. The forests of the uplands give timber for the making of paper and other wood products, while pastoral work and farming of the central European type are carried on in the valleys. The iron of the Eisenerz area is used in metallurgical works in the valleys of the Murz and of the upper Mur, where in the Tertiary strata lignite is found ; lead is mined near the Klagenfurt basin, and here, too, are metal works. Communications are relatively easy, and with Vienna on the one side and Trieste on the other, there is a fair amount of through traffic ; hence, with fairly varied resources, the valleys of this sub-region are moderately well populated.

QUESTIONS

1. Give an account of the structure as related to the relief of the Alps.
2. Draw a sketch-map showing the principal Alpine valleys. Comment upon their distribution, and group them into types according to their situation and arrangement.
3. Explain how glaciation has affected (a) the scenery, and (b) the utilization, of the Alps.
4. Show where and why industrial development has penetrated the Alps.
5. Describe the railway routes crossing the High Alps.
6. What reasons may justify the name " Mediterranean " being applied to part of the south-western Alpine Lands ? How may this area be demarcated ?
7. Write an essay on " Pastoral Life in the Alps."
8. Describe the characteristics of the " Italian Lake Region " of the Alpine Lands.
9. Contrast, and account for the differences between, the North-western and South-Eastern Pre-Alps.

THE DANUBIAN LANDS

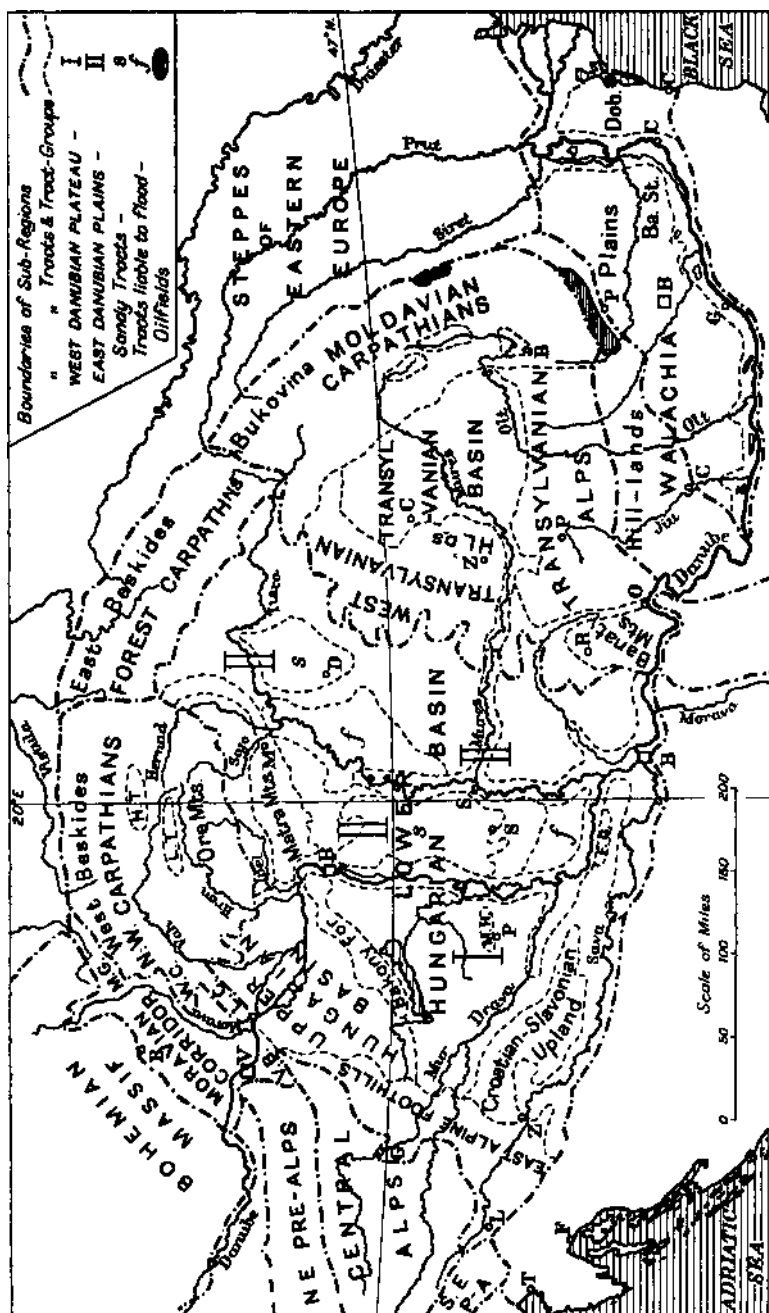
Position and Relief.—At their eastern extremities the Alpine Mountains appear to spread out towards the north-east and the south-east; the North-Eastern Pre-Alps are continued, across the Vienna Basin, into the north-western ranges of the Carpathians, while the South-Eastern Pre-Alps pass directly into the mountains of the Balkan Peninsula.

Between these diverging mountains the Central Alpine structures break down eastward first into a region of hill-country, which may be termed the East Alpine Foothills (see Fig. 56), and then into two great subsidence areas, the Upper Hungarian Basin and the Lower Hungarian Basin.

These Middle Danubian Lowlands are interrupted by higher "islands," such as the Bakony Forest and, continuing the same north-easterly direction across the Danube, the Matra and other mountains, while farther south are the Mecsek Heights ("M.H." in Fig. 56), and the uplands in the Croatian and Slavonian districts between the Drava and Sava. It is convenient to refer collectively to these areas as the Middle Danubian Uplands; they have a complicated structure and in general represent masses of older rock projecting through the relatively recent deposits laid down in the subsidence basins.

The great highlands and uplands of the Carpathian System form three sub-regions: (1) the wide mass of the North-Western Carpathians, of which the outermost ranges are known as the Western Beskides; (2) the much narrower Eastern Beskides or Forest Carpathians; (3) the almost triangular mass of the South-Eastern Carpathians comprising the Moldavian Carpathians on the eastern side, the Transylvanian Alps and Banat Mountains on the southern side, and the West Transylvanian Highlands, including the Bihor (or Bihar) Mountains, on the western side, while between these three highland masses lies the upland Basin of Transylvania.

Finally, the Hill-lands and Plains of Walachia represent a



filled-in subsidence basin between the Transylvanian Alps and the low plateau of Bulgaria south of the lower Danube.

Climate.—The statistics for Budapest given on p. 26 indicate that in this part of Temperate Europe there are hot summers and rather cold winters, while the rainfall is moderate in amount. But the climate, of course, varies within the region, and while Budapest, because of its almost central position and its situation between upland and lowland, has average figures, the highlands have much colder and wetter conditions and the lowlands are generally warmer and drier.

In the eastern part of the lowlands of the Lower Hungarian Basin there is a lack of rain, especially felt in the hot summer ; here aridity shows itself by the occurrence of steppe-like country, known as the Pussta, and even districts of sand-dunes.

To the south and east of the Transylvanian Alps is another area where the rainfall becomes less than is common in central Europe. The Walachian Hill-lands are fairly well watered and may be grouped with the eastern part of the Balkan Peninsula to form the "Drier South-eastern Lowlands" sub-region of Temperate Europe, marked "10" in Fig. 21.

The climate of the Plains of Walachia, however, as shown by the figures for Bucharest on p. 26, is definitely of the steppe-land type, and therefore this part of the Danubian Lands lies beyond the geographical region of Temperate Europe, and in several respects is an extension of eastern Europe.

The Carpathian System.—We will begin the regional description by dealing with the highlands, and will consider first the *North-Western Carpathians*. Here there is a series of curved highland zones which lie, as it were, one within the other, and are separated by valleys or high basins, in which recent deposits have been laid down. Thus there are the outer and almost concentric curved chains of the Beskides, continued south-westwards by the White Carpathians ; south of the Beskides there is the highland mass of the High Tatra, which, at an altitude of about 8,700 feet, includes the culminating point of the whole Carpathian System ; separated from this highland by the upper valley of the Vah is the Low Tatra, which, in spite of its name, reaches about 6,700 feet ; separated from the Low Tatra by the upper valley of the Hron are lower masses, known as the Slovakian (also known as Hungarian) Ore Mountains. The Vah and Hron flow first westward and then

southward to join the Danube, while back-to-back with their upper courses are the Hornad (Hernad) and Sajo (Slana) which flow first eastward and then southward to join the Tisza (Tisa).

As regards structure, the outer zone of the White Carpathians and the Beskides are composed of the Flysch strata of shales, sandstones, etc., while the High and Low Tatra, the Little Carpathians, which extend south-westward to the Danube at Bratislava (Pressburg), and part of the Ore Mountains are



[Czechoslovak Legation.

FIG. 57.—VIEW OF A CARPATHIAN PASTURE.

Note.—This is a view in the High Tatra region ; in the foreground is a flock of sheep—on the level ground of an old lake-basin.

formed mainly of crystalline rock ; the remaining parts of the Ore Mountains are of volcanic origin (see Fig. 58).

The Beskides, modelled from the Flysch rocks of relatively weak resistance, have rather smooth forms ; they are forested with beech and firs, and almost the only resource they offer is their timber.

The crystalline areas have bolder outlines ; the High Tatra in particular has wild scenery, for here, and to a less extent on the Low Tatra, glaciation has produced the same striking land-forms as those of the High Alps. Forests of firs clothe nearly all the slopes as far as the tree-line at about 5,000 feet, above

which rise almost bare crests and summits ; alpine pastures **are** rare. On the Tatra Mountains a forest economy is again predominant, and only in the valleys and the high basins is there any considerable population. In these valleys and basins most of the people get their living by cattle- and sheep-rearing and subsidiary agriculture, with small domestic industries, such as spinning and weaving, the manufacture of glass and metal-working. The last occupation is due to the occurrence of silver ores in the volcanic area of the Ore Mountains, while more ancient rocks yield iron, manganese and copper.

The Forest Carpathians are much narrower, for it appears that the great subsidence which has occurred in this part of the Tisza basin has left little of the highland but the Flysch chains of the Eastern Beskides, except that on the edge of the depression, i.e. on the inner side of the mountains, are certain volcanic masses. The parallel ranges are well named the Forest Carpathians, for woods almost completely cover them, and forestry is almost the only occupation ; but on the slopes and in the valleys of the volcanic areas there is more cultivation, and even some vine-growing. In the upper valleys of the Tisza and its tributaries live the greater part of the people of Ruthenia, the easternmost part of Czechoslovakia.

The South-Eastern Carpathians,—The Flysch belt of the Beskides is continued first in the mountains of the Bukovina, i.e. Beech-land ; farther south the Flysch continues in the outer part of the Moldavian Carpathians, and even just around the great westerly bend of the system where it borders the Walachian Hill-lands. Behind the Flysch chains there are crystalline and volcanic areas, and an important characteristic of the region is the existence of basins of considerable altitude and wide extent in the uppermost courses of the Mures (Maros) and Olt (Aluta).

While the mountain areas have but a scanty population, which depends mainly on the beech and fir forests, the basins have a very considerable number of inhabitants who cultivate meadows and grow forage crops for their cattle, and in the lower basin of Brasov the town of that name is surrounded by a fertile district in which corn and sugar-beet are obtained.

On the outer margin of the Moldavian Carpathians is one of the Rumanian oilfields (see Fig. 56).

The Transylvanian Basin.—In this great hollow Tertiary deposits of clays and sands, with layers of gypsum and salt,

were formed. The whole region has been cut up into a land of very irregular relief by the Mures and other tributaries of the Tisza, and by the Olt, which cuts through the Transylvanian Alps to the lower Danube.

The higher lands, frequently formed of sandstone, bear woods of beech and other deciduous trees. The lower areas, however, are usually treeless, and consist of arable lands or pastures, on which large numbers of cattle, sheep, swine and horses are reared. The valleys are the most productive areas; some of them have terraces mantled by loess, and on such lands great harvests of wheat and of maize are gathered, while on sunny slopes fruit trees and the vine are cultivated. There are a considerable number of small towns, and the largest, Cluj, has about 100,000 inhabitants.

The Transylvanian Alps.—On the southern side the upland basin is shut in by the broad highland mass of the Transylvanian Alps. Although involved in the "alpine" folds, its structure is in the main that of a great massif of crystalline rock, whose higher parts are in the form of plateaus.

On the southern side of the Transylvanian Alps is the depression now occupied by the Walachian Hill-lands and Plains, and at one period in the geological history rivers from basins in the highland descended so steeply to this depression that they rapidly eroded their valleys and formed great gorges, including those of the Jiu and Olt. The Olt, indeed, cut back its valley till it captured that part of the course which is within the Transylvanian Basin. By such valleys through the highland barrier, railways join Transylvania with the lower south-western lands of Rumania.

Only the greatest elevations of the Transylvanian Alps show jagged outlines due to glaciation, and lower are broad, undulating plateaus which bear alpine pastures; to these large numbers of sheep migrate in summer from Walachia. Below the alpine pastures is the zone of forests of pines and beech, and in the lower and wider parts of the valleys, near the margins of the highland, chestnut trees and the vine are grown.

Near the western end of the Transylvanian Alps is the upper valley of the Jiu and the basin of Petrosani, floored by Tertiary deposits from which lignite is obtained.

A rift-valley separates the Transylvanian Alps from the Banat Mountains, and through this valley, north of Orsova, runs the

railway which connects central Europe with the lower Danubian lands (refer back to Fig. 20).

The Banat Mountains contain a variety of structures : there are ores of iron, copper and other valuable metals and deposits of anthracite. Hence, metallurgical industries have developed at Resita, and here are the greatest iron and steel works of Rumania, where armaments and railway equipment are made.

South of the Banat Mountains there is no real break between these highlands and their southward continuation across the Danube to the Balkan Mountains. The mountain barrier is cut by the Danube only by a series of gorges, which stretch downstream for about 60 miles till Orsova is reached ; below that town are the rocks and rapids of the Iron Gate, where a side-canal has had to be cut to allow the passage of the small number of river craft which pass from the middle to the lower courses of the river.

The West Transylvanian Highlands.—North-west of the Transylvanian Alps is the valley of the Mures (Maros), a rather wide corridor, fertile and well populated. On the farther side of this valley rises the confused area of highlands and uplands, to which the only convenient general name seems to be the West Transylvanian Highlands. Here the rounded granitic Bihor Mountains reach about 6,000 feet. Igneous rocks and volcanic activity are associated with mineral deposits in two or three places, and small industries have developed at Zlatna. For the rest, the scattered population depends on forestry and farming.

East Alpine Foothills and Middle Danubian Uplands.—*The East Alpine Foothills.*—The crystalline rocks of the Alps sink down eastwards and are covered by limestones, sands and clays, in which rivers have carved their valleys and formed a very irregular relief. The forests which cover the ridges consist mainly of beech, and on the lower slopes chestnuts have been planted. The valleys are utilized for agriculture ; and fruit and vines are grown. Where the Mur enters this region is the town of Graz, a market for the exchange of the products of the Alps and the lower lands, and a centre of manufacturing which, with the trade, supports a population of 200,000 persons in and around the town.

On the southern margin the Sava issues from the Alps, and here is the town of Lyublyana ; at this point the route of the Sava valley is crossed by that from the head of the Adriatic Sea.

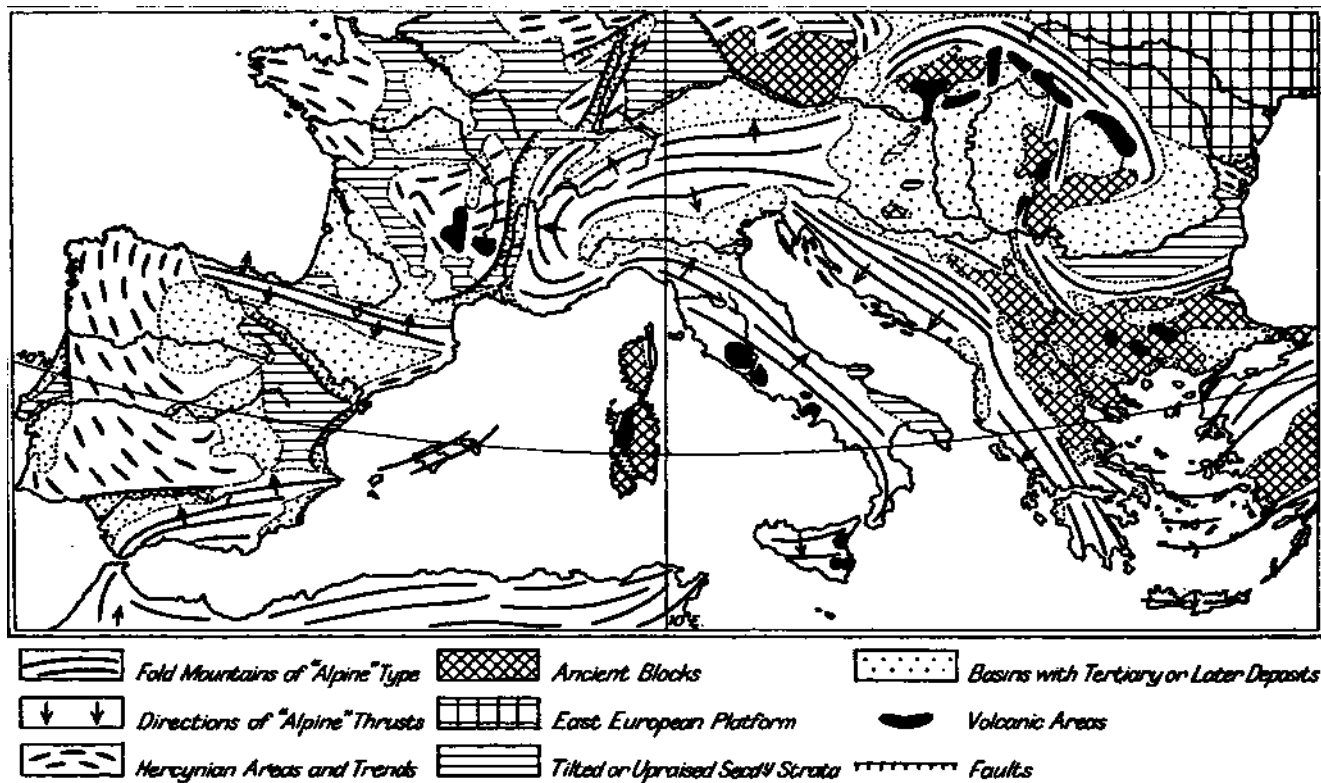


FIG. 58.—STRUCTURE OF SOUTHERN EUROPE.

The Middle Danubian Uplands.—Between the Drava and Sava the Croatian-Slavonian Upland from the Alpine margin stretches south-east; its highest parts are formed of upthrust masses of crystalline rock and are mainly wooded; the lower slopes have orchards and vineyards. From the lowlands north of the Drava rises a small massif, the Mecsek Heights, which also bears woods and vineyards, but the relatively old rock of which it is composed has some deposits of coal; these are of particular value to the State of Hungary, in which there is a lack of minerals, and under the faulted edge of the upland has grown up Pecs, one of the few industrial towns of Hungary.

The Bakony Forest is a somewhat similar upland, whose long, faulted south-eastern edge descends steeply to the depression in which waters of the shallow Lake Balaton have accumulated. Other smaller hill-areas continue the line of the Bakony Forest to the north-east, until there rises a volcanic mass, through which the Danube has cut a picturesque gorge just before the river turns from its easterly to its southerly course above Budapest.

Beyond the Danube gorge the upland continues gaining in width and elevation, and in the volcanic mass of the Matra Mountains it reaches about 3,500 feet. On the northern side of these uplands lignite is found. Farther to the north-east, where the River Sajó breaks through the volcanic belt, more lignite is found, and also some iron-ore deposits, by which are situated large ironworks. The Matra Mountains and the volcanic belt shut in, on the north-west, a long fertile basin between them and the North-western Carpathians; this hollow is drained by the Rivers Ipel and Sajó to the Danube and Tisza respectively. Its north-eastern end affords a route up the valley of the Hernád, a tributary of the Sajó; in this valley is the industrial centre Kassa (Kosice).

The Middle Danubian Lowlands.—*The Moravian Corridor.*—The name Moravian Gate is applied to the narrow hollow between the Sudetes Upland and the Western Beskides, while to the south-west, between the Bohemian Massif in general and the broken line of ridges which link the Alps with the Carpathians, extends a longer and broader lowland area; this is drained to the Danube by the Morava and its tributaries, and it may conveniently be called the Moravian Corridor. An

extension of the corridor across the Danube is known as the Vienna Basin, since that city is situated on its edge.

Much of the broad corridor is floored by deposits of Tertiary age, on part of which loess has been laid down, and in general it is a fertile region with a wide variety of products. It is not by any means a uniform country, for from the lowland rise lines of wooded, sandstone hills, while as other exceptional features there are the marshy valleys of the Danube below Vienna and of the lower Morava.

The break between the Alpine and Carpathian Highlands is of the greatest commercial significance, for it gives an easy route for traffic to accompany the Danube from its upper to its middle course, and to link central to south-eastern Europe. Where the river skirts the north-eastern extremity of the great Alpine barrier is Vienna, situated at the meeting-place of this north-west to south-east route with another at right angles, viz. from the Adriatic Sea and northern Italy through the Moravian Gate to the Baltic lands and north-eastern Europe.

Vienna was the capital, and was situated almost in the centre, of the great Austrian Empire ; when the Empire broke up in the War of 1914-18 Vienna remained the capital, though almost on the frontier, of the much smaller State of Austria, until in 1938 this was incorporated into the German Reich.

When it was the residence of powerful rulers, Vienna became a centre of science and the arts, particularly of music ; as a seat of Government and a meeting-place of routes it attracted commerce and industry. Thus before the War of 1914-18 its population was over 2 million persons. The small new State of Austria, however, did not require, nor could it support, such a large capital as the old Empire, and now the city is only the administrative centre of the Austrian province of Germany ; the population has declined and is now less than 2 millions.

In the Moravian part of the Corridor there are several large towns, notably along the north-western margin, where there are trading centres on the routes into Bohemia and through the Moravian Gate. The largest of these towns is Brno, with about a quarter of a million inhabitants. Here, as well as in other towns along this border of the Bohemian Massif, are industries aided by coal both from the Upper Silesian coal basins and also from those of the Massif.

The Upper Hungarian Basin.—This region almost corre-

sponds to the lowland drained to the Danube between two gorges; the upper is that where the river cuts through the south-western extremity of the Little Carpathians above Bratislava, and the lower is that where it breaks through the barrier of the volcanic uplands above Budapest. In this broad subsidence basin have been laid down from Tertiary times onwards varied deposits, mainly of sands and clays, and including loess ; on these are grown wheat, maize, sugar-beet and fodder crops. Where the side-streams meet the Danube, however, there is a great accumulation of sand and mud, which is liable to flooding, and of which only a part has been utilized. The Danube itself divides into three main channels, enclosing a great " island " which has gradually been reclaimed, mainly for keeping cattle and horses and to some extent for cultivation of grain and vegetables.

The Lower Hungarian Basin.—Apart from the emergent uplands already dealt with, tracts of three main types are found in the great basin drained by the Danube between the gorge above Budapest and the narrows which end in the Iron Gate : (i) the West Danubian Plateau, of moderate relief and with a climate of central European type ; (ii) the wide East Danubian Plains, in general of less-marked relief and of more arid character ; (iii) between and interrupting these regions, the broad and naturally swampy valleys of the Danube and of the lower courses of the Drava, Sava, Tisza, Mures and other smaller rivers.

Just below the gorge where the Danube enters the Lower Hungarian Basin is Budapest, the capital of Hungary. It consists of two parts : Buda is on the high, right bank of the Danube, where the heights come to the river's bank and give a favourable site for an old fortress ; Pest is on the low, left bank, and was a market-place for the products of the Danubian Plains. Budapest has spread out widely, having grown particularly with the reclamation and improvement of the plains and the construction of railways which collect much of their produce at this centre ; the whole conurbation numbers about 1½ millions of inhabitants, in spite of the check due to the partition of Hungary.

The West Danubian Plateau is mainly undulating country, rather similar in its build, soils, climate and productions to the Upper Hungarian Basin on the other side of the Bakony Forest. In the southern portion, however, the summers become hotter,

and in some parts growing of maize and melons becomes characteristic, while in other areas drought may be frequently experienced. Where the Sava enters the Lower Hungarian Basin from the East Alpine Foothills is Zagreb; it is on the route which connects the Danubian lands with the Adriatic ports of Fiume and Susak.

The East Danubian Plains.—This is the region of which the greater part is sometimes known as the Alföld, while the southeastern area adjoining the Banat Mountains is called the Banat Lowland. In climate, scenery and the type of land-utilization the East Danubian Plains are transitional to the steppes of southern Russia.

The temperatures tend to extremes, particularly felt when violent winds, blowing without hindrance across the great plains, bring snowstorms in winter and burning heat in summer.

Only on the margins of the region where there is more rain, and in those districts where the soils collect or conserve more moisture, is the water-supply sufficient for tree life; hence over the central areas stretch the open, treeless plains of the Pussta.

Although on the Carpathian borders many streams have cut their valleys, and although the great rivers have clearly marked flood-plains, over much of the country the relief has been smoothed by a thick mantle of fertile loess. From the point of view of the farming resources, however, this area has been reduced by the liability to flooding in certain districts, particularly near the north-western part of the course of the Tisza and between the lowest reach of the Tisza and the Danube (see Fig. 56). Moreover, at a past period sand was formed and blown into dunes which covered much of the area between the Danube and the Tisza and the country in the angle formed by the northernmost part of the course of the Tisza. Now that the climate is not so arid, vegetation has grown upon the sand and checked the movement of the dunes, but they are still the characteristic features of much of those two specified areas.

The fertile loess plains have now become great fields of wheat and maize, but after the harvests are reaped, the stubble-fields again give to the country its steppe-land appearance. Maize is the common food of the people and is fed also to enormous numbers of poultry and pigs; wheat was sown as the main crop on the large estates of the wealthy landowners, and grown for export. Cattle, sheep and horses are widely reared, but they

are now generally fed more upon sown grasses or other crops than upon natural pastures.

The loess lowlands which are liable to flood have been in part protected by dyking and draining, but where the rivers may still spread out over the country, only pastoral work can be carried on.

The sandy regions have also been considerably developed, but the absence of streams in these regions has made this work largely dependent upon the construction of deep wells.

Scattered over the great plains are a number of large towns, or perhaps one might say huge over-grown villages, for although their populations in several cases number about 100,000 persons, they sprawl loosely over wide areas ; a large proportion of their inhabitants are the farming families who work the surrounding lands, or are shopkeepers or merchants dealing in the products or the requirements of the farming folk. Some of these towns, however, are also the railway junctions and serve a wider area. The largest of such settlements are Subotica and Debrecen.

The Rivers and Flood-plains.—The Danube and its tributaries flow with complicated meanders or side-channels through broad valleys, normally marshy and frequently flooded, set with great thickets of reeds and clumps of alders and willows. In parts of the basin canals have been constructed across the plain to facilitate drainage, and some of these, like the larger rivers, are, or should be, navigable. But systematic control of the waterways is necessary to keep the courses clear, especially in the later part of the dry summers, and to prevent flooding when the melted snows from the surrounding highlands add greatly to the volume of water in spring. This work would require a unified control of the whole of the basin, but when, in 1918, Hungary was divided up, the river control was disorganized and traffic in general declined.

Budapest, however, carries on a good deal of trade by water, and Szeged, near the junction of the Tisza and the Mures, is the second largest town of Hungary. Belgrade (Beograd), at the junction of the Sava and Danube, is essentially a border city of the Balkan Peninsula.

The Lower Danubian Lands.—The surface conditions give the basis for a threefold division of these lower Danubian lands : (i) Walachian Hill-lands adjoining the Transylvanian Alps ; (ii) the Walachian Plains, widening towards the east and including the Dobrogea across the Danube in the angle between the

lowest part of its valley and the delta; (iii) the broad valley and the delta of the Danube,

The Walachian Hill-lands.—This area is relatively well watered and has been fairly deeply dissected by the streams from the Transylvanian Alps ; consequently there is a marked difference between the ridges, to a considerable extent still forested with oaks and other deciduous trees, and the valleys utilized for cultivation and settlement. In these valleys there are alluvial terraces, on which cereals are grown, while vines and fruit trees cover the slopes.

An important oilfield is worked in the hill-lands adjoining the Transylvanian Alps north of Ploesti; at this town, as well as elsewhere on the field, are great refineries, and pipe-lines convey the oil for export to the port of Constanta (Constantza) on the Black Sea, and for home use to the river-port of Giurgiu on the Danube, and to the capital, Bucharest.

The Walachian Plains.—Here a scanty rainfall makes itself manifest, and this area, together with the Dobrogea across the lower Danube, must be regarded as a distinct sub-region and grouped with the Steppe-lands of eastern Europe.

Except in the rather shallow valleys in which recent alluvium has been laid down and where cultivation has assumed varied forms, the wide plains are generally covered with loess and have a monotonous appearance.

The better-watered areas are very productive and support many people, who grow wheat and maize for their own consumption, and oats and fodder crops for the sheep, cattle and horses, which they keep in considerable numbers. Other parts are relatively barren, and in the east is a region still known as the Baragan Steppe ; indeed, there are districts bordering the larger valleys where the wind has blown the finer river sand across the plains and formed miniature deserts.

Almost in the middle of the plains region is the capital of Rumania, Bucharest (Bucuresti), from which roads radiate in all directions ; it has become the commercial as well as the political centre of the country, and its population is well over half a million persons.

The Dobrogea.—This is a low plateau formed of a block of ancient rock whose surface is partly covered by loess ; the porous soil increases the aridity due to low rainfall, and the natural condition is that of steppe-land. Although an increasing area

is cultivated or used for pasture, it supports few people, and the only town of any size is the port of Constanta.

The Danube Valley and Delta.— A complete contrast to such districts is afforded by the broad valley in which the Danube meanders and in parts forms a network of channels. In spring much of the region may be flooded.

Lakes, marshes and floods render the wide valley a serious obstacle to traffic, and only one railway crosses the Danube in the whole of its lower course ; this is at Cernavoda, on the line between Bucharest and Constanta.

In its northward reach the lower Danube valley widens considerably, and after receiving the Seret and Prut, the river turns eastward and forms a great delta as it deposits its load of mud in the Black Sea. The delta is shut off from the sea by a sand-spit through which the northernmost of the three main channels discharges the greater part of the river water. The middle channel has been straightened and used for navigation, and the chief ports are Galati (Galatz) and Braila, at the head of the delta. These ports export mainly wood from the Carpathians and grain from the plains of Rumania, but are closed by ice for several weeks in the winter.

Owing to the obstacles to navigation in several parts of its course, the Danube has less importance as a highway of communication than its great length might suggest, its value being further diminished by the fact that it flows, not westwards from central Europe to the open ocean, but eastwards to an almost enclosed sea.

QUESTIONS

1. Give a brief account of the relief and the associated structure of the Carpathian Highlands.

2. Show how the physical geography of the North-western Carpathians (including the Ore Mountains) is related to the means of communication and the occupations of the people of this region.

3. Describe the Moravian Corridor (including the Moravian Gate and the Vienna Basin) from the points of view of its internal conditions and its relations with other regions.

4. Make a systematic study of the physical and economic conditions of the Transylvanian Basin.

5. Give an account of the climate, and show how it is related to the farming, of the Upper Hungarian Basin.

6. Compare and contrast the West Danubian Plateau with the East Danubian Plains.

THE BALKAN PENINSULA

THE Balkan Peninsula appears to be such a tangle of mountains and valleys that before giving a description of its constituent regions, it will be convenient to examine its relief and routes, and refer also to its climate and vegetation, in general.

Relief and Routes.—If the geological structure is ignored, a map showing only elevation of the land would suggest that the South-eastern Pre-Alps are continued behind the Adriatic Coast. Three regions may here be distinguished : the irregular coastlands of Dalmatia ; the high plateaus of Karst formation, including the Dinaric Alps ; the mountains and valleys, inhabited by Croats and Serbs, which drain eastward to the Sava and Morava tributaries of the Danube (see Fig. 59). From the Karst Plateau region only one river of any size, the Neretva (Narenta), drains westward. The only important routes from the interior to the coast are where the mountain barrier is narrowest, in the extreme north-west; here are the ports of Trieste, Fiume and Susak.

Farther south, the coast changes its direction : Albania approaches the " heel " of Italy, and at the Strait of Otranto the entrance to the Adriatic is almost closed. Behind the coast lie the Albanian Lowlands, and behind this region is an almost chaotic group of mountains, valleys and basins, situated partly in Albania and partly in Macedonia, the latter being a rather vaguely defined area politically divided between Yugoslavia and Greece. Through Macedonia the valley of the River Vardar runs almost back-to-back with that of the Morava, and the two valleys together form the main route between central Europe and the Ægean Sea at the port of Salonika or Thessalonike (refer back to Fig. 20).

A partial submergence of the whole area around the Ægean Sea has caused the drowning of all the lowlands, while the surrounding ranges become lower and break up into peninsulas and islands, such as Krete and Rhodes (Rodi); on the farther side of the Ægean Sea they again appear as mountains in Asia Minor (see Fig. 58).

Returning to the north of the Balkan Peninsula, we note that the Banat Mountains curve round into the Balkan Mountains (or Stara Planina), and between these and the Danube is a rather low plateau region. South of the Balkan Mountains rises the great mass of the Rodopi (Rhodope) Mountain region, the highest of the Balkan Peninsula, reaching about **10,000** feet.

Between the Balkan and Rodopi Mountains are two important basins, the higher and smaller being that of Sofia, and the lower and more extensive that of Plovdiv (Philippopolis); through the latter runs the River Maritsa, which then turns southward through the Edirne (Adrianople) Basin to reach the *Ægean*. These three basins form parts of the mainland route between Europe and the Near East, for the "Orient Express" line (again refer to Fig. 20) leaves the Danubian lands at Beograd, goes up the Morava valley to Nis (Nish) and thence south-east by the tributary Nishava; it next crosses the water-parting into the Sofia Basin, and then another water-parting to the Maritsa valley, which it follows through the Plovdiv Basin and into the Edirne Basin; finally it passes into the Marmara region and reaches Istanbul (Constantinople), the historic meeting-place of West and East.

In a past geological age there was here a continuous land-bridge between Europe and Asia, but the subsidence of the whole region transformed what were then river-valleys into the present straits of the Bosphorus and the Dardanelles, which join the Black Sea to the Sea of Marmara and the *Ægean*.

North of the Marmara region are the lands which look out, as it were, to the Black Sea, and have climatic similarities with the other regions on the European shores of this sea. Also, there is the fertile valley of the upper River Tunja, which lies sheltered and confined between the Balkan Mountains and a narrow offshoot called the Anti-Balkan range. The River Tunja does not, however, continue its eastward course from this valley to the Black Sea, but turns abruptly southward to join the Maritsa.

Climate and Vegetation.—The broad bulk and the generally considerable elevation of the northern part of the Balkan Peninsula have the effect of prolonging the "temperate" climate conditions far into southern latitudes; only those regions of **the** south and west which are directly influenced by the

Adriatic, Ionian and Ægean Seas have the characteristic Mediterranean climate.

The temperate type of climate is exemplified in the meteoro-

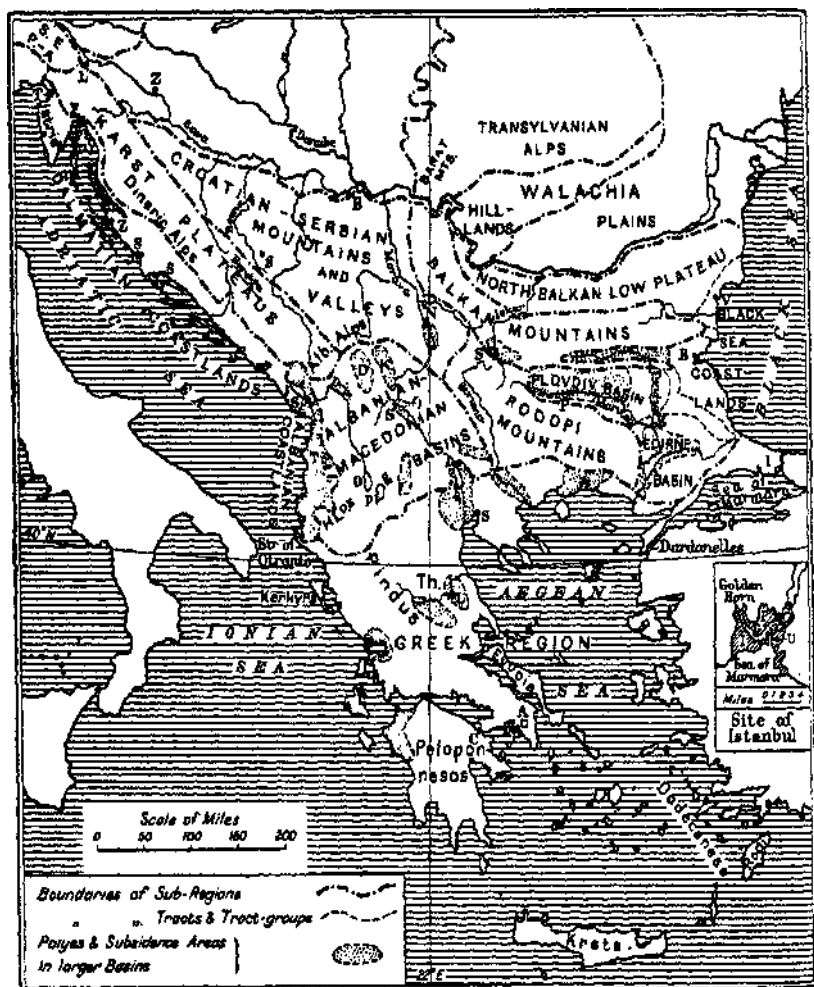


FIG. 59.-REGIONS OF THE BALKAN PENINSULA.

logical records for Sofia. Here, in the heart of the peninsula, and in an enclosed basin 1,800 feet above the sea, are temperature conditions very similar to those of Budapest, for the more southerly latitude is counterbalanced by the greater elevation;

in respect of rainfall, also, there is but little difference between Sofia and Budapest (see the figures on p. 26).

Yet within this northern or non-Mediterranean part of the Balkan Peninsula the variations of altitude are so considerable that the local climates dependent upon elevation are accompanied by marked contrasts in the natural vegetation. In the valleys and basins this has been displaced or largely modified by cultivation or by the use of the land for pastoral purposes, but the slopes and highland areas are still partly covered by forests, "mixed" at moderate elevations and coniferous at higher levels; an alpine zone of low growths is found in the highest parts of the Dinaric Alps and the Rodopi Mountains.

In the highlands of Albania and Macedonia these climatic conditions and their associated forms of vegetation continue far to the south between the Ægean and Adriatic areas and form an indefinite boundary between the regions which can be clearly distinguished as "Temperate" and "Mediterranean" respectively: even the Pindus Mountains of Greece show rather similar characteristics, although they rise from the clearly Mediterranean part of the Peninsula.

The true Mediterranean climate and life-forms are indeed only found on the lower slopes of the coastal mountains, and in the adjoining valleys and plains. Yet this Mediterranean region is situated so far southward, that on the lowlands it has its full development of winter warmth and summer drought. Accordingly the figures for Athens (as given on p. 26) show remarkably high temperatures both in summer and winter; also, while the total annual rainfall at Athens is only 15 inches, that of the three summer months combined is less than one-tenth of this amount. With such climatic conditions, trees of the evergreen, hard-leaved type form woods in situations where man has not destroyed them, but maquis and expanses of thorny shrubs, such as thistles, are common.

Along the Dalmatian coast the Mediterranean conditions extend exceptionally far to the north, for in the Adriatic Sea currents flow in a counter-clockwise direction and take warm waters northward along the coast, while the great mountain barrier of the Dinaric Alps is at least a partial protection from the winds which would otherwise bring cold air from the north-east in winter time. Yet the Dalmatian coast-lands are occasionally visited by a bitterly cold north wind, the Bora, which comes

down from the Karst Plateau region, and is produced in the same way as the Mistral of southern France.

On the eastern side of the Balkan Peninsula, open both to the north and to the east, the true Mediterranean conditions give place before greater winter cold, and save in exceptional spots the olive extends only as far as the shores of the Sea of Marmara. The Black Sea coast-lands show a transition towards the steppe type of climate, and while woods are found on the higher lands, the chief natural growths of the lower country are drought-resistant shrubs and the spring-flowering herbaceous plants and grasses.

Constituent Regions.—*The Dalmatian Coast-lands.*—In the north-west of the Balkan Peninsula the limestone mountains of the South-east Pre-Alps are continued behind the Adriatic sea-board, with folds running in a north-west to south-east direction (refer back to Fig. 58). The structure is, however, more complicated than this statement alone would suggest, for in the coastal area there have been overthrusts, faultings and sinkings, which have produced the succession of peninsulas and gulfs, islands and inlets, small coastal plains and precipitous cliffs which make up the Dalmatian Coast-lands region.

On either side of the plateau of Istria deep gulfs allow ships to reach the narrowest part of the mountain barrier. Here the ancient city of Trieste flourished while it was the outlet of the Austrian Empire, but when this broke up and Trieste passed to Italy, its commercial significance declined, although industries have been developed under the new regime and the city has a quarter of a million inhabitants. Similarly, Fiume became important as the port of Hungary, but when that country lost its sea-board and Fiume became Italian, the trade decreased. The suburb of Susak, however, remained in the hands of Yugoslavia and has become the chief port of that State.

As the highlands rise steeply behind much of the Dalmatian sea-board, there are relatively small areas of productive lowland. The slopes are in part well forested, and timber is sent out from several ports, but cultivation is mainly limited to the islands, the Istrian peninsula, the coastal lowland between Zara and Split and terraces on the hills bordering the sea. Maize, wheat and barley are the cereals; vineyards and olive-yards are scattered along the coast.

Fishing, as well as cultivation, is the work of the people in

many villages ; moreover, an increasing number of visitors from other lands are attracted by the beauty of the scenery.

Bauxite (from which aluminium is prepared) is obtained from the Istrian Peninsula, the inner margin of the Zara-Split lowland and at some points farther south ; it is exported from Split and Sibenik. There is but poor railway communication inland from these ports ; hence, although industries are now being developed, the trade and population are not great.

The Karst Plateau Region.—Behind the coast-lands, the fold-mountains have been peneplained and subsequently uplifted, with the result that steep walls of rock bound high plateaus, which in the south reach 8,000 feet above sea-level. The limestone of which they are mainly formed has been but little dissected by surface streams, and much of the drainage is underground. Deep gorges cut the plateaus, and in some of them rivers issue from the depths and after a course of some miles disappear into subterranean tunnels and caverns. The surface is occasionally pitted by dolines, i.e. solution hollows, and in these there is generally an accumulation of soil, reddish in colour and clayey in composition, which has remained when the limestone has been dissolved away.

On the plateau levels the permeable surface is commonly dry, in spite of a heavy rainfall, and with the coldness of the winters conditions do not favour vegetable growth. Poor pastures on which feed sheep and goats, but relatively few cattle, are the main resource of the higher areas, though in dolines and some valleys cultivation can be carried on. There is little mineral wealth, though bauxite is quarried near the Neretva valley, which enables it to be conveyed to the coast for export. The gorge-like valleys generally hinder rather than help communication, and the population is small.

The Croatian-Serbian Mountains and Valleys.—Behind the Karst belt the structure is more complicated; eastward the limestones are less pure, and are then succeeded by older rocks, including granites. With the greater variety in the bed-rock the soils improve, and with the lower elevation the country becomes more habitable. The higher areas bear forests, in which oaks are specially valuable, both for their timber and also for acorns which give food for the many swine kept in these districts. As the valleys become lower and broader towards the Sava and Morava, agriculture becomes the main occupation :

maize, wheat and potatoes are grown on the level lands, and on the slopes are plum, mulberry and other trees, and vines. The older rocks contain a considerable variety of minerals: zinc, iron, lead and manganese are worked at several places, but although some coal and lignite are also found, there is a lack of suitable fuel for smelting, and consequently there is little industrial development beyond some chemical works.



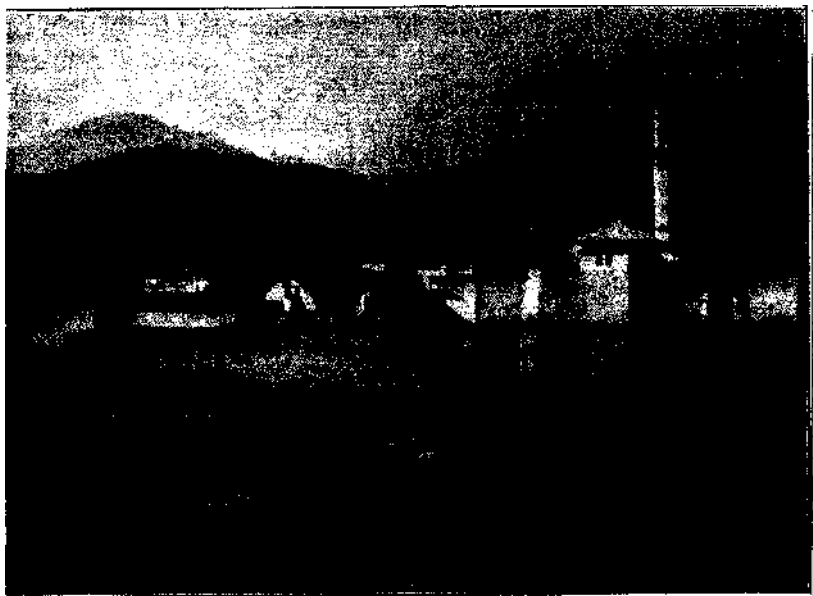
[Royal Geographical Society.]

FIG. 60.—VIEW ON THE KARST PLATEAUS.

Note.—The view shows how the almost level surface of the plateau is cut by steep-sided valleys which make communication very difficult. The photograph was taken in spring when the snow had almost melted, and it may be seen that little vegetation exists. The almost vertical walls of the valley, above the screes, are bare, and expose the strata which form the plateau.

The productive valleys lead down to the Sava and Morava and along the valley of the latter river comes the traffic from the Mediterranean and the East; consequently the district where the two rivers meet the Danube is the focus of routes both from all parts of Yugoslavia and from a much wider area. Beograd, with an elevated site above the junction of the Sava and Danube, is therefore well placed as the capital of Yugoslavia; as a political and commercial, and to a less extent industrial, city it is the centre of a conurbation of over 300,000 persons.

The Albanian Coast-lands contrast with those farther north in showing less effect of subsidence and having considerable areas of recent formation. The region is in part alluvial with swamps and lakes, and in part consists of low hills covered with maquis. In recent years reclamation has allowed the extension of the cultivable land, and farming has now outweighed the winter pasturing for which alone the Albanians earlier utilized the region. Maize is the chief grain crop, while tobacco is grown in



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FIG. 61.—VIEW ON THE RIVER BOSNA.

Note.—This is a scene in the higher part of the "Croatian-Serbian Mountains and Valleys" region; there is here but little agricultural land, and the forests are the chief resource of the area. The minaret shows that in this district of Yugoslavia the people are Mohammedans.

the north and some rice and cotton in the south. Olives and mulberries are obtained, and in the warmer parts oranges and lemons. The towns are small: Shkodra (Scutari) has only about 25,000 people, and the capital, Tirana, has still fewer inhabitants.

The Albanian-Macedonian Highlands and Basins.—The Karst Plateaus and the adjoining Serbian Mountains end southward in heights, sometimes called the North Albanian Alps, which overlook a series of relatively low areas lying between the north of the Albanian coast-lands and the upper Morava valley. This

series of lowlands comprises the basin in which Lake Shkodra (Scutari) is situated, the north-easterly part of the valley of the River Drin, and the two basins of Djakovica (Diakova) and Kosovo (" D " and " K " in Fig. 59). These depressions afford a moderately easy way across the highlands, and to them collectively has been given the name of the Albanian Gap.

Towards the south and east of the Balkan Peninsula appear more of such basins, known as polyes. They have been formed probably by subsidence as well as solution ; they are often bounded by steep walls, and in them water tends to collect. Lakes have commonly resulted, and in some cases still remain, e.g. Ohrid and Prespa on the borders of Albania and Macedonia. In most cases, however, the lakes have disappeared and their beds yield soils which, though liable to floods, give almost the only extensive areas for cultivation and settlement in the highland regions.

South of the Albanian Gap there is a complicated mass of mountains, difficult to cross. The western part is Albanian, and here the structure is like that of the Dinaric Alps to the north. The eastern part is in Macedonia, where granites and other crystalline rocks predominate, as the area forms part of the great mass of ancient rock which lies between the folds of the west of the Balkan Peninsula and those of the Balkan Mountains proper ; in this block, sometimes known as the Rodopi Massif, minerals have been found, and there are also considerable areas of recent eruptive rock.

The highlands, especially in the Albanian portion, have an irregular relief, and the country often has a wild and savage appearance. It is mainly used for the summer pasturing of sheep, goats and cattle. The polyes are the sites of all the important settlements ; in them are grown maize and wheat, the vine and fruit trees, while in sheltered areas in the south even olives are produced.

Petroleum has been found in the marginal district between the highlands and the southern part of the Albanian coast-lands; some copper is obtained, and chromium and other metals are known to exist in the mountainous parts of the region, but mining and industries have not been developed to any considerable extent.

The Balkan and Rodopi Mountains.—The Balkan Mountains which curve southward from the Danubian gorges increase in

height till, where they run parallel with the river, the highest ranges attain a height of nearly 8,000 feet. The foldings have involved rocks of varied age and composition, and in them are some mineral ores and lignite deposits. In the small portion belonging to Yugoslavia in the north-west considerable amounts of lignite and copper are mined.

The ranges are cut by a number of river valleys, and half a dozen passes lead roads across from the north to the south of Bulgaria. Forestry is carried on, and animals are sent up to pasture during the summer, while in the valleys there is mixed farming.

The Rodopi Mountains rise higher, and since they are relatively flat-topped there are wide elevated areas on which the only vegetation is of the sub-alpine or alpine type. The slopes, however, are well wooded, and forestry, with the production of charcoal and the sawing and working of timber, is the principal resource of the small population. There are a few fairly wide valleys, notably that of the River Struma, but in the main the upland edges are cut only by small streams.

The *Sofia Basin*, situated between the Balkan and Rodopi highland regions, is on the great route from central Europe to Istanbul and the East, while the Iskar and Struma give passages to northern Bulgaria and the Ægean Sea respectively. Due to this nodal position, the city of Sofia has had a long history, and it is now the capital of Bulgaria, with 300,000 people.

The soil conditions of the elevated basin, however, are not favourable and the climate may be rather severe ; the chief grain crop is a hardy mixture of rye and wheat, and potatoes and vegetables occupy much of the cultivable land, though in the more sheltered positions there are extensive orchards.

The Eastern Lowlands.—This is the part of the peninsula which is distinguished by steppe-like or almost steppe-like conditions. Together with the Walachian Hill-lands, it forms part of the sub-region of Temperate Europe called the "Drier South-eastern Lowlands," marked "10" in Fig. 21, and it comprises the following areas. The *North Balkan Low Plateau* is formed of almost horizontal layers of limestone, which give a uniformity in scenery, although in parts layers of clay and loess add greatly to its fertility ; on the great plains maize and wheat are produced in large amounts. Only in a belt of foot-

hills adjoining the Balkan Mountains is there any marked variety in relief and any extensive growth of trees.

The *Black Sea Coast-lands* are varied in structure and relief. The higher lands have oak woods, low scrubby growths and poor pastures used mainly for sheep, but the lower lands are cultivated with barley, wheat and maize, and fruit trees. Situated by inlets due to subsidence are Varna and Burgas, the two ports of Bulgaria ; the latter has the greater amount of trade because of its more direct railway communication with the chief towns, Plovdiv and Sofia.

The *Plovdiv Basin*, open only to the east, has rather extreme temperatures and a low rainfall; consequently its most prosperous agriculture depends on the natural water-supply being supplemented by irrigation. With this help the meadows yield good pasture, the fields bear wheat, tobacco and even some rice, and the slopes have orchards of warmth-loving fruit. Plovdiv, on the banks of the River Maritsa, and on the main commercial route, has over 100,000 inhabitants.

Communicating with this basin, and sheltered from the north by the Balkan Mountains, is the narrow but very fertile valley of the upper Tunja ; it is famous for extensive gardens of roses, from which scent is distilled.

The *Edirne Basin* is the southernmost of the steppe-like Eastern Lowland regions. Cultivation, mainly of barley and rye, has not widely developed, except in the river valleys ; in these, however, even cotton and rice are grown to a limited extent, for the summer heat is considerable. The basin is drained by the lower River Maritsa, which forms the boundary between Greece and Turkey ; Edirne, at the junction of the Tunja and the Maritsa, is in Turkish territory.

The Marmara Region.—The main significance of this region, situated along the north-western shores of the Sea of Marmara, lies in its position at the crossing from one continent to another.

Near the southern end of the Bosphorus, a small inlet known as the Golden Horn gives good harbourage, and here in ancient times arose the city of Byzantium, later called Constantinople ; when the Roman Empire was divided into two parts in A. D. 395, the city became the capital of the Eastern or Byzantine Empire as well as the centre of the Eastern or Greek Church. For many centuries it was the focus of the civilization and trade of

all the lands around the Eastern Mediterranean. In A.D. 1453 it was captured by the Ottoman Turks from Asia Minor, and its trade declined ; in recent centuries its chief importance was in being the capital of the Turkish Empire, which extended far into Europe. When, after the war of 1914-18, the Turkish territory in Europe was restricted to its present small limits, the capital of Turkey was removed to Ankara in Asia Minor, and the old capital, now known under its Turkish name of Istanbul, lost much of its significance.

Yet Istanbul still has a population of nearly a million, if the suburbs of Galata and Pera on the opposite site of the Golden Horn, and Uskudar (Scutari) across the Bosphorus, are included. The city has a markedly Oriental appearance, with the numerous cupolas and tall minarets of its mosques.

The Greek Region is that which is most truly Mediterranean in character. On the mainland it almost coincides with the political territory of Greece, and it includes the iEgean islands.

The region is composite, in that it is formed in the main of three types of country, distinct in character, though intricately associated in situation. First, there are the mountainous areas, broadest and highest on the mainland, but reappearing on the larger islands. They are usually rugged in their relief, and have only a sparse population living in small villages in the valleys ; on the heights are summer pastures for sheep and goats which winter in the adjoining lowlands.

In marked contrast are the low and level basins ; the largest of these afford relatively extensive lowlands, e.g. by the lower courses of the Struma and Vardar, by the northern coasts of the Ægean, in the plains of Thessaly (marked " Th " in Fig. 59) and by the Ionian Sea. They have the possibility of considerable agricultural production ; wheat, and to a less extent, barley and maize, are grown, particularly in Thessaly, and tobacco on the northern plains. But marshes have in the past covered extensive areas, and, as in many of the Mediterranean lowlands, the mosquitoes which bred in the marshes made malaria a very serious scourge to the population. Now drainage is being carried out, malaria is being reduced, and cultivation, even including in some parts cotton, is being extended.

The third important type of country is that of the hilly coastal areas of the mainland and the islands. Such areas may have small lowlands, though for long stretches they are formed by

slopes terraced for cultivation. ' Cereals are grown, but the characteristic production is of olives, tobacco, grapes and other fruits. The grapes are in part used for the making of wine, in part dried and exported ; currants are obtained mainly from the southern shores of the Gulf of Corinth (whence the name " currant " was derived) and the neighbouring coast-lands of the Ionian Sea, and sultanas mainly from the island of Krete.

The other fruits include figs, locust beans, oranges, mandarines, and the lemons which are grown chiefly in the southernmost districts. On the northern shores of the *Ægesm* Sea mulberry trees are grown and silk-worms are reared ; the cocoons are mainly exported to the silk mills of western Europe.

Minerals, including iron, emery, magnesium, chromium and lead, are obtained in several parts of Greece, but in no large quantities ; industrial development is handicapped by a lack of fuel, though lignite is found on the island of Ewoia (Euboea) and the neighbouring mainland.

Fishing is another resource. Moreover, the people are further encouraged to become seafarers by the fact that the land traffic is hindered by the highlands of the interior and by mountainous spurs which reach the sea and almost isolate the more productive basins ; on the other hand, the numerous islands facilitate maritime communication between all parts of the *Ægean* region. The greater part of the population of Greece lives in the coastal lands, and here are situated the capital and the largest trading towns.

Athens was at first only a small city-state in one of the small basins bordering the *iEgean* Sea, but in it art and science developed in almost miraculous fashion in those centuries preceding the Christian Era in which Greece was the centre of a civilization to which mankind owes more than to any other. Traces of the former greatness are still to be seen in the temples and statues remaining in and near the city, but for a very long period Athens shared the decline of Greek civilization and power. With the independence and growth of modern Greece the capital has also grown, but the manufacturing which has recently begun to develop has not added to its beauty, although it has increased its population. Being a few miles from the sea, Athens has as its port the Piræus, and the whole conurbation has about three-quarters of a million inhabitants.

The chief port of Greece is Salonika ; its trade is considerably increased by an arrangement by which Yugoslavia has a " free zone " through which goods to and from that country can pass without paying Customs duty to the Greek Government,

QUESTIONS

1. Discuss what truth there is in the dictum : the Balkan Peninsula turns its back to Europe and looks to the Orient.
2. Describe the chief trade-routes across the Balkan Peninsula, and show how they are related to the physical geography.
3. Give an account of the mineral resources of the Balkan Peninsula. How far has their relatively slow utilization been affected by physical conditions and by human factors ?
4. State the limits, and describe the character and productions, of the " Mediterranean climate " areas of the Balkan Peninsula.
5. Describe the coastal areas and their hinterlands as they would be observed on a journey along the eastern Adriatic Sea from the Strait of Otranto to Trieste.
6. State the location of the chief farming areas in the " Temperate climate " region west of the Balkan and Rodopi mountains ; give an account of these areas and the work carried on in them.
7. In what ways, and to what extent, may the north-eastern part of the Balkan Peninsula be considered as transitional to the Steppe-lands of eastern Europe ?
8. Make a comparative study of the four cities : Athens ; Belgrade ; Istanbul ; Sofia.

CHAPTER XIV

THE ITALIAN PENINSULA AND NEIGHBOURING REGIONS

The North Italian Plain.—Between the Alps and the Apennines is situated the great lowland sometimes called the Plain of Lombardy, but better named the North Italian Plain. It is, as it were, a half-way house between central and southern Europe, for while on the one hand its climate (as explained in Chapter II) is of the Mid-Temperate type, on the other hand it is so cut off from the north by the Alps and so easily accessible from the south, that in its human geography it is closely bound up with the Mediterranean lands.

The North Italian Plain has been greatly influenced by the adjoining Alpine region, for the lowland occupies a great depression within the curve formed by the Alps and Apennines, and its surface is formed mainly by deposits brought down from these mountains and particularly from the Alps. Indeed, the differences between the various tracts constituting the North Italian Plain are largely due to the nature of these surface deposits ; they are generally more elevated and of coarser and drier material on the margins, and become progressively lower, finer in texture and wetter towards the centre and near the Adriatic Sea.

Constituent Regions.—The " *Morainic Amphitheatres* " which are grouped round the southern exits of some of the larger Alpine valleys, from the Dora Baltea to the Tagliamento, recall the regions of recent glaciation on the northern margins of the Alps (see Fig. 53). The " *amphitheatres* " have outer rings of irregular, and sometimes quite high, end-moraine surrounding areas of clayey ground-moraine ; the latter are sometimes wet and moor-like, but because of the southern aspect and lower altitude they are more responsive to cultivation than the northern Alpine margins, and indeed are in parts so sheltered from winter cold that fruit trees and even olive trees can be grown.

A continuous belt along the whole of the Alpine border of the plain, and another on the eastern part of the Apennine border,

may be termed the *Drier Margins*, as compared with the better-watered interior. On these margins, rather coarse material has been spread out by the streams ; it is often permeable and the water-table lies well below the surface, which is therefore dry and not remarkably fertile. In parts there are still some heath-lands or wood-lands, but most of the land has now been farmed. The productions are those which one would expect from the fact that the climatic conditions resemble those of the Rh&ne valley in the same latitudes on the other side of the Alps : maize is the chief grain crop, followed by wheat ; mulberry trees are grown for the culture of silk-worms, and there are vineyards and orchards.

The Well-watered Plains are of lighter material, and the soil is generally a fine and fertile loam. Much of the natural inequality of the surface has been obliterated in the construction of extensive irrigation systems. North of the Po, the water is derived from innumerable pools known as *fontanili*, which are mostly artificial reservoirs, fed by water which seeps out from below the coarser material of the drier margins, where this overlaps the finer deposits along the northern edge of the well-watered plains.

The water is available during the whole year, and during the winter and spring it has been kept at a relatively high temperature while beneath the surface of the northern margins. Consequently its warmth is very useful when in spring it is allowed to spread out over the meadows of the lower plains ; it aids the rapid growth of the grass, which is cut for hay six or eight times during the year. Cattle are stall-fed on this fodder, and milk and cheese are important products of the plain.

The streams, too, are used for irrigation, and the natural drainage system has been supplemented by canals ; some of these are employed also for transport. Irrigation is necessary for the flooding of fields for rice, grown either as an annually repeated crop or in rotation with others, such as maize and flax. There are also unirrigated areas dependent on the rainfall, and these also yield a great variety of products.

It is in this most thoroughly cultivated and extraordinarily productive region that the same field may be planted with lines of mulberry trees, with vines trained along them, and grain growing between the rows.

The *River-valleys* of the larger streams are generally broad and

liable to flood ; they are therefore less used and are avoided as building sites. The innumerable large villages and towns of all sizes in this densely populated plain usually stand away from the rivers ; it is noteworthy that between Turin and the sea there are only two cities on the River Po, and these, Piacenza and Cremona, are situated on the high banks on the outer side of the river-meanders.

The *Deltaic Areas* are of relatively recent formation, as is



[E.N.A.]

FIG. 62.—VIEW ON THE NORTH ITALIAN PLAIN.

Note.—Men are preparing a rice-field ; it is a shallow, rectangular basin irrigated from the canal shown in the background. On the banks are planted rows of pollarded poplar trees—a common feature of the landscape of the plain.

shown by the fact that Adria, from which the sea was named, is now 14 miles inland. The Po has seven distributaries ; these have deposited so much material that the other streams which once joined the Po, such as the Adige and Reno, have been forced into independent courses.

The rivers of this region have to be dyked to prevent disastrous floods, and reclamation like that of the Dutch polders has been undertaken. By the coasts, sand is washed southward by the counter-clockwise currents of the Adriatic, and sand-spits and dunes have cut off great lagoons.

The " *Hilly Enclaves* " are exceptional areas in the North Italian Plain, The largest is that of Montferrat, which may be thought of as a detached and lower portion of the Northern Apennines ; on its rounded slopes are orchards and vineyards and " Asti " wine is named from a town on its southern border.

In the north-eastern part of the plain rise the Berici and Euganean Hills ; they are formed partly of volcanic rock, from which trachyte was taken to build the palaces of Venice amid the coastal swamps and waters.

Communications and Cities.—The largest settlements are commercial centres whose positions are to a considerable extent related to the Alpine valleys which open upon the plain. The largest city, Milan, with well over a million inhabitants, is at the meeting-place of routes from the Simplon, St. Gothard and Spliigen Passes. Its nodal position, with roads and railways constructed from it to all parts of northern Italy, has helped to make it the most important commercial and industrial centre of the whole Kingdom. Water-power from the Alps has aided in its manufactures of silk and other textiles, and in engineering of all kinds; there is also much preparation of food-stuffs, and the city is a centre of book-production and publishing.

A similar development has occurred at Turin, where the route from the Mont Cenis Pass reaches the Po ; here, also, water-power from the Alps is used for a similar group of industries, including the construction of motor-cars and associated rubber manufactures. The population of Turin is approaching three-quarters of a million.

Where the more easterly and commercially less important Alpine valleys open upon the plain are a number of smaller cities, including Verona on the Adige.

An ancient route led from the crossing of the Po at Piacenza, south-eastward along the Dry Margins of the Apennines to the Adriatic coast, and along this route a series of towns grew up, including Parma, Modena and Bologna. The last-named city is the most important, for it is the crossing-place of the easiest route from Northern Italy, by the La Futa Pass through the Apennines, to Florence, Rome and southern Italy.

The one port along the difficult Adriatic shore of the plain is Venice, on the " safe " side of the Po estuary away from the current-drifted silt. Here, in the early Middle Ages, refugees from a Hun invasion of the mainland made a settlement on an

island. Later, Venice became the centre of trade with the East and arose to political as well as commercial dominance in the eastern Mediterranean. When the fall of Constantinople stopped the trade, the power of Venice declined, but its past wealth is still shown by the palaces standing by the canals which serve as streets. More recently the trade of Venice has revived, and there are plans to connect it by a ship-canal to **Milan** ; at present it has a permanent population of nearly a quarter of a million, and many visitors are attracted by its historic and architectural interest, and by the fashionable resort of the " Lido," the sand-spit which encloses its lagoon.

Peninsular Italy shows " Mediterranean " characters, with the exception of the north-facing part of the Northern Apennines. We have earlier made a distinction between the cooler part of the Mediterranean region in which the olive is the typical plant and the warmer part where the citrus fruits flourish ; following this distinction we may separate the peninsula into two sub-regions, central Italy and southern Italy, as shown in Fig. 63.

Central Italy.—The Apennines, the " back-bone " of Italy, consist of broad uplands which occupy a large proportion of the peninsula. In central Italy they curve round so as to leave a narrow coastal lowland by the Adriatic, while within the curve there is a wider area of generally hilly country facing the Tyrrhenian Sea ; thus there are three well-contrasted tract-groups in central Italy.

The Northern and Central Apennines.—The north-eastward curve of the Apennines shows some similarity with the outer, north-western portion of the curve of the Alps, for in both cases there have been overthrusts towards the outer side of the folded areas, and in both cases the rocks are largely either limestones, or flysch comprising sandstones, marls or clays. In central Italy the Apennines show the characters of more recent uplift, and broad terrace-like plateaus are divided by relatively narrow valleys.

The *Northern Apennines* are transitional in character, for they are " Mediterranean " only in the sheltered Riviera region. The climatic statistics for Genoa (see the table on p. 26) show that the winter temperatures are remarkably high for the latitude, and to such a degree that even citrus fruits here find **an** exceptional possibility of growth in the northern Mediterranean region. As in the French part of the Riviera, the tourist

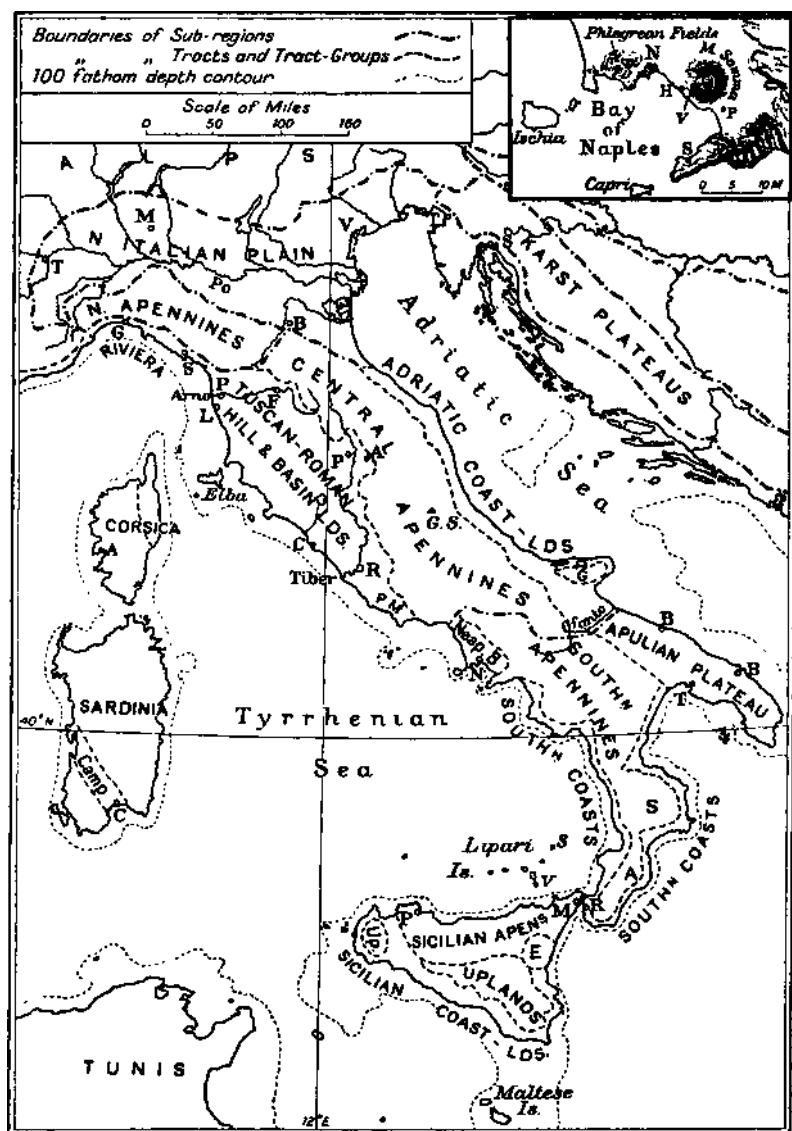


FIG. 63.—REGIONS OF THE ITALIAN LANDS.

industry has led to the rise of a chain of large and small settlements along the coast. Genoa is the great port, for behind it the Giovi and Bocchetta Passes give easy roads across the Apennines to the North Italian Plain, and thence by the Alpine routes to

central and north-western Europe. Around Genoa have grown up industries, especially, those connected with ship-building, and the population of the port numbers about 400,000 people.

Li a sheltered harbour farther east is the naval dockyard of Spezia. Near here the limestones of the Apennines have been metamorphosed into marbles which at Massa and Carrara have been for many centuries quarried and exported for buildings and statuary.

The Central Apennines.—These mountains rise to over 9,000 feet in the great limestone range of the "Gran Sasso d'Italia," the highest point in the peninsula. The more elevated areas are generally almost bare, and even at rather lower elevations there is little forest remaining; below the waste or *macchia*-covered heights there is a zone of chestnut woods, and the valleys are cultivated. In the *flysch* areas the peasants are menaced by land-slides and mud-streams, which result from heavy rainfall on the heights washing down unconsolidated marl and clay into the valleys. These "frane" rank with earthquake shocks as being as destructive in central Italy as the floods in the northern river-valleys, or as volcanic outbursts and earthquakes in the south.

On the plateau areas there is summer pasture for sheep and goats, and "transhumance" between the uplands and the lowlands on both sides of the peninsula is a feature of the life of central Italy. In the Apennine region east of Rome are deposits of *bauxite*, which are important as giving supplies of aluminium to Italy, a State rather lacking in mineral resources.

The Adriatic Coast-lands.—The low terraces of the eastern Apennines gradually descend to a coastal plain, which is very narrow for most of its length. It is, however, important in affording an easy land-route from the north to the south-east of Italy, and thence by sea to the Orient. In this part of the peninsula the coast is regular, with the exception of the spur-like promontory formed by the upraised and karst-like limestone block of Monte Gargano.

The Tuscan-Roman Hill-lands.—This is a region of complicated structure and correspondingly varied relief and character. There are hilly districts of ancient and crystalline rocks in which some iron, lead, quicksilver and other minerals are found; to these areas may be added the adjacent island of Elba, which yields iron ore. There are also districts of eruptive rock, and

others where recent volcanism has occurred ; the heat obtained from vapour from " fumaroles " is utilized in electrical power-stations. The Alban Hills south of Rome and the small lakes north-east of the lower Tiber are of volcanic origin.

Much of the region has been shaped by the erosion of sedimentary rocks of various composition, and the result is a land of numerous small ranges of hills, divided by narrow valleys or by wider basins. In general, it is fertile country producing the wheat, fruit, olives and wine characteristic of the northern Mediterranean region. The hills are often crowned by villages or small walled towns, built during earlier centuries in situations where defence was easy, although the peasants might have to go some distance to their fields. Perugia and Assisi, with their old buildings and beautiful outlook over the surrounding country, are small hill towns which attract many visitors.

By the coasts are small lowlands, once malarial marshes, but now reclaimed. South of Rome are what were formerly the Pontine marshes (" P.M." on the map in Fig. 63); here and by the mouth of the Tiber fields have been laid out and new cities have been built in the work of reclamation.

But if some features of the region are quite new, others are very old, for the history both of Tuscany and the Roman country goes back many centuries. Florence, on the banks of the Arno, with its palaces now used as museums and picture galleries, is still a rich treasury of mediaeval art and life, though around the old city tenement houses and factories of the machine-age have grown up, and raised its population to over a quarter of a million.

The chief port of the Tuscan area is Livorna (Leghorn) on the " safe " side of the mouth of the Arno. A few miles up the river is Pisa, once the port of Florence, but the silt of the river has destroyed its shipping trade, and, incidentally, proved an insecure foundation for the Campanile, which became the " leaning tower of Pisa."

Still older than the mediaeval buildings of Tuscany are the memorials of ancient Rome, the " Eternal City." In the beginning it was a small settlement built on " the seven hills " (merely the eroded banks of the Tiber and small side-streams) at a point where a narrowing of the swampy valley made crossing relatively easy. On this site the city became the chief town of Latium, and, when the power of its rulers increased, its central and accessible position enabled it to become the capital of their

extended dominions. In this respect the history of Rome resembles that of other capitals of Europe, but with the unparalleled growth of the Roman Empire it virtually became the centre, both politically and geographically, of the civilized world.

When the Roman Empire fell, Rome declined, but it recovered to some extent with the growth of the power of the Popes, and became the spiritual capital of the world. Yet although its central position in the Mediterranean made it a good centre for widely extended realms, it has no large productive area in its vicinity and it is off the main lines of commerce ; hence with the growth of trade near the end of the Middle Ages, Rome fell behind the other Italian cities in population, and its ancient buildings, streets and aqueducts continued to decay.

When, in 1870, the new Kingdom of Italy was formed, Rome became the political capital, while continuing to be the seat of the Papacy. The memorials of its ancient grandeur which remained throughout its chequered history, the many traditions of the past, and the reverence attaching to its spiritual eminence, —these have drawn to Rome visitors, and even residents, from all parts of the world.

Recently the growth of national feeling in Italy has led to restorations and improvements in the appearance of the city and to its development as the centre of the national life. Its population has increased, and now numbers considerably over a million people. Settlements have spread down the Tiber valley, where marshes have been reclaimed, but the chief port of the region is Civitavecchia, situated to the north, away from the sediment brought down by the river.

Southern Italy.—This is the part of Italy in which is experienced the full development of the "Mediterranean" characteristics of mild or even warm winters and pronounced summer drought, strikingly exemplified in the coastal regions on each side of the "toe" of the peninsula.

The Apulian Plateau.—On the Adriatic side, the low plateau of Apulia is exceptionally dry, and the limestone of which the region is formed is so permeable that there is no surface stream between the Ofanto and the far end of the "heel" of Italy, a distance of 150 miles. Nevertheless, there are fields of drought-resistant wheat, and the water-supply is carefully utilized for growing vines, olive trees and almond trees.

Round the coast there is a fairly considerable population, and

Bari and Taranto are fair-sized towns. Brindisi, which has a good natural harbour, is the port for traffic which has come as far as possible by the quick over-land route for mails and passengers to the East.

The Neapolitan Basin.—On the opposite side of the peninsula is the Neapolitan Basin ; it is separated from central Italy by uplands which extend from the main mass of the Apennines to the coast of the Tyrrhenian Sea. In the lowland around Naples the winters are appreciably warmer than at Rome, and warmer even than on the sheltered Riviera ; consequently the citrus fruits grow well. The Neapolitan Basin is an area of subsidence surrounded by macchia-covered limestone heights, and within the region are both alluvial and volcanic deposits ; here, as in several parts of southern Italy recent volcanism has important geographical consequences.

West of the town of Naples are the " Phlegrean (burning) Fields," a volcanic area in which small craters are to be seen and the " solfatara " still emit steam and hot, muddy water (see inset map in Fig. 63). East of the town the great cone of volcanic ash of Vesuvius rises to about 4,000 feet, capped by clouds of steam which occasionally rise to a glowing column ; at intervals there are outbursts of ash and streams of lava pour down the sides. Vesuvius stands within the broken crater of what was once a much greater volcano, Monte Somma, whose eruption in A.D. 79 destroyed part of its cone and overwhelmed the ancient cities of Pompeii and Herculaneum.

The lava of Vesuvius weathers to such a fertile soil that the peasants take the risk of cultivating the slopes for vineyards and orchards. Indeed, the Neapolitan basin in general is very productive ; besides grain, fruit and vegetables, tobacco and hemp are grown, and the region is densely populated.

The city of Naples is primarily the market and port of this productive area, and also for the wider region of southern Italy, of which at one time it was the political capital. There has been a recent growth of industries of various kinds, and there are many hotels to accommodate the visitors drawn especially by the interest of Vesuvius and the beauty of the Bay of Naples. The population of the city now numbers about one million.

The Southern Coasts.—From the Neapolitan Basin southward, and around the coasts of Calabria, the " toe " of Italy, are many small patches of lowland and stretches of terraced hill-sides on

which there is an intensive cultivation of vines and olives, figs and almonds, oranges and lemons.

Around these coasts and farther east on the peninsula of Apulia are the remains of Greek settlements, temples and statues, for here was "Magna Grsecia," a region of Greek colonial expansion long before the rise of the power of Rome.

Facing the Strait of Messina is Reggio, a "ferry-port" for the narrow crossing to Sicily. The break between the peninsula and the island is due to faulting, and the earth's crust is here still so unstable that an earthquake in the early part of the present century reduced both Reggio and Messina almost to ruins.

The Southern Apennines.—Although at several points fertile valleys lead through these mountains, the uplands are less productive than in central Italy; the flysch districts are often poor and the limestone areas bare. In the far south the structure is different: the Sila mass (marked "S" in the map) is formed of granite and other crystalline rock, and has rounded heights reaching to over 6,000 feet, while Aspromonte ("A") is of gneissic rock, has sharper outlines and is of rather greater elevation. Although the highest parts are snow-covered in winter, the middle slopes bear deciduous trees and the lowest parts have extensive chestnut plantations. On the Sila there are great water reservoirs intended both for irrigation and for the supply of electricity for industrial development.

Sicily is essentially part of southern Italy. Its northern heights may be termed the Sicilian Apennines, for across the Strait of Messina appear mountains of gneiss like those of Calabria, while the rest of this area is mainly formed of massive limestone uplands.

By the east coast the great volcanic cone of Etna rises to a generally snow-clad summit 10,000 feet in height. Like Vesuvius, its slopes have small craters and lava-streams which menace the olive-yards, vineyards and dwellings of the very considerable population which has invaded it.

The rest of Sicily is, in the main, a much-dissected plateau of sedimentary rocks with a lower coastal zone, and these, too, have been well utilized. The interior of the island grows much corn, especially wheat, and by the coasts is an intensive cultivation of fruit, for which the climate is specially favourable.

But the sirocco wind, felt throughout the central and southern parts of the Mediterranean, blows here frequently and very

unpleasantly. It is a southerly wind accompanying the passage < of depressions along the Mediterranean Sea, and it brings very hot and dust-laden air from the North African desert.

A minor resource of Sicily is sulphur, but this is now of less importance than formerly. Many tourists come to enjoy the warm and sunny climate, the beautiful scenery, especially in the neighbourhood of Etna, and the memorials of ancient Roman and Greek occupation. With its varied resources, and the export of much wine and citrus fruit, the island supports quite a dense population. On the east coast is the port of Catania, with a quarter of a million inhabitants, while on the north coast the capital, Palermo, has nearly half a million people.

The Lipari, or Molian, Islands, which emerge steeply from the Tyrrhenian Sea, are of volcanic origin; Stromboli is almost constantly in eruption, and on the island Vulcano, from which the name volcano was derived, there is occasional activity.

The Maltese Islands are small limestone areas which rise from the shallows separating the eastern and western basins of the Mediterranean. They are most thoroughly cultivated, and are extraordinarily densely populated. They are a British possession, valuable as affording a port of call and a naval base on the Mediterranean route to India and the East.

Corsica and Sardinia.—In the main, these islands are composed of great masses of granite and other crystalline rocks which have been caught up among the folds of Alpine date. They are the highest parts of a belt of the earth's crust which has escaped the great subsidence of the Tyrrhenian Sea on the one side and of the western basin of the Mediterranean on the other. A rift-valley cutting off the south-western corner of Sardinia stands only just above sea-level and gives a lowland, the Campidano, which is exceptional in these high and cliff-bordered islands.

The very irregular relief and considerable altitude of much of the land would greatly limit cultivation, while parts of the coastal lowlands and the Campidano of Sardinia are naturally swampy and malarial. There have been recent improvements, but on the whole human agency seems to have brought about a deterioration of the natural conditions, for the widespread destruction of forest has led to the growth of almost valueless maquis over a great deal of the country.

Olive-yards and vineyards are cultivated at various parts of the coastal belts of both islands and in the Campidano lowland,

while on the uplands there are rather poor pastures for sheep and goats. Sardinia has a considerable amount of ores of lead, zinc and iron, and these are exported for smelting in Italy.

The capital of Sardinia, Cagliari, is a rather small town, and Ajaccio, the capital of Corsica, is still smaller, though it is the centre of a tourist industry attracted by the natural beauty of the island.

Sardinia is the least populous part of the Kingdom of Italy ; with about the same area as Sicily it supports only about a quarter as many inhabitants. Similarly, Corsica, which is one of the " departements " of France, ranks among the least densely populated areas of that country.

QUESTIONS

1. **Write** an account of agriculture in the North Italian Plain, tracing as far as you can the causes of the facts you adduce.
2. Make a reasoned study of the cities of North Italy, with special reference to their commercial and industrial development.
3. **How** far is it true that the Apennines are an unproductive barrier between the productive lowlands of Italy ?
4. What differences of climate can be observed in Peninsular Italy (apart from mountain regions) ? Show how these differences are related to the positions and productions of the various parts of the Peninsula.
5. Make a study of Rome and its evolution in relation to its site and its position both in Italy and also in the Mediterranean Lands as a whole.
6. Compare and contrast the islands of Sicily and Sardinia in as many respects as possible.
7. Examine the mineral resources of Italy with special reference to its industrial activities.
8. State and account for the broad features of the distribution of population in the mainland territory of Italy.

THE IBERIAN PENINSULA

Introduction.—Although the Iberian Peninsula almost forms a bridge between Europe and Africa, for long periods it has remained apart from the main currents of human life, as it points south-westward, away from the older regions of civilization, towards the Atlantic Ocean and towards a corner of Africa which is itself separated by desert from the wider world of men.

Yet it was from north-western Africa that, about A.D. 700, the Moors overran the Peninsula as far as the mountains of the north. For a period of about 400 or 500 years they dominated much of the country, and their influence is still to be seen in many ways, especially in the south, where they maintained themselves longest. Here are the "huertas," the "gardens," in which the most intensive forms of cultivation are carried on by methods of irrigation brought from Africa; here are mosques and other buildings of "Oriental" aspect, while the costumes, words, names and even the physical appearance of some of the people bear further witness to the Moorish occupation.

The Pyrenees almost cut off the Peninsula from the rest of Europe, while other highlands hinder movement across it and to a large degree isolate its most habitable parts from one another. We will therefore first examine its relief and structure from this point of view.

Relief and Structure.—There are three main elements in the structure of the Iberian Peninsula (refer back to Fig. 58). First, there is the Hercynian massif, the broad upland known as the Meseta, which forms the greater part of the west and centre of the Peninsula. An ancient peneplain was raised to form a ridged and dislocated plateau at the time of the Alpine disturbances. As a whole the Meseta was tilted with a slope from its high eastern margin down towards the Atlantic, and in this direction flow the Rivers Douro, Tagus and Guadiana. In the north-west, however, the Galician portion of the massif drops by fault-edged coasts to the ocean.

Also, dislocations within the Meseta area have uplifted a series



FIG. 64.—REGIONS OF THE IBERIAN PENINSULA.

of resistant blocks in the region of the Central Sierras, namely the Sierra de Gata, the Sierra de Gredos and the Sierra de Guadarrama.

On each side of this central highland region warpings of the Meseta have formed two shallow upland basins, those of Old Castile and New Castile, in which have accumulated deposits mainly of Tertiary and later age. In the high basin of Old Castile, the waters from the surrounding mountains collect to form the Douro, which flows slowly over the fairly level surface of the basin as far as Zamora; below this town the river runs more swiftly and has cut through the upland area marked on the regional map as the Douro Plateau, first by a gorge in the south-westerly part of its course and then by a wider valley where it flows more directly westward to the Portuguese Coast-lands,

In the high basin of New Castile, the Tagus and the Guadiana similarly run slowly and have relatively shallow valleys in the basin area, and have cut more marked valleys where they cross

the older rocks in the region which may be termed the Tagus-Guadiana Plateaus.

The second main element in the structure of the Peninsula consists of the highlands due to the foldings and thrusts of the Alpine type. In the north are the Pyrenees, continued westward in the Cantabrian Mountains behind the north coast about as far as Oviedo, where the folded mountains are welded, as it were, into the north-western corner of the Meseta. In the south are the ranges forming the Andalusian, or Betic, Cordillera, which appear to swing round from north-west Africa and the Strait of Gibraltar north-eastward, breaking down at Cape de la Nao under the Mediterranean Sea, but reappearing in the Balearic Isles.

To these fold mountains of definitely Alpine type may be added two other upland areas which were raised as a result of the same series of disturbances : the relatively narrow Catalanian Mountains which shut off the Ebro Trough from the Mediterranean, and the broad mass of the Iberian Highlands where Secondary limestones previously laid down upon the Meseta were uplifted to form its high eastern edge.

The third element in the structure is shown in the lower lands, generally areas of dislocation and subsidence, which border the upraised tablelands and mountains, and are floored by sedimentary deposits of Secondary, Tertiary or later age. Of this type is the Ebro Trough, whose steep south-western wall is the fault-bounded edge of the Meseta, but which rises more gradually on its northern margin to the Pyrenees. From all sides it collects the waters to the River Ebro, which meanders through the lowlands of the Trough and then cuts a narrow and tortuous course through the Catalanian Mountains to the sea.

Of rather similar formation is the Andalusian Trough, above which rises the rampart of the Sierra Morena, while the south-eastern side rises by hills and plateaus to the Andalusian Cordillera ; unlike the Ebro Trough, however, it is open to the ocean, and the Guadalquivir flows to the Atlantic through a broad, delta-like lowland.

The eastern highlands of Spain break down towards the Mediterranean in a series of great curves, and within these curves, between the mountains and the sea, are a number of lowlands important as areas of production and population.

The Portuguese Coast-lands are of composite formation. In

the north the ancient rocks of the Meseta sink gently to the coast; south of the Douro is an area of subsidence floored by relatively recent deposits; south of this area a line of heights extends westwards from the Central Sierras to the hills of Cintra behind Lisbon—this line may be conveniently termed the Cintra Hills; next follows another lowland of recent deposits, through which the Tagus winds slowly to the Atlantic; then the platform of the Meseta reaches to the Atlantic and its south-western corner projects in Cape St. Vincent; finally a low coastal strip forms the southernmost part of Portugal.

The consequence of the structure of the Peninsula is that the upland of the Meseta and the fold mountains together bar easy communication across the Peninsula in any direction; the lower and more populous areas are cut off from one another to an unusual degree. The Peninsula has therefore been described as a region of isolations.

Climates.—The position and relief of the Iberian Peninsula together give it a strongly contrasted set of climatic conditions.

In the first place, its northern part is in the climate belt in which cyclonic conditions are common throughout the year. The north-west is so exposed to the Atlantic on two sides that it has the oceanic temperate type of climate (refer back to Fig. 15). The figures on p. 26 show that Santiago, in Galicia, in spite of being over 800 feet above the sea, has rather warmer conditions, both in summer and winter, than Brest, while it has a heavier rainfall than any other place mentioned in the table except Bergen. Conditions are not greatly different along the well-watered Cantabrian region, and in this northern belt a lack of rainfall becomes noticeable only on the southern side of the Pyrenees.

The "Mediterranean" climatic region begins to the south of the northern belt of the Peninsula, but the differences of relief allow the typical Mediterranean conditions to be experienced only over parts of the area. The high Central Sierras have a relatively heavy rainfall and relatively low temperatures, and thus lack both the drought of summer and also the mildness of the winter; their climate is, indeed, similar to that of north-western Europe. The Iberian Highlands region and the high Basin of Old Castile have summer drought, but over most of their area the winters are too cold for the growth of the olive (see Fig. 18), and on this account can scarcely be regarded as

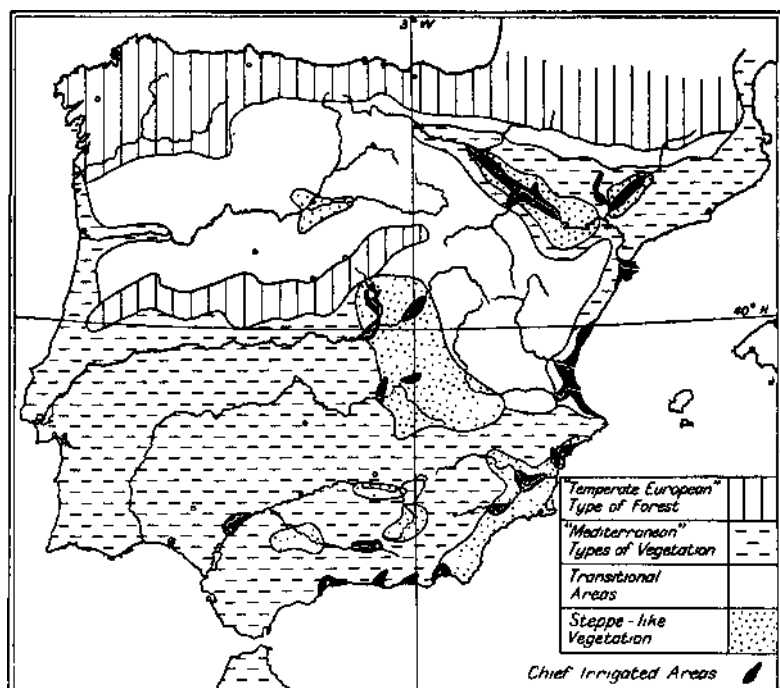


FIG. 65.—NATURAL VEGETATION-TYPES AND IRRIGATED AREAS OF THE IBERIAN PENINSULA.

having a truly Mediterranean climate. The Douro Plateau region is also transitional in regard to climate, for only its more sheltered valleys, not the exposed uplands, are mild and dry enough for the typical Mediterranean products.

Of the remaining regions of the Peninsula, the greater part may be classed as having the Mediterranean climate, and olives are grown in all areas except where the altitudes are too great. But on the eastern side of the Peninsula, barred by highlands from the moisture-bearing winds of the Atlantic, the summer drought is so long, and even at other seasons the rain is so little, that the climate almost approaches that of the semi-deserts.

In the driest areas irrigation is needed to obtain the common Mediterranean products ; the natural vegetation is very scanty and the growths are like those of the steppe-lands, esparto grasses being at one time the characteristic plants of the more southerly of these semi-arid regions. Because of the natural vegetation, the drier parts of the eastern lowlands of Spain are

sometimes described as having the steppe type of climate, but they do not have the cold winters of the true steppes.

The map in Fig. 65 shows the broad distribution of some of the forms of natural vegetation, and from this distribution some of the more significant climatic conditions may be deduced.

One important feature of the climate remains to be described. The broad and high areas of the central part of the Peninsula are greatly heated by the sun in summer, and greatly cooled by outward radiation in winter. Consequently the annual range of temperature is greater than in other parts of the Mediterranean region, and the table on p. 26 shows that at Madrid it is 36° F. The daily range is also great, especially in summer, and the mean annual maximum at Madrid is 104° F., a figure higher than that given for any other station in the table, although Madrid stands at a height of more than 2,000 feet above the sea. The winter nights are frequently bitterly cold, and the figures show that at Madrid, although the average January temperature is 40° F., the mean annual minimum sinks to 14° below freezing-point.

As a result of this contrast between summer and winter, something like a small monsoonal condition tends to occur over the Peninsula; the summer becomes a season of considerable heat, with relatively low air-pressures and in-blowing winds, while the winter is a season of cold, with relatively high air-pressures and out-blowing winds. Yet it must not be supposed that these systems develop to a degree which brings about the summer rain and winter drought typical of a monsoon climate; the general conditions of the Atlantic wind systems and the paths of depressions give the normal conditions of winter rain and summer drought to the greater part of the Peninsula.

Constituent Regions.—The marked differences in relief and in climate necessitate a division of the Iberian Peninsula into a relatively large number of sub-regions of contrasting characteristics.

The Northern Mountain Regions.—*Galicia* is mild and well watered, and has forests of "mixed" character. Apple trees are common, and from them cider is obtained as a common drink of the people; the vine, mulberry and fig trees are grown, and maize is the chief cereal. There is much meadow-land and cattle-rearing is an important element in the farming. The "drowning" of the coast has given good harbours, and encouraged maritime pursuits; in *Galicia*, *La Corufia* (*Corunna*)

and Vigo are fishing ports, and the latter is a port of call for liners, while the deep and almost land-locked harbour of Ferrol is a Spanish naval station.

The Minho is the largest river of Galicia, and its tributary the Sil comes from a more inland area ; consequently this tract of the Upper Sil is drier, less productive and has fewer inhabitants than Galicia, which ranks among the more populous regions of Spain.

The Cantabrian Cordillera.—Here the climate and productions are broadly similar to those of Galicia, but the granitic block gives place eastward to sedimentary rocks and near Oviedo a Carboniferous basin yields the most important supply of coal in the Peninsula. With coal and other minerals found in the same district Oviedo has become an industrial town, with Gijon as its port, and this province of Asturias is fairly well populated.

Farther east, limestones folded in the "alpine" disturbances rise to nearly 9,000 feet and form one of the highest parts of Spain, making an effective barrier between the north coast and the inland areas of Leon and Castile. There are, however, passes behind Santander which enable that town to serve as a northern outlet for the interior.

The Basque Mountain Region links the Cantabrian and the Pyrenean mountains, but its lower elevation gives relatively easy routes from France through Old Castile to central Spain.

For a mountainous region, the Basque country is productive, obtaining the same commodities as the more westerly regions of the northern belt, and it has a number of towns of moderate size. The largest is Bilbao, which owes its importance mainly to the occurrence of iron ore ; this is found near the deep inlet which forms a good harbour from which part of the ore is exported, while the rest is smelted at Bilbao with imported coal.

This coastal region and that of Catalonia are the two most densely populated and most highly developed parts of Spain, and in each case the character of the people has been an important factor in their advance. The Basque people are distinguished by qualities of industry and energy as well as by their retention of an ancient language, old customs and a tenaciously held tradition of a nationality different from that of the other inhabitants of Spain. It should be noted that the region here marked out on a geographical basis does not quite correspond with that occupied by the Basque-speaking people, for it extends

farther to the south than their country, while many Basques live in the Pyreneean region, even across the French frontier.

The Pyreneean Region.—These mountains are not one "range"; they are composed of a broad belt of highlands, with a longi-



[French Railways—National Tourist Office.]

FIG. 66.—VIEW OF THE CIRQUE OF GAVARNIE.

Note.—The Cirque of Gavarnie is on the French side of the water-parting of the Pyrenees, which here forms the political boundary. It is one of the most striking witnesses of past glaciation: a colossal amphitheatre two miles across, whose vertical sides rise in terraces to a height of about 5,000 feet above the floor of the rock basin. The summit shown in the view is about 10,000 feet above sea-level, and a mile or two behind this is Mt. Perdu, the culminating peak of the Pyrenees.

tudinal axis of crystalline rocks and with folded and faulted sedimentary strata on both flanks.

The crystalline zone is widest and highest away from the Atlantic and the Mediterranean; in this central area a number of peaks reach over 9,000 feet, the lowest passes are well over 6,000 feet and crossing is very difficult. The difficulty is

increased by the cirque formations, due to glaciation in the Ice Age, which give abrupt ends to the valleys. One of the most striking features of the scenery is the huge amphitheatre of the "Cirque of Gavarnie," which is overlooked on the Spanish side by Mt. Perdu, over 10,000 feet in height.

At each end of the region the contorted and broken sedimentary rocks, often limestones, occupy more of the area, and these are most widely developed on the southern side. Here they have been eroded into irregular tilted plateaus, whose steep scarps are so notched that they are called "Sierras," i.e. "saws."

Where the high crystalline region gives place to the lower areas of the two ends, railway routes have been constructed which tunnel below the passes connecting the Spanish and French valleys. The western line runs northward from Zaragoza by the Somport or Canfranc tunnel (marked "S" on the regional map), and the eastern one northward from Barcelona by the Puymorens tunnel ("P" on the map); the main railway traffic from the Iberian Peninsula, however, still goes by the routes skirting the seaward ends of the region.

On the Spanish side precipitation is generally scanty, and the chief resources are the rather poor pastures; here the aspect of the country is often barren and settlements are rare.

The Portuguese Coast-lands.—In the coastal region south of the Minho watershed, the climate is clearly "Mediterranean," as is shown by the temperature and rainfall figures for Oporto on p. 26.

In the *North Portugal Lowland*, marked "a" on the regional map, the warmth and the ample precipitation combine with fertile soils to allow a wide range of products; these, include both those, such as maize, which are characteristic of the warmer parts of Temperate Europe as well as the wheat and fruits of the Mediterranean Lands. Here is Oporto with an export trade of "port" wine, made from the grapes grown along the valley of the Douro where it cuts through the adjoining plateau. Taken as a whole, this northern part of the Portuguese Coast-lands is one of the most productive areas of the Iberian Peninsula.

The *Cintra Hills* ("b" on the map) are abundantly watered, and have woods of chestnut, pine and oak as well as groves of orange and lemon trees.

South of the Cintra Hills, the *Tagus Lowland* (marked "c") tends to suffer from a lack of water. Much of the area is occupied

by poor pastures or the maquis type of vegetation, though in the neighbourhood of the River Tagus grain and olives are produced to a considerable extent. Centred upon Setubal are two other resources : fishing, especially of sardines, and the extraction of salt from coastal lagoons.

On the shore of the Tagus estuary stands Lisbon, the capital of Portugal, in a convenient position mid-way along the coast of the country ; the city has a population of about two-thirds of a million people. Lisbon has a beautiful situation overlooking the broad, lagoon-like estuary and extending by terraces up the slopes of the Cintra Hills. Yet it is in a part of the Peninsula where crustal instability still persists, and less than two centuries ago an earthquake destroyed the western part of the city and cost scores of thousands of lives.

The *South Portugal Uplands* (marked " d "), where the Meseta extends to the Atlantic, are noteworthy as having the chief mineral resources of Portugal; near the Spanish frontier there is a considerable development of copper-mining.

The *Algarve Lowland* (marked " e ") has a fertile soil and a south-facing aspect, and obtains water from the adjoining uplands. With a closely settled and hard-working population deriving methods of cultivation from the Moorish occupation, it is an area of great productivity, and in addition there are a number of fishing settlements along the coast.

The Douro Plateau.—Into this upland the rivers have cut deep valleys. The south-westerly course of the Douro is rapid, and encumbered by reefs, and the valley walls are sometimes canon-like. Where the river resumes its westward course the valley widens, and on the terraced slopes are olive-yards and vineyards; the difference of vegetation types is shown in Fig. 65.

On the upland parts are heaths and pastures, while wheat and the Mediterranean fruits are grown in the more favourable valley areas. There are no large settlements, and as a whole the region is not well populated.

The Basin of Old Castile.—The larger part of this region lies at an altitude of about 2,500 feet, but it is enclosed by still higher areas ; consequently it is relatively little influenced by winds from the sea and its climate is marked both by a cold winter (Valladolid has a mean January temperature lower than that of London) and also by a lack of water, particularly in summer (Valladolid has a mean annual rainfall of about

12 inches, of which less than 2 inches fall in the summer season).

Moreover, the daily range of temperature is great, and often the ground is subject to rapid alternations of frost and thaw, while in summer it may be cracked by drought and heat. In addition, the soils which have developed upon the Tertiary and other deposits have, over considerable areas, a high salt content.

Under these conditions neither the forests of Temperate Europe nor the fruit trees of the Mediterranean region can have a wide distribution; the natural vegetation consists of the poorer growths of the Mediterranean type and in the driest areas approximates to that of the steppe-lands.

There are, of course, differences within this sub-region. For example, the higher northern and eastern margins are relatively bare, and often of stony appearance; around Burgos and Valladolid wheat is grown and large flocks of sheep are kept; south of Valladolid pine plantations are the chief resource; in the south-west of the region the less severe climate allows the cultivation of cereals, sugar-beet and even vines.

Valladolid is the centre of the railways and roads which traverse the region, and the other towns of moderate size are on the margins where these routes cross the encircling highlands.

The Central Sierras.—These high ranges, which rise to about 8,000 feet, have a fairly heavy precipitation, and on their highest parts the winter snows may last even till June. The deciduous forests of earlier times have now been largely destroyed and migratory pasturage is the chief resource, apart from farming in the valleys.

Although the steep slopes of the Sierras often present the appearance of colossal mountain-walls, there are gaps between them which offer routes connecting the more populated regions on either side.

The Tagus-Guadiana Plateaus have a somewhat similar structure and relief to those of the Douro Plateau, though the main river-valleys are in general broader and in parts open out into almost lowland areas. In consequence there is here a greater proportion of farmed land, and also the warmer climate allows the growth of the Mediterranean group of productions.

In this extensive sub-region three tract-groups may be distinguished. The western area, marked (1) on the map, is the best watered and therefore the most productive. The eastern

area (2) is more arid and more extreme in climate, and it can support only a rather scanty population ; on the north-east margin is Toledo. The southern area (3), which includes the irregular and in parts even rugged country of the Sierra Morena, is distinguished from the other plateaus by its mineral wealth ; mercury is obtained at Almaden ; copper is mined in the Rio Tinto district, and is in part smelted in the neighbourhood, in part exported from Huelva ; farther east some lead, zinc and coal are found ; on the south-east margin north of Linares lead is mined and smelted.

The New Castile Basin.—The temperatures here are normally higher than in Old Castile, and aridity is a common characteristic of the climate. Among the unpleasant weather conditions are the dust-storms of summer and the snow blizzards of winter. In the south the streams have an uncertain flow ; the upper Guadiana in normal conditions loses its water in the gravel of its bed and has an underground course for several miles, and the Manzanares, the small tributary of the Tagus on which Madrid stands, is completely dry for half the year.

Much of the region has a rather desolate aspect, like that of a poor steppe-land. There are, however, some fairly wide areas in which wheat and barley can be grown, and oasis-like valleys in which there are olive plantations and vineyards. Also, especially near Madrid, there are irrigated huertas, which stand out in strong contrast to the surrounding country.

The one large settlement is Madrid, which rose to importance only when, in the sixteenth century, it was made the capital of Spain ; for this purpose it was well situated, in the centre of the country and at the meeting-point of the chief roads. Now the railways converge upon it and it has become the centre of inland commerce with about a million inhabitants.

The Iberian Highlands.—This region comprises a group of plateaus relatively little raised above the centre of the Peninsula, but descending steeply by step-faults to the Ebro Trough. The rivers have cut deep valleys ; some of these, like the Jalon tributary of the Ebro, give routes into the interior, and some open out into wide areas or even productive basins. Other rivers, however, have canon-like valleys of little use even for roads ; this is particularly the case with the Jucar, Guadalaviar and other rivers in the southern part, and consequently Valencia and the neighbouring Mediterranean Coast-lands are

almost completely cut off from the Basin of New Castile and Madrid,

With a severe climate, the Iberian Highlands are in general unproductive and poorly inhabited.

The Ebro Trough.—This region is so shut off from maritime influence that it has a very scanty rainfall, Zaragoza receiving about 12 inches a year, and the soils often contain salt or gypsum and are generally infertile.

The margins of the region have the maquis type of vegetation, while the central portions are largely treeless steppes and in parts are even salt-wastes. Only where the waters of the Ebro and its tributaries are led out by canals is the generally desolate appearance of the country relieved by continuous ribbons of green ; in these irrigated valleys of the Ebro, Jalon and Segre are produced corn, beetroot, vegetables, olives and vines.

The upper part of the Trough, above Zaragoza, is better watered and the only part where the population is not very scanty, apart from the irrigated areas. Zaragoza is the one large city, situated in the centre of the routes which cross the region.

The Ebro is of little value in linking the region with the Mediterranean Sea, for its winding course is not navigable for large vessels and the delta is too shallow for sea-going ships.

The Catalanian Mountains are better watered, and the area includes a number of river valleys and interior basins in which the typical Mediterranean productions are obtained to a considerable extent; also there are some coal, salt and mineral springs. Together with these natural advantages must be considered the character of the people ; the Catalonians have shown themselves to be enterprising and active in mind and body. Hence the resources have been well utilized, industrial developments have been fostered, and even within the mountain region are areas of relatively dense settlement.

The Andalusian Trough.—Open to the Atlantic, this region has a greater rainfall than the Ebro Trough, but because of its more southerly latitude it has a marked period of drought in summer and higher temperatures throughout the year. Parts of the region have only the steppe type of vegetation, but others bear cereal crops. Below Cordoba the valley of the Guadalquivir is more fertile ; cereals, beet and vegetables are largely produced, and the Mediterranean fruits can here ripen to perfection. The natural water-supply is supplemented by irrigation,

and for this the Guadalquivir is particularly favourable, for the snow of the high Sierra Nevada and other ranges feeds its head-streams long after many of the rivers of southern Spain are reduced to a mere trickle or even run dry.

Below Seville is a swampy area, and along the sea-board of the region are marshes and lagoons from which salt is obtained.

In Cordoba and Seville are beautiful buildings, examples of the architecture of the time when the cities flourished during the Moorish occupation. Seville is still the most important trading centre in the south of Spain; with varied manufactures, especially of cotton and other textile goods, it has a population of about a quarter of a million inhabitants. Cadiz has a good situation as a port-of-call for Mediterranean traffic, and is a centre for the production and export of "sherry," the wine named from the neighbouring town of Jerez.

The Andalusian Cordillera.—This region includes two zones : (i) a northern area of moderate height, formed mainly of limestones and flysch ; (ii) a southern area formed largely of schists and other crystalline rocks, which rises to the Sierra Nevada, the highest part of the Iberian Peninsula. Between the two zones is a narrow interior belt comprising a series of valleys linking broader basins.

The higher crystalline zone reaches over 11,000 ft. in the Sierra Nevada, and cirques and mountain-lakes show the effect of past glaciation. It is well watered, but the woodlands which once covered the mountains are now almost gone. The snow on the heights lasts till late summer and the water is used both in the valleys of this region and on the neighbouring coast-lands. The valleys on the southern side are very productive : olives are grown to an altitude of over 3,000 feet; chestnut, mulberry and walnut trees to over 5,000 feet; rye and potatoes even above 8,000 feet. The sedimentary zone of the Andalusian Cordillera is in general poor country of maquis, with several steppe-like tracts and relatively small productive areas ; some of the limestone uplands have typical karst characteristics.

The narrow interior belt of valleys and basins is important as giving opportunities for communications ; also cultivation is favoured by water from the southern heights, and some of the basins have considerable populations. The vega¹ of Granada is still prosperous, though the town has lost the importance which

¹ " Vega " is the Arabic word for " huerta,"

it had when it was the capital, and the last bulwark, of the Moors in Spain ; the beautiful palace of the Alhambra, which overlooks the city, is a famous memorial of Moorish architecture.

Where the interior belt is cut by the Strait of Gibraltar, it descends into the bay named Algeciras, from the town on the western shore. The eastern side of the bay is formed by the steep-rising limestone mass of the Rock of Gibraltar, and here have been constructed the British fortress and dockyard to protect British interests in the Mediterranean route to India and the East,

The Mediterranean Coast-lands.—This term is used to denote the lands bordering the Mediterranean Sea, which are sufficiently low to have the typical Mediterranean products ; they comprise four tracts, which may be named after the chief towns : Barcelona, Valencia, Murcia and Malaga. '

, *The Barcelona or Catalanian Coast-land* has an irregular relief, and in parts is cliff -bordered . The greater part of the land is productive, and irrigation supplements the rainfall, especially for growing vegetables for the use of Barcelona and other towns of the region, as well as for export; much of the Ebro delta is devoted to rice cultivation.

The characteristic development of the Catalanian Coast-land is, however, industrial. At numerous smaller centres as well as at Barcelona there are manufactures of the various textiles and of machinery, glass and chemicals ; the work is carried on with the aid of imported coal, and with electric power derived largely from the Pyrenees and Catalanian Mountains. Besides being the largest industrial city, Barcelona is the chief port of Spain, and is also the cultural centre of the Catalanian people ; consequently the city is now the greatest in the Peninsula, having a population of over a million inhabitants.

The Valencia Lowland.—This region differs from that north of about latitude 40° in two respects. In the first place, it is an almost unbroken lowland, floored by relatively recent deposits or river alluvium. In the second place, it has higher temperatures and a very marked summer drought; hence much of the region is naturally of the steppe-land type. Now, however, there are only small " islands " of esparto grass, and very large areas have been converted into extraordinary productivity by irrigation.

The Guadalaviar, Jucar and other streams bring water from

the highlands, which is led out over the almost level country by a multitude of channels, and wheat, maize and barley, flax and hemp, rice, vegetables of all kinds, vines and olives, mulberries and pomegranates, almonds and oranges are obtained by intensive cultivation ; in the case of the grains and vegetables a careful rotation of crops allows more than one harvest in the year.

With an abundance of water, no great engineering schemes are



FIG. 67.—VIEW IN ELCHE.

[E.N. A.]

Note.—This is almost the only region in Europe in which date-palms flourish and ripen their fruit. In Elche there are about 80,000 trees ; these are well adapted to the occasional droughts by their deep roots, which draw water stored in the subsoil for a considerable period. The view shows the road from Elche to Alicante, with an irrigation-channel beside it. Observe the short shadow cast by the covered mule-cart—an indication of the altitude of the sun, and hence of the relatively low latitude.

required ; the method of irrigation is simple, although elaborate. The owners of the land have a right to a share in the water, and only rarely does drought necessitate a limitation of the supply.

A dense population finds work and subsistence in the region. Denia and Gandia have their names associated with the fruit sent abroad, but in Valencia is concentrated much of the commercial life of the region, and, with industries also, it has a population of about one-third of a million persons.

The Murcia Coast-lands.—Here the temperatures are still higher, while the rainfall is less and very variable ; occasional

floods may destroy the irrigation works, and droughts may cause the supply of water to be deficient or even to fail. Hence irrigation is mainly limited to the neighbourhood of Murcia, where the Segura brings water from a wide catchment-basin, Lorca, on a tributary of this river, Alicante and Elche.

Also, the organization of the system is different. Great barrages and costly canal construction are necessary, and the proprietors of these irrigation works sell the water to the owners or tenants of the land. When supplies are deficient, the price is raised and the cultivators may be seriously affected, both by the lack of water and by the cost of the small amount which they can procure.

The agricultural production of this region is similar to that of the Valencia area. In addition, minerals are obtained, especially lead and iron, from near Cartagena. This port sends out the ores and the fruit of the region, and having a good natural harbour is the chief Mediterranean naval station of Spain.

The Malaga Coast-lands are formed in part by relatively small areas of lowland, such as those of Almeria and Malaga, where there are vegas, and in part by the terraced south-facing slopes of the Andalusian Cordillera. In this region there is a better rainfall than on the eastern coasts, and a more ample water-supply from the highlands. The summer heat is sufficient even to allow the growth of bamboos, sugar-cane and banana trees. From the ports of Malaga and Almeria, wine and grapes are largely exported, and also iron ore from the adjoining uplands.

The Balearic Islands, of which the largest are Majorca and Minorca, continue the direction and the structure of the Andalusian Cordillera, and are in part mountainous, in part lowland. The uplands have large areas with the maquis type of vegetation, though their borders have terraces for olives, vines and carob trees; on the lowlands, irrigation is utilized for cultivation and almonds are produced in great quantities for export. Palma is a town of moderate size, and as a whole these islands are more productive and more densely populated than Corsica and Sardinia.

QUESTIONS

1. Describe the structure of the Iberian Peninsula, and indicate how it has influenced other factors of the physical geography.
2. Expand, and if necessary modify, the statement that the Iberian Peninsula is a region of isolations.

8. Consider what parts of the Iberian Peninsula have climatic conditions which are " typically Mediterranean " and " modified Mediterranean " respectively.

4. Select three areas with markedly contrasted types of natural vegetation in Spain. State the position of the areas, and describe and account for the characteristics of the vegetation-types.

5. Compare and contrast the position and physical characteristics of the Balkan and Iberian Peninsulas.

6. Write an essay on " Irrigation in Spain."

7. Make a systematic and reasoned study of the main facts of the geography of Portugal.

8. Show in what ways the Moorish invasion has influenced the present-day human geography of the Iberian Peninsula.

9. Examine the dictum : The outstanding fact in the human geography of Spain is the opposition between the central and the marginal peoples.

10. Contrast the average density of population in the Iberian and Italian Peninsulas ; trace the causes of the difference.

CHAPTER XVI

THE SCANDINAVIAN PENINSULA

IN Part I, the general characteristics of the major geographical regions represented in this Peninsula were described (refer back to Fig. 19); here more detail, particularly as to their economic development, will be given.

The Atlantic Margins of Scandinavia form part of Temperate Europe. They are composite regions in that they consist partly of lowlands and partly of uplands, but they have the following common characteristics: their climate and productions are greatly affected by oceanic influences; they have scattered communities of people throughout their extent; these communities look mainly outward towards the Atlantic, and not inland towards the rest of Scandinavia.

The extent of the region is great, covering over 13° of latitude; hence climatic conditions vary markedly and two sub-regions must be distinguished (see Fig. 68).

The South-Western Coast-lands begin with the southernmost point of Norway and include the region around the Trondheim Fiord. In the extreme south the coastal plain is relatively wide and continuous, and here agriculture, mainly the growing of oats and barley, is a relatively important occupation.

From Stavanger northward, the lowland appears only as small islands and patches of coastal plain (refer back to Fig. 2), whose hummocky morainic surface is grass-grown and mainly used for pasture. In addition there are only small habitable areas at the sides of the fiords, and at their heads where river valleys lead upward to the highlands; yet the considerable extent of the fiords (note the length of the Sogne Fiord as shown in Fig. 2) and their many branches allow scattered settlements to reach far into the interior.

The steep slopes behind the coast and by the waters of the fiords have occasionally terraces used for summer pasture or for growing hay fed to the cattle in their winter stalls. On the slopes, too, are woods which provide timber used for house-building and for many other purposes for which other materials

are employed in more southerly latitudes. There are innumerable waterfalls on the mountain sides, and many of these are utilized for obtaining electricity for lighting and for power used in

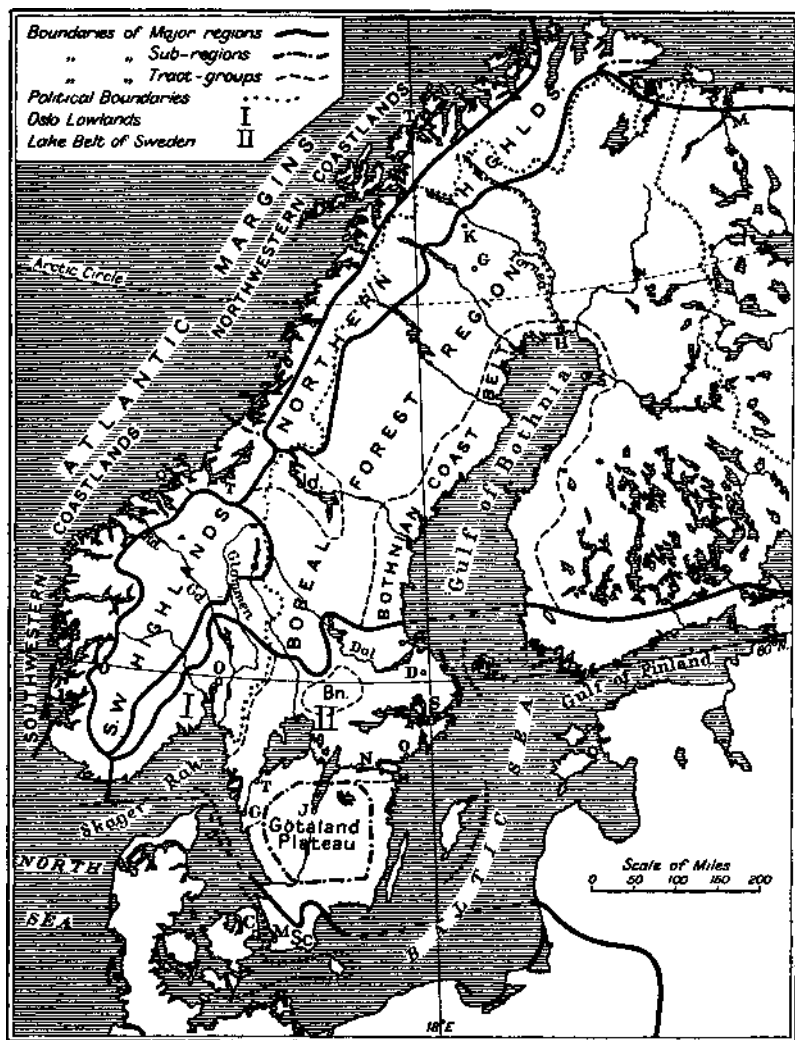


FIG. 68.—REGIONS OF THE SCANDINAVIAN PENINSULA.

factories, as, for example, in chemical works at Odde on a branch of the Hardanger Fiord.

Fishing is one of the chief resources of the people. In the

small settlements the family combine this work with the care of their animals and land ; the towns are all centres of fishing fleets, and in them are carried on the sale of fresh fish and the preparation, by drying, salting or canning, of fish for export. In the extreme south, as far north as Stavanger, mackerel are largely caught; herring become more important in the area which centres upon Bergen. This is the largest town of the Atlantic regions ; besides being a centre of local trade, it is the northernmost terminal of trans-Atlantic liner communication and is connected by railway across the highland with Oslo.

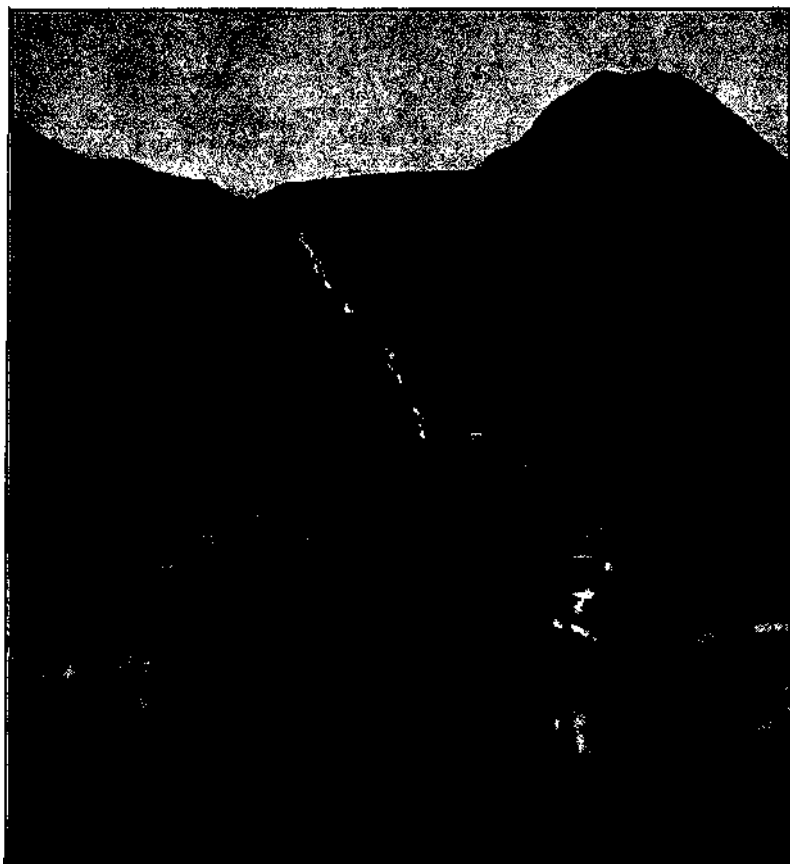
Trondheim. is situated in a wide lowland area ; its fiord, around which are quite extensive areas suitable for farming, is longitudinal to the coast. Structurally, the region is one of relative depression, and behind the coastal lowland is a break in the highlands which may be called the " Trondheim saddle " ; this gives fairly easy access to the eastern part of the Peninsula, and across it a railway joins Trondheim to Sweden. Two other lines go southward from Trondheim to the Oslo region, taking advantage of the Glommen and Gudbrandsdal valleys through the South-western Highlands.

Because of its situation in an unusually productive and accessible environment, Trondheim was in past centuries the centre of Norwegian settlement on the Atlantic coast and the capital of the old kingdom of Norway. Now, however, Trondheim is of far less importance than the modern capital, Oslo, and is even surpassed by the trading centre of Bergen.

The fiords count for very much in the life of the Atlantic Coast-lands ; traffic between the settlements is largely carried on by small steamers, for communication across the highlands is limited to certain routes and almost entirely stopped during the long winter. Also, the fiord scenery, with its beauty and grandeur, brings many visitors from overseas, and thus adds to the contacts of the Atlantic Margins with western lands.

The North-western Coast-lands are less favoured by climate, for the summers are colder and shorter, while the winters are longer and have very little daylight. Agriculture is very restricted, and Jbasky. is practically the only crop that can be grown. As the latitude increases, the supply of timber and the area of pasture-land become less ; fishing is the chief resource of the scanty and scattered population, while the trading towns are fewer in number and smaller in size.

A marked contrast with the south is shown by the lack of small, low islands, while the Lofoten Islands represent a partially drowned mountain region, showing the features of Alpine



[Norwegian State Railways

FIG. 69.—VIEW ON THE STOR FIORD.

Note.—This is the head of one of the smaller Norwegian fiords—about Lat. 62° N. A stream falls from a hanging valley into the main valley occupied by the fiord, in which it forms a small delta, partially seen on the right. Above the delta is a terrace used as a site for houses, while hotels have been recently built near the water's edge. Forest covers most of the land, but at the lower levels clearings have been made and utilized mainly for pasture.

ranges with peaks rising sometimes almost from the water's edge. They emerge from a wide sub-marine platform which forms a rich fishing-ground; here cod are taken in great numbers, and on the coasts are drying-grounds and plant for obtaining the cod-liver oil. Salmon-fishing is also carried on in

many of the fiords of northern Norway. Tromsø is the chief centre for the whaling and sealing fleets of the polar seas.

In a fiord behind the Lofoten Islands is the ice-free harbour of Narvik, from which is exported the iron ore of northern Sweden. Almost at the extremity of the Atlantic region is Hammerfest, the northernmost town in the world, a small trading centre and the site of whale-oil preparation.

Compared with most of the people of Europe, the inhabitants of this region, especially in the northern part, are unusually isolated, most of all during the long, dark winter.

The Scandinavian Highlands comprise two main areas which rise above the tree-line and bear only a scanty vegetation of the Alpine type.

The South-west Highlands include the most elevated parts of the Peninsula: the Hardanger "Fjeld" (i.e. high treeless plateau), the Jostedal "Brae" (i.e. ice-field) and the Dovre Fjeld. These are mainly broad and undulating, upraised peneplains, above which stand occasional peaks of highly resistant rocks; e.g. above the Jostedal Brae, Glittertind rises to over 8,000 feet. The ice of the plateaus works outwards on all sides, and is not concentrated into a few valleys with long glaciers as in the Alps; hence the Scandinavian glaciers are generally short.

The highlands are of little use to man, except for some summer pastures, but there is some mining of iron and copper in Norwegian territory near the margins of the Trondheim Saddle and also near the Arctic Circle.

The highlands are penetrated and even cut right across by a number of deep valleys, as shown in Fig. 2; in these valleys settlement is possible and through them roads and railways have been constructed. The Gudbrandsdal (dal = valley), which leads northward from the neighbourhood of Oslo, is quite continuous across a flat water-parting with the Romsdal which drains out to a fiord of the Atlantic coast; these valleys are marked "Gd." and "Rd." in Fig. 68.

North of the relatively low Trondheim Saddle, through which coniferous woods extend across the whole Peninsula, the treeless fjeld reappears in the *Northern* or *Kiølen Highlands*. These are not so high as those of the south, and because of the lower precipitation of northern latitudes snow does not accumulate to form such extensive snow-fields as in the south.

On their south-eastern side the northern highlands have a marked descent, the Glint, to the Baltic slopes ; in the extreme north they jut out to the sea in the precipitous headland of the North Cape, though towards the north-east they descend more gradually to the tundra of the Arctic Coast.

A strip of tundra land is included in Norwegian territory (see Fig. 68), and here, at Kirknes, are iron mines and ironworks and the terminus of the Norwegian coastal steamship service.

The Boreal Forest Region.—Immediately east of the Highlands is the little-utilized region of coniferous forest; it is narrow in the south, but north of the Lake Belt of Sweden it occupies all the eastern part of the Peninsula and almost corresponds with the historic region of the Swedish Norrland.

The severity of the winter can be judged by the fact that the land is snow-covered for a period which lasts for four months in the south of the region and for seven months in the north ; the shores of the Gulf of Bothnia are blocked by ice for more than three months in the year. But one should note also the fact that the temperatures for July at Haparanda, at the head of the Gulf, are rather higher than those at Bergen (see p. 26).

Along much of the western edge of the region the Glint descends into a long shallow depression, where many of the river valleys are occupied by long lakes. Between the parallel river valleys the land gently rises to moderate heights which are covered by almost unbroken forests ; in the valleys glaciation has interrupted the smooth flow of the rivers, and falls prevent navigation but give water-power, which is being increasingly developed.

The Bothnian Coastal Belt is distinct from the greater part of the region, and is continued around the head of the Gulf and along the shores of Finland. It is of lower elevation than the rest of the Boreal Forest region, and since the Ice Age has more than once been covered by water when the area of the Baltic Sea was considerably greater than at present. Hence behind the present coasts are sandy and clayey deposits which yield more fertile soils than those of most of the Baltic Shield.

The severity of the climate along this belt is somewhat modified by the lower elevation and by the neighbourhood of the sea, and the valleys which cross the area have pastures and even some agriculture, especially in the south.

Forestry is the main occupation over most of the Boreal Forest

region, but some farming, in the form of cattle-rearing and the cultivation of barley, is carried on in the valleys of two areas in which both the soil and the climate are rather more favourable. These areas are the Bothnian Coast Belt, and Jamtland (" Jd " in the regional map), where the Trondheim Saddle permits Atlantic influences to show themselves and where the relatively low country has a cover of unusually fertile glacial deposits.

A railway has been constructed around the Gulf of Bothnia along the inland edge of the coastal belt, and it is connected with the sea-board by branches which run down several of the valleys. The small settlements of the coast have seaward traffic in the summer, and there is some industrial development. This is especially connected with the timber floated down the rivers from the interior, and there are many saw-mills and factories for the making of products such as paper, matches and cellulose.

In the north of Sweden are the greatest known deposits of high-grade iron ore in the world. This is quarried from what are literally mountains of ore, adjoining which the small towns of Gellivara and Kiruna have grown up.

The northern part of the Baltic Forest region is the home of the Lapps, the nomadic reindeer-herders who seek the highlands in the summer; some of them have now permanently settled by the rivers farther south in Sweden, where they fish and keep their herds near their villages, and still more of them live as fishermen by the Norwegian fiords.

The Farmed Forest Lands.—All the south-eastern area of Scandinavia, except Scania, is part of the region which is partly still forested, and partly cleared and taken into cultivation. As was explained earlier, its climate is of the sub-boreal type, with summers as warm as those of southern Britain, but with much colder and longer winters, and the natural vegetation cover is forest of the mixed coniferous and deciduous type. Much of this forest growth has now been replaced by meadows on which cattle are reared or by fields on which fodder crops and grain are produced; among the cereals, oats are the main object of farming, while rye and barley are grown to a less extent.

Within the area, however, differences of structure and relief are bound up with differences of soil and surface conditions, and it is largely because of these factors that some areas are fairly thoroughly utilized while others remain under forest. Also

there are mineral resources in some districts, and the location and outlook of other areas have led to their relatively dense settlement. On these grounds the following divisions have been made. There is a broad lowland extending from the Norwegian lands north of the Skager Rak eastward across Sweden ; it may conveniently be considered as composed of the Oslo Lowlands in Norway, and the Lake Belt of Sweden. South of the Lake Belt, in the division of Sweden known historically as Gotaland, are the South Gotaland Lowlands, and in their centre rises the Gotaland Plateau.

The Oslo Lowlands.—The surface-forms of this region are largely the result of the great glaciers which worked their way down from the adjoining highlands to the hollow of the Skager Rak. Consequently the rivers have falls now used for water-power, while the lowlands in some parts show bare rock and in other parts have glacial deposits on which good soils have developed.

The subsidence of the area between the North Sea and the Baltic Sea has allowed the waters to penetrate the lower parts of the valleys of both the Norwegian and also the Swedish Lowlands ; the resultant shallow inlets with gently sloping banks are known as fiords, although their characteristics are entirely different from the fiords of the Atlantic Margins.

At the head of the largest of these lowland fiords is Oslo, the capital of Norway. It has a convenient situation between the sea (though the harbour is closed by ice for about four months in the year) and the valleys which penetrate the highlands and give access to the Atlantic side of the country. The city is practically in the centre of the Oslo Lowland region, the most closely settled and agriculturally the most productive part of Norway. Moreover, at several parts of the area iron ore is mined and water-power is developed ; there are scattered metallurgical industries, and works utilizing the products of saw-mills.

This economic activity is also found in Oslo itself and its neighbourhood, which is the most densely populated in Norway. With the trade and shipbuilding of the port, the capital has a population of over a quarter of a million persons.

The Lake Belt of Sweden.—Glaciation has had great influence on the land-forms here, as on the Oslo Lowlands, and in consequence there are such a number of small lakes that, like those of Finland, they can be shown only on maps of the largest scale. The existence and the general shape of the greater lakes, Vaner,



FIG. 70.—VIEW OF IRONWORKS BY THE RIVER DAL.

[Swedish Travel Bureau.

Note.—The works are situated where the Dal most closely approaches the iron mines of the Bergslagen. At this point the river has a marked fall which is used for water-power at the works, though fuel is also needed, as is shown by the high chimney in the centre of the view. The industry is here carried on in a semi-rural district of the "Farmed Forest" region in which the trees have not been entirely cleared.

Vatter, Hjelmar and Malar, are due to faulting and the subsidence of portions of the Baltic Shield, as was explained in Chapter I, though the intricacy of their outlines is the effect of ice-action.

Another factor affecting surface conditions in the region is the occurrence of areas of recent sandy and clayey deposits, like those bordering the Gulf of Bothnia.

Because of the contrasts in surface conditions there are patches of almost barren rock, small areas of moorland, larger areas of uncleared forest, and very considerable stretches of farm-land, especially in the south. Climatic conditions are indicated by the figures for Stockholm in the table on p. 26, though in the west temperatures are a little more equable ; the account of agriculture in the farmed forest region, as described on p. 263, is particularly applicable to the Lake Belt. As a whole, this region is the most productive part of Sweden, with the exception of Scania.

The mineral wealth of the region is also considerable. Copper is found on its northern margin, though the deposits at Falun are now nearly exhausted. Iron is mined near Dannemora on the Baltic side, but the main area of iron production, where ore is obtained from great open quarries, is the district known as the Bergslagen (" Bn " on the regional map). In this area, stretching from the north of Lake Vaner north-eastward to near the River Dal, iron has been mined and worked for many centuries. The industry was originally based upon the proximity of iron ore, fuel from the forests and power from the rivers ; now the same factors are utilized, though by modern methods. The iron ore which is exported goes out largely through the port of Oxelosund, south-west of Stockholm, and to a less extent through Stockholm and through Gavle near the mouth of the Dal.

The remaining part of the iron ore is the basis of an important iron and steel industry in which machinery of many kinds is produced, and associated with this are other branches of metallurgy. The work is carried on at a number of quite small places as well as at several towns in the Bergslagen.

Water-power is obtained especially where the streams descend from the higher ground on the northern margin of the Lake Belt, and both at such points and at many others in southern Sweden there are works for the products of the timber which is floated

down the rivers or brought by coastwise shipping from the Gulf of Bothnia.

Thus there are varied forms of economic activity in the Lake Belt, and here live the great majority of the Swedish people.

Goteborg, with over a quarter of a million inhabitants, is the western outlet of the region and the chief port of Sweden. It is the terminus of oceanic commerce, which avoids the shallow and winding waterways through the entry to the Baltic Sea. Moreover, Goteborg is in a favourable situation both for trade and also as a manufacturing centre, because it is at the mouth of the River Gota which drains Lake Vaner; in its course this river forms the great Trollhatta Falls, now harnessed for water-power. By the River Gota and by canals Goteborg has water-communication through the Lakes Vaner and Vatter across the whole region to Soderkoping (i.e. South-market); this is a small port, at the head of a fiord on the Baltic Sea, near the larger port of Norrkoping (i.e. North-market) (see the map in Fig. 68).

On the Baltic side of the Lake Belt is Stockholm, which, although not well placed for trading with western nations, has other factors in its position which have enabled it to serve as the capital of Sweden. It is about 30 miles from the Baltic Sea, at the head of an inlet where a group of small islands marks the transition to the long Lake Malar. Together, the inlet and the lake form a water-barrier stretching far inland and separating the Swedish settlements on the Baltic from those near the Gulf of Bothnia; the islands, however, give a means of bridging the barrier, and here Stockholm grew up. Also, until the nineteenth century Sweden extended across the Gulf of Bothnia and included what is now Finland, and thus Stockholm had a central position as the capital.

Because it has been built upon a group of islands, Stockholm has been called "the Venice of the North," and because of its beautiful situation and its splendid buildings it is regarded as one of the finest capitals of the world. With a population of over half a million, it is the largest city of the Peninsula.

The South Gotaland Regions.—Between the Lake Belt and Scania are the regions of south Gotaland. The marginal areas are like those of the Lake Belt, except that there is relatively little industrial or commercial development, but the central plateau rather resembles the Norrland part of Sweden. Its climate is less extreme than in the north, but its altitude, which

at one point is over **1,000** feet, and its rocky nature are unfavourable to agriculture and the forest remains uncleared to a greater extent than in any other part of southern Sweden. Lake Vatter penetrates the region, and at the southern end is the small manufacturing town of JSnkoping ; there are a few other small industrial centres on the margins, but the population is scanty, and the people who get their living by agriculture have a poorer return than those of the adjoining regions.

The plateau and even the more favoured lowlands of south Gotaland stand in marked contrast to fertile Scania, which was described in the chapter on the South-West Baltic Lands and is indeed the most densely populated region of all Sweden.

Spitsbergen.—This island group, officially known as Svalbard since it was assigned to Norway in 1925, lies about half-way between North Cape and the North Pole. It has a complicated geological structure and a correspondingly complicated relief; there are fiord coasts, and at one point the land reaches an altitude of over 5,000 feet.

Even at the high latitude of 80°, the North Atlantic Drift has a warming influence, and while glaciers cover much of the surface the lowland areas have a tundra-like vegetation and reindeer and foxes can find a living. By the coasts polar bears and walrus are hunted and the down of eider ducks is gathered by a few people. The main resource of Spitsbergen is the occurrence of great deposits of good coal, which is mined throughout the year, giving occupation to a few thousand persons, and exported during the summer when navigation is not impeded by ice.

Iceland, which just touches the Arctic Circle, is also greatly influenced by the North Atlantic Drift, and its climate may be broadly compared with that of the northern part of Norway. Although built of volcanic material, its relief in general resembles that of north-western Norway, for most of it is a plateau bordered by fiords. Its highlands are covered by ice-fields and lower areas are tundra-like ; in the south there a few trees, pasture for horses, sheep and cattle, and fields where vegetables are grown. A population of about 100,000 people depends less upon farming, however, than upon occupations connected directly or indirectly with the sea. Fishing comes first; cod are taken in great quantities and to a large extent are salted and dried, and exported to Mediterranean countries, while cod-liver

oil is another important product. Trade and industries are also significant occupations, and about a third of the people live in the capital, Reykjavik.

Although Iceland has such a small population, because of its past history it now forms an independent State, united with Denmark by a personal bond of Union under the Danish king.

QUESTIONS

1. Describe the Scandinavian Highlands and examine their influence on the geography of the other parts of the Peninsula.
2. Write an essay on "The Norwegian Fiords."
3. Indicate, and briefly account for, the different types of climate experienced in Sweden.
4. State the distribution, and give an account of the utilization, of the mineral resources of Scandinavia.
5. Describe and explain the differences in the nature of the farming in various parts of the Scandinavian Peninsula.
6. Examine the sites and the functions of the chief ports of Norway and Sweden.
7. Make a systematic study of the lowland which includes near its margins the towns of Oslo, Goteborg and Stockholm.
8. Trace the influences of glaciation upon the Scandinavian people.
9. Compare and contrast the natural resources of Norway with those of Sweden.

EASTERN EUROPE

THE broad characteristics of the regions of eastern or Trunk Europe were described in the first part of this book, and in this chapter further details will be given, especially in connexion with the economic geography. Attention may well be directed particularly to the changes which have occurred in recent years, for in eastern Europe developments have been rapid.

In the old Russian Empire both social and economic conditions were in general behind those of the rest of Europe, and the developments which did occur were limited in the main to the western margin of the Empire into which people and ideas had come from Peninsular Europe. Thus when peace was established after the war of 1914-1918, and the new States adjoining Peninsular Europe (Finland, the East Baltic States and Poland) were formed, these countries were able to continue developments already begun.

In the rest of the Russian Empire only two regions stood out as markedly affected by western advances : (i) That around Moscow and to a less degree at Leningrad, where manufacturing had been started ; (ii) the Ukraine, where cultivation, especially of wheat for export, had been fostered by the great land-owners, and where the iron of the Dnieper district and the coal of the Donetsk basin were mined partly for use in the more northern industrial district and partly for manufacturing near the shores of the Black Sea and the Sea of Azov. Elsewhere there were but small-scale mining and manufacturing works, and there was little traffic with other countries ; even farming, which was the occupation of the vast majority of the people, was carried on by simple and in some parts even primitive methods.

On the other hand, the natural resources were great, and there was therefore opportunity for great improvements. Moreover, the new Communist Government took over the ownership or the management of all the natural wealth of the country, together with the organizations, such as the farms, mines, factories and railways, by which it was utilized. The rulers of the State made

a comprehensive review of the resources, and organized their development in successive "five-year plans," beginning in 1928. With the aid of foreign experts, large numbers of Russians were trained in new methods, production was pushed on by every possible means, and there resulted much geographical redistribution of industrial and agricultural activity.

In connexion with industrial developments, mining was increased or begun in a number of coal- and metal-bearing regions, the water-power of rivers was harnessed, and manufacturing was extended from the previously restricted districts to wider areas, particularly in the neighbourhood of the Ural Mountains, in the steppe-lands of European Russia, in Transcaucasia, and in parts of Asiatic Russia where coal and metals were discovered.

In farming, too, improvements took place, and in particular, agriculture was extended into the forests of the north, into the drier steppe-lands of the south, and by irrigation even into the semi-deserts. It is scarcely too much to say that in the space of twenty years from 1917, Russia experienced at the same time a political revolution, an industrial revolution and an agrarian revolution.

The major regions are determined mainly by climatic factors and correspond broadly to the natural vegetation regions ; hence the names of the larger regions as given in the map in Fig. 19. The subdivisions of these regions are more influenced by differences of relief, structure and surface conditions, and they show consequent differences in the utilization of the land. The major regions are so vast that a complete survey of each is quite impossible ; only the most important features, and a few of the outstanding subdivisions, can be described in the text or indicated as separate regions in the map in Fig. 71.

The Tundra.—In this region there has been little development ; away from the ports referred to below, the few inhabitants are the Lapps in the west and the Samoyeds in the east, who live mainly on the products of their reindeer and by fishing.

The wet Tundra is a barrier to communication when the coast is open in the summer ; it is crossed where help is given by rivers and inlets, and at such places a few small ports have been made, for example at the mouth of the River Pechora in the east and at Kola Bay in the west. The latter inlet so benefits from the North Atlantic Drift that its mouth is ice-free during the



FIG. 71.—REGIONS OF EASTERN EUROPE.

Note.—W indicates the White Russian Republic; U, the Ukraine; T, the Transcaucasian Republics.

whole year, and with the aid of ice-breakers ships can always reach the port of Murmansk. Because this port is open when Leningrad is closed in winter, a railway has been built through Karelia to Murmansk. Moreover, a naval base has been established nearby at Poljarno to supplement that at Kronstadt, the island near Leningrad in the Gulf of Finland, where war-ships are immobilized during part of the year.

The Boreal Forest.—In the European portion of this great region, three sub-regions may be distinguished. In the west is the area of the Baltic Shield marked by the occurrence of innumerable lakes ; east of this is the region, largely lowlands, where the forests resemble those of the Siberian taiga ; separating Europe from Asia are the Ural Mountains, which cause the forest area to bulge southward into the steppe-land.

The " Lake-Shield Area " may be a convenient term for the western sub-region. Politically it is divided between Finland, whose territory consists, except in the extreme north, of the basins of the streams draining to the Gulfs of Bothnia and Finland, and Russia, which occupies the easterly portion draining to Barents Sea and the White Sea or through Lakes Onega and Ladoga to the River Neva.

In several respects this sub-region forms a unity and shows a similarity to the Scandinavian part of the Baltic Shield. The forest trees are the same species as those of Sweden, and they yield timber which is the chief product of considerable areas. In the north the ancient rocks contain minerals ; in the Kola Peninsula, in Russian territory, ores of iron, nickel, aluminium and phosphates are mined, and with the aid of electricity, obtained both from water-power and from peat-fuel, metallurgical and chemical industries have been established within the Arctic Circle.

To meet the local needs of fresh vegetable food and milk, scientific methods have been devised to hasten the growth of the desired vegetables and hay, and even of barley and wheat ; at present this process is relatively costly, and can be carried on only upon a small scale.

The region has been heavily glaciated and the resultant innumerable falls and rapids have been utilized for obtaining electricity in many places in the Finnish area. Glaciation is responsible, too, for the other features of the " lake plateau " of Finland. Here there is an indescribable complexity of water-

surfaces : lakes of most intricate shape are set with numberless islands and interconnected by a maze of water-courses. These lakes alternate with swamps, and it is significant that the Finns name their country "Suomi," which is translated both as "swamp-land " and " lake-land."

Roads through the Lake Plateau region are often made upon the long winding eskers which stand like dykes above the waters. In the Russian region of Karelia a canal has been constructed from the White Sea, utilizing lakes and rivers in its course, to



[E.N. A.]

FIG. 72.—VIEW ON LAKE PAIJANNE, FINLAND.

Note.—This is one of the larger lakes immediately behind the morainic barrier separating the Finnish Lake Plateau from the coastal plain of South Finland. The view shows the irregular though low relief of the region, and some of the innumerable islands in the lake. In the foreground birch and spruce trees are seen as components of the Boreal Forest which still covers most of the land, and a steamer suggests the use of the water for communication.

reach Lake Onega; farther to the south, other canals and rivers complete water-communication through Lake Ladoga to Leningrad and the Gulf of Finland, and also to the Volga river system and Moscow. In considering the use of the waterways, it must be remembered that in the neighbourhood of Lake Onega they are frozen from mid-November till mid-April.

The south-western part of the Lake-Shield sub-region is the most developed. Here in Finland the Bothnian Coast Belt resembles that of Sweden, and there are coastal settlements where saw-mills are driven by electric power and some farming is carried on. In the Finnish Lake Plateau, too, there are

scattered settlements where there are areas of relatively fertile glacial clay and recent marine deposits like those on the Swedish side of the Gulf of Bothnia ; such cleared " islands " in the forests give pasturage for swine and cattle and have small fields of barley and, in the south, also of oats.

Along the southern edge of the Finnish Lake Plateau the waters are ponded back by a double line of terminal moraines ; in crossing this barrier the streams have falls which give much power. Where Lake Saima is drained to Lake Ladoga are the famous Imatra Falls, and in the south-west of the region water-power is one of the chief factors which have aided the development of a number of small industries at Tampere (Tammerfors).

The " Taiga " Area in European Russia is in the main still a forest region, with only small and scattered clearings. Save for the Timan Uplands it is a lowland, with considerable stretches of swamp. Most of the region drains northward, the largest rivers being the Dvina and the Pechora ; the south-east part drains to the Volga, mainly by the Kama. These rivers form the chief means of transport and the Dvina is connected by canals with the Volga and Kama, but like most of the other rivers of Russia, their navigation is subject to much interruption; when ice-covered, they can be utilized by sledges, but in spring floods render them useless, and in summer the lowness of the water may seriously limit traffic.

Timber is the main product of the region, and in the north its chief shipping port is Archangel, at the mouth of the Dvina ; much timber is also obtained from the southern part of the Boreal Forest region where it adjoins the better-populated areas requiring this commodity. In this southern part railways have been constructed, and from it a line goes north to Archangel. There is little mineral wealth in the region, though a coalfield has been discovered in the Pechora basin near the Arctic Circle.

Because of the climate and soil conditions, farming is restricted to very small areas save on the southern margin. Moreover, as it is generally carried on by relatively backward methods its return is rendered the more scanty ; the population is small and lives in poor, indeed often squalid, circumstances.

The Ural Mountains, because of the moderate uplift of the Hercynian massifs which form them, nowhere reach 6,000 feet in elevation, and in the central section the watershed between the European and Asiatic rivers is little over 1,000 feet above

sea-level. Also the tilt of the upraised peneplains is generally slight, especially on the European side, and hence these mountains do not form a difficult barrier between the continents.

Three railway lines cross the Central Urals from the west, uniting at Sverdlovsk (formerly Yekaterinburg) on the eastern flank, and another line traverses the broader and higher Southern Urals by the industrial centres of Zlatousk and Chelyabinsk.

The forests of the Ural region are valuable, and timber is still an important product; as a source of fuel it was one of the factors which aided the growth of industries in this far-distant border of Europe, but the mineral resources of the region are the main cause of its economic development.

In the south is the broad, longitudinal valley of the River Ural; the neighbourhood of this river at Orsk, just beyond the limits of the mountain region, yields deposits of iron ore containing also chromium and nickel. With the aid of an electric power-station and of oil brought by pipe-line from Emba in the Caspian basin, a group of closely linked chemical and metallurgical industries, the latter including the construction of locomotives, has been organized in the district, and a considerable population has settled in what was until quite recently an almost uninhabited area.

Farther north, in the same valley, a similar industrial development has occurred at a newly created large town, Magnitogorsk, named after the magnetic iron ore to which it owes its existence, while manganese is another mineral obtained in this district.

In the Central Urals west of Sverdlovsk, ores of iron, copper, aluminium, nickel and gold are found, and east of that town is a coalfield of considerable size. Hence in this section exists another industrial region, important also as being linked by railway on the one side with other sources of mineral wealth in central Asia, and on the other side with the manufacturing and consuming regions of Europe; Sverdlovsk itself has a population of about half a million people.

There is less economic activity in the Northern Urals, but some coal, iron and oil are worked and great stores of potassium salts have been discovered north-east of Perm. This town is situated beyond the upland region, on the Kama; from the river water-power is obtained and is utilized at Perm.

Centuries ago, the mineral wealth of the Hercynian massifs of central Europe drew people to their neighbourhood; now their

resources are largely exhausted while those of the similar areas in the east of Europe are in their turn transforming a wilderness.

The Farmed Forest Regions.—While the coniferous forests have been cleared only in patches, the "mixed" forest region, with its better climate and soil conditions and its easier accessibility from central Europe, has been far more thoroughly utilized. Yet different types and different degrees of development may be observed in the following areas :

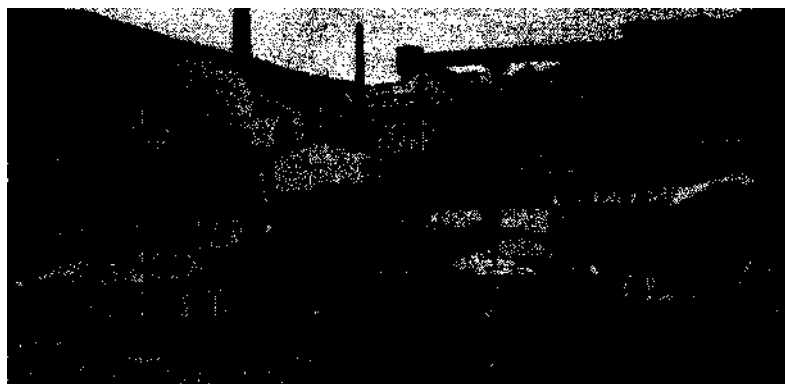


FIG. 73.—VIEW IN MAGNITOGORSK.

[E.N.A.]

Note.—The upper Ural River occupies one of the longitudinal valleys which dissect the broad plateau-like elevations of the Southern Urals. Overlooking the valley the height "Magnitnaya" contains one of the greatest deposits of iron ore in the world, and near it the first "Five-Year Plan" created a new town, Magnitogorsk, centred upon the great "Stalin" metallurgical plant, part of which is shown in the view. Coal is brought from the Kuznets field in southern Siberia, the iron and steel works are closely related to other metallurgical industries, and with the workmen brought from western Russia the settlement numbered about a quarter of a million people within a few years of its establishment.

The South Finland Coastal Plain.—North of the Gulf of Finland the ancient rocks of the Baltic Shield are largely covered by recent clays, which have been so well cultivated that this is the most productive part of Finland ; the farming is concerned mostly with the growing of oats and rye, and the keeping of cattle.

Off the coast is a swarm of small islands, continued across the entrance to the Gulf of Bothnia as far as the Aland Islands; the islands and the small inlets of the mainland are the homes of many fisher-folk.

The streams which issue from the lake-land of the interior give water-power for many saw-mills and other works utilizing the timber, and for metal, textile and other industries in the small ports of Turku (Åbo) and Viipuri (Viborg), and particularly in Helsinki (Helsingfors), the capital and the chief trading centre of Finland.

The East Baltic Lands.—South of the Gulf of Finland the strata of the Russian platform form a group of low plateaus which are separated by slight depressions generally marked by deposits from lobes of ice occupying these hollows in the Ice Age. Hence the States of Esthonia and Latvia and the north-eastern parts of Lithuania and Poland have plateaus farmed in much the same way as the coastal plain of Finland, but these alternate with lower and wetter areas, which still have a good proportion of forest and even marsh-land and lakes.

The most obvious of these lower areas is that largely occupied by the Gulf of Riga, around the margins of which are some of the less-productive farming districts. Yet the commercial advantage of the inlet has led to the growth of Riga, a short distance up the River Daugava (Dvina). This is the largest city of the three small Baltic States, and its importance dates from the time when it was the centre of the German colonization of these lands ; to that colonization is due, also, the general appearance and much of the architecture of Riga and others of the larger towns of the region.

In the time of the Russian rule over the east Baltic States Riga had much trade, aided by the fact that it is closed by ice for a shorter period than Leningrad ; also, with the facilities for transport, there grew up manufacturing of textiles, metals and wood. When Russia was cut off from this outlet to the Baltic Sea the activities of Riga were curtailed, but it still remains a port having a fair amount of commerce, and it has become the capital of Latvia with about 400,000 inhabitants.

A port of somewhat similar history and circumstances is Tallinn (Reval) on a small inlet near the entrance to the Gulf of Finland. It is, however, a smaller city than Riga, for it has only about 150,000 inhabitants ; it is now the capital of Estonia.

Another still smaller port is Liepāja (Libau) on the open coast of Latvia ; its artificial harbour served the Russians as a naval station because, not being in a river mouth at which ice would

accumulate, it could be kept open for vessels during the winter. In the interior is Wilno, in Poland, previously known as Vilna when it was the capital of Lithuania,

As the influence of past German dominion over the greater part of the east Baltic countries is seen in the cities, so it is to be traced also in the agriculture ; hence farming in the east Baltic lands was more advanced than in the farmed forest region farther east, partly because of the peoples who have occupied it, but partly also because of the physical conditions.

The West Russian Lowlands.—The States of Estonia and Latvia are separated from Russia by a natural frontier as well as by a political boundary, for southward from Lake Peipus is one of the ice-lobe hollows, with lakes, marshes and forests. West of this barrier settled the Ests and Letts ; east of it spread the Russians. This part of Russia, however, is one of the less favourable areas for settlement, and poor conditions extend eastward to include the neighbourhood of Lake Ilmen.

Southward the land rises very gradually to the water-parting leading over to the basin of the upper Dnieper, where again the country gradually descends to the Pripet Marshes—the greatest swamp-region of Europe. Near the River Dnieper the land has now been largely drained and utilized, but its tributary the Pripet still flows sluggishly through the vast marshes ; swamp-woods alternate with wet and sometimes flooded marsh-lands, and only here and there small sandy islands rise above the uninhabited lowlands.

Here, again, surface conditions have affected political boundaries, for this region, once a " no-man's land," separates Poland on the west from Russia on the east; moreover, while the White Russians occupied the region to the north-east, the Little Russians settled on the south-east, and consequently the boundary between White Russia and the Ukraine also runs through the marsh-land.

The North-West Russian Entry-land.—East of the head of the Gulf of Finland is another region which has generally poor resources in itself, but in this case is important as being for over two centuries the main entry into Russia. Here Peter the Great founded a new capital in the swamps at the mouth of the River Neva to be in touch with the western nations, from which the older capital, Moscow, could in those days be reached only with difficulty. In spite of the unpleasant and even unhealthy

site and in spite of the winter-closing of the port, Petersburg, as the city was first named, justified its creation.

Inland communications from the port were gradually improved, beginning with roads leading to Moscow and the other important towns of central Russia. Canals have been cut across the low water-partings to join the Neva to the Volga and the other great river systems of the country; the most important of these canals are those leading to the Volga and thence to Moscow, as shown on the regional map in Fig. 71. Railways have also been built across the swamps, and that constructed from St. Petersburg to Moscow appears on a map almost as a straight line.

Trading, shipbuilding and armament-making were the first economic developments at St. Petersburg, and when manufacturing was introduced into Russia, textile and other factories were established there. With its importance as a capital and residential city, St. Petersburg had a population of well over 2 millions before the fall of the Russian Empire.

After the revolution the seat of government was again transferred to the earlier capital, Moscow. The city on the Neva was renamed Petrograd, and with a temporary cutting-off of most of the trade between Russia and other countries, it suffered severely and the population diminished to about 1½ millions. Then came the third stage of its history : it was called Leningrad, and with the resumption of foreign trade and the new industrial developments in Russia it has again grown ; now, although its work is almost restricted to that of a port and a manufacturing centre, Leningrad has about three million inhabitants.

The Central Plateaus.—Near Lake Ilmen, the west Russian lowlands are overlooked by the scarp of the Valdai Heights, which, capped by part of an end-moraine, reach a height of over 1,100 feet. The Valdai Heights, lake-studded and forested, descend southwards to a region of broad, low plateau? ; towards the east these plateaus are drained by the Volga, its tributary the Oka, and a tributary of the latter stream, the Moskva, on which Moscow stands.

As a whole this low plateau region is now farm-land. Until recent years, rye was the main crop, but as methods of agriculture are being improved wheat, being a more valuable grain, is being increasingly sown. Industrial crops, too, are cultivated in greater variety and to a greater extent than formerly; flax

and hemp are of special importance. The rise of industries in the neighbouring regions has stimulated also the demand for vegetables and dairy produce.

The Moscow-Gorky Industrial Area.—From Moscow eastward to Gorky (formerly Nijni Novgorod) is a region marked by industrial development; it overlaps the Central Plateaus near Moscow and forms a great triangle stretching eastward between the upper Volga and Oka to Gorky at their confluence. The modern development arose here partly because of the existence of these two important cities of old Russia.

About seven centuries ago Moscow became the capital of what was then the relatively small State of Russia ; like many other cities it originated where an island made a convenient crossing-place on a river, and in Russia the rivers formed the easiest means of communication. As in the case of other capitals, too, the extension of the territory ruled by its princes led to its increase in importance, and to the river routes were added roads which radiated from it to all parts of the State.

In spite of the removal of the Government to St. Petersburg, Moscow, which was situated almost in the centre of Russia, remained the ecclesiastical capital of the country and in other ways kept its position as the centre of the national life and traditions. When the Russian power extended southward over the steppe-lands and eastward over Siberia, and when railways were built from Moscow to all parts of the dominions, the central position became more important and the city continued to grow in size. Finally, when the Soviet Government was put back to Moscow, and it became the seat of the highly centralized administration of the great State, it increased rapidly in importance and size and has now a population of about 4 millions within the boundaries of the city.

The ancient citadel, the Kremlin, with churches and palaces, surmounted by cupolas and enclosed by a battlemented-wall, has become the site of the government buildings. Both within and beyond the residential area of Moscow many great factories, making almost all kinds of commodities, have been built.

The region between the Oka and the Volga was the heart of the country of the Great Russians, and scattered about it were towns in which small-scale manufactures gradually grew up ; these were largely of textiles using at first home-grown wool and flax, and then cotton which was brought from Persia and the

eastern Mediterranean up the Volga to the great fair-ground at Nijni Novgorod. After the Russian industrial revolution, this manufacturing industry employed large-scale methods, extended its range to all kinds of enterprises, and utilized varied sources of mechanical power.

The so-called "Moscow coalfield," which lies a considerable distance south of that city, in the neighbourhood of Kaluga and Tula, yields mainly lignite, and as a result of the more efficient use of this fuel, both the demand for it and the amount produced from the field have increased greatly; coal and oil from other parts of Russia are also employed. The water-power of the Volga has been harnessed, and even peat from the bogs is burned in specially constructed furnaces for producing electric power. Iron is obtained from the neighbourhood of the Kaluga-Tula coalfield.

Within the limits of this industrial area, as shown on the regional map, are now about **100** manufacturing cities and towns; these include Gorky with 500,000 inhabitants and about half a dozen others (the positions of which are shown by circles on the map) which have populations between 100,000 and 250,000 people.

Yet even in this district the greater number of the people still depend upon agriculture, of the type referred to in connexion with the central plateaus. On the other hand, industries are carried on at more widely scattered places in other parts of the "farmed forest" region, as, for example, at the large town of Kazan on the Volga, where this river turns southward to the steppe-lands.

The Steppe-lands.—Over the great extent of this major region there are marked differences both in the physical geography and in the economic developments. The broadest distinction is that based upon climate, and it corresponds to the division into the northern or forest-steppe and the southern or true steppe.

The Forest-steppe.—As a whole, the region of the forest-steppe, with its varied and abundant vegetation growing upon the rich black-earth soil, is the most favourable for cultivation of all eastern Europe; consequently the natural wooded grass-land has now been transformed into a country of farms and settlements. Characteristic of this belt is mixed farming, with a balance between the growing of crops for human use and the

production of fodder for animals ; among the grain-crops there is also a balance between the cultivation of wheat and that of rye (refer back to Fig. 18).

The western section is mainly situated in the basins of the Dnieper and other rivers flowing to the Black Sea and in the basin of the upper Don ; as compared with the eastern section which is drained to the Volga, it is better watered and has a rather longer period of warmth ; hence the normal yield of the harvests is greater in the west than in the east. Moreover, industrial crops, among which sugar-beet, hemp and tobacco may be specially mentioned, are grown to a considerable extent in the west, and here various fruits add to the abundance of the products.

The farming has been mechanized and, particularly in the west, is carried on by intensive methods ; it therefore supports a population which is dense for a predominantly agricultural region, although the numbers necessarily decrease towards the east. There are numerous towns of medium size serving as centres of local trade, but not many large cities ; the chief are Kiev, on the Dnieper in the west, and Kuibyshev (Samara) on the Volga in the east.

The region has little mineral wealth, an exception being the iron ores which have recently been discovered in the centre of the belt near Kursk. In this district a metallurgical industry has been started ; elsewhere there is little manufacturing except in some of the towns where it is connected largely with the products of the farms or the needs of the farmers.

Politically, the western section of the combined forest and true steppe-lands region includes the greater part of the Republic of the Ukraine. In the extreme north-western corner, an area has been incorporated into Poland, and west of the broad and deep valley of the Dniester is Bessarabia, which has been assigned to Rumania. On the other side of the Ukraine, a part of the western section and all the eastern section of the European steppe-lands are in the " Russian Soviet Socialist Republic."

Kiev, the capital of the Ukraine, is situated on the northern margin of the forest-steppe and has a population of over half a million persons. It was an early centre of Russian development and is distinguished by many domes of ancient churches and monasteries. Its position has favoured its development as a seat both of administration and also of commerce, for it is where

roads skirting the Pripet Marshes (once greater than they are now) crossed the Dnieper, which was for long one of the main means of communication of Russia.

The site of the kernel of the city was the high right bank of the river, for the Dnieper here shows the characteristic common to many of the larger rivers of the steppe-lands. The right or western bank of these rivers is the "hill shore" which overlooks the stream at a considerable height, while the left is the "meadow shore" liable to flooding in the spring; from this low level the country rises gradually eastward, rather like a dip-slope, to the undulating plateau which continues for many miles till it ends in the scarp-like hill shore of the next great river.

The Southern Steppe-lands.—The term "true steppe" may be applied to this region to describe the natural vegetation, but it may give a wrong idea of the present conditions, for much of the country is now under the plough and many large industrial towns are scattered over the western part of the region.

The southern, as compared with the northern, steppe-lands have higher summer temperatures, with less and more irregular precipitation, particularly in the eastern part, where aridity is a serious difficulty. The west is predominantly a grain-growing region, a part of the "maize and wheat belt" of Europe, though other crops have their place in the rotations; among these the sugar-beet and barley are important and the soya-bean has been more recently introduced. Fruit and the vine are also cultivated.

In the districts immediately to the north of the Black Sea and to the north and the east of the Sea of Azov, the lack of moisture is dealt with by "dry-farming" methods like those employed in the Middle West of North America, while irrigation is used where water can be diverted from the streams; by such means the range of products is increased, and vines and water-melons and even rice and cotton are obtained in the naturally dry areas.

In the eastern part of the southern steppe, barley, millet and drought-resistant varieties of wheat are grown; over a good deal of the steppe-land, but especially in the east, sunflowers are cultivated mainly for the sake of oil contained in the seeds. In this drier country great changes were brought about after the Revolution by the formation of large State-farms, using modern methods in what were previously almost unutilized areas; here,

as in the west, planting of trees has been begun in order to serve as wind-breaks for the farm-lands.

Pastoral work is everywhere important in the southern steppes, and towards the south-east the keeping of sheep becomes the main occupation. With all the developments, there are still considerable areas where the land bears little, and except in the western part the population dependent upon agriculture is not great.

The Industrial South.—Mineral deposits and water-power are



FIG. 74.—VIEW OF THE DAM AT DNEPROSTROY.

[E.N.A.]

Note.—The belt of granite which outcrops across the course of the Dnieper not only causes rapids, but narrows the stream and provides a firm base for the dam. This ponds back the river, and gives a supply of water for the canal which circumvents the falls and for the power-station which adjoins them. The view shows the overflow from the barrage and suggests the widening of the river below this point.

the basis of great industrial and commercial developments in three districts north of the Black Sea and Sea of Azov.

The region within the great bend of the Dnieper utilizes the iron ore found over a considerable area where the granitic belt rises from below the younger rocks of the Russian Platform as explained in Chapter I; in the southern part of the area, by Nikopol, manganese is obtained. The granitic belt is also responsible for the rapids which have prevented navigation in the southward-flowing reach of the Dnieper, but which have offered an enormous source of power. Near the newly created town of Zaporozhe, at the rapid known as Dneprostroy, are great works which provide water for a canal connecting the

navigable upper and lower reaches of the river, and also furnish power to one of the greatest hydro-electric stations in the world. Based upon this power, the " Dnieper Combine " has a connected system of industrial plants in which are manufactured many metallurgical products, including iron and steel, aluminium and manganese. Some miles above this point is the large city of Dniepropetrovsk (Yekaterinoslav), of nearly half a million inhabitants, with varied commercial and industrial activities.

The centre of the iron-mining is at Krivoirog, and here metal working is carried on, for there is an exchange of ore and coal between this region and the Donetz coalfield. At the western side of the Dnieper industrial region is Kirovo (Zinovievsk).

The Donetz region yields coal, the production of which is about half the total production of the U.S.S.R., and stands second only to that of the Ruhr among the coalfields of Europe (including the British Isles); in recent years not only the actual annual output but also the estimate of the total reserves has been greatly increased. Some iron, salt, mercury and other minerals are also obtained in the district. Metallurgical works are established at several centres ; among these Voroshilovgrad (Lugansk) and Stalino (Stalin) are the largest, the latter having rapidly grown from a small iron-working centre (then named Yuzovska) to a town of over 300,000 inhabitants.

The third area of industrial activity is situated near the north shore of the Sea of Azov, where several towns take advantage of their facilities for transport by water, and of their proximity to supplies of metals and coal, for metallurgical and other works. Near the mouth of the Don is Rostov, where trading and varied manufactures support a population of over half a million ; farther west, among other centres are Taganrog and Mariupol. There is an exchange of coal and iron between Mariupol and Kerch, at the entrance to the Sea of Azov, for while Mariupol exports coal, Kerch sends out iron ore obtained near that town ; consequently at Kerch also there are iron and steel works.

Still other industrial developments have taken place in the southern steppe-lands, particularly at towns which have been for a relatively long period centres of local administration and commerce. Kharkov was one of the early centres of Russian dominion over the steppes, and has now become a city of nearly three-quarters of a million people. On the Don is Voronezh, and Stalingrad (Tsaritsyn) on the Volga has had a marked

growth and numbers about **400,000** inhabitants ; its importance will be greatly increased by the construction of the canal from the Volga at Stalingrad to the Don at Kalaeh, thus bringing the greatest Russian water-way into communication with the Black Sea.

The north-west of the Black Sea coast is the main entry and outlet for all southern Russia, though trade is hampered by the formation of sand-bars across the river-mouths and by the accumulation of ice at midwinter. In spite of these drawbacks, Nikolaiev on the Bug grew to have a considerable export of wheat when, before the Revolution, the great landlords devoted much of their land to the cultivation of grain to be sent abroad and thus to bring them wealth.

For much the same kind of trade Odessa was made a port with an artificial harbour safely away from the silt and ice of any river-mouth ; in recent years the development of the south of Russia has increased the variety and the amount of the commerce of Odessa, until it is now a city of over half a million inhabitants.

The "Mediterranean" Coasts.—In the Crimean Peninsula, the country becomes more arid and poorer in appearance towards the south, until it rises to the Yaila Mountains, whose heights are relatively well watered and bear woods both of deciduous and coniferous trees.

The southern coast, facing the Black Sea and protected from the north by the mountains, has much milder temperatures and a moderate rainfall in winter, while the summers are warm and dry ; it is therefore a region of the "Mediterranean" type, and resembles the Riviera of France and Italy in its scenery, its natural vegetation, its vineyards and orchards, and its use as a health and pleasure resort.

This region is continued along the north shore of the Black Sea, backed by the slopes of the western Caucasus, until it merges into the Transcaucasian area with still warmer summers.

The Caspian Lowland.—This arid region has been utilized in several ways. Agriculture is mainly limited to areas which can be irrigated by rivers coming from better-watered regions : viz. the deltas and lower courses of the Rivers Volga, Ural, Emba and Terek, and the coastal strip where streams descend from the Caucasus south of the River Terek. Cotton is grown in these areas, and a beginning has been made with wheat cultivation on the low, left bank of the Volga above Stalingrad.

The very aridity of the region and the saltiness of the soil have been made use of by the construction of large salt pans, into which water is drained and then evaporated, near the Volga.

Oilfields are developed at Emba and at Grozny ; the latter has grown to be a large settlement on the border of the arid depression and the southernmost part of the steppe-land.

Commerce is centred at Astrakhan, where, at the mouth of the Volga, commodities are interchanged between the regions east and south of the Caspian Sea, especially the Transcaucasian Republics, and the regions served by the inland water-ways of central and eastern Russia. Fish, including the sturgeon from the roe of which caviare is made, are caught in the lower Volga and exported from Astrakhan.

The Caucasus and Transcaucasia.—The Caucasus Mountains are regarded as forming the boundary of Europe towards south-west Asia. They are a link in the chain of " Alpine " fold-mountains which continue from southern Europe through southern Asia, and in structure and relief they are more closely connected with the neighbouring highlands of Asia Minor than with those of Europe. For this reason we shall deal with their physical geography only so far as to note that the Caucasus Mountains consist of a series of forested and almost parallel ranges surmounted by volcanic cones, the highest of which, Elbruz, reaches an elevation of over 18,000 feet above sea-level; on the southern side they are separated from the highlands of Armenia by the broad valleys of the Rivers Rion and Kura, where the climate and vegetation may be described as sub-tropical.

Yet because the Transcaucasian Republics form part of the U.S.S.R, there is a close economic association between these regions and European Russia. Of great importance is the production of oil on the northern flanks of the Caucasus at Maikop as well at Grozny, on the southern side of the mountains near Tiflis, and especially at the eastern end near Baku. The enormous yield in this last area is in part used for local industries, which, together with commerce, have caused Baku to become the third largest conurbation in Russia, with a population of more than three-quarters of a million inhabitants. Much of the oil is either sent out from Baku to the Volga, or pumped by pipeline across Transcaucasia to Batum and thence distributed by

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EUROPE

BY

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FORMERLY PROFESSOR OF GEOGRAPHY IN THE
(UNIVERSITY OF LONDON

WITH NUMEROUS MAPS AND
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PREFACE

THIS study of the lands and peoples of Europe is written primarily for the use of students taking " Intermediate " or " General " courses towards a University degree, " Higher School " examinations, or courses in Training Colleges.

It aims at providing a twofold training : in the first place it not only presents facts but points out their significance and how they may be correlated ; in the second place, it shows the interaction between the facts of geography and those human affairs, economic and political, which are the concern of all.

From both points of view a study of Europe is important. To the geographer, this continent offers a great variety of conditions within an area small enough to be studied in some detail and with some approach to actuality. To every man, the economic and political affairs of Europe influence his own life whether he lives within the borders of the continent or beyond the seas.

Yet a study of Europe involves considerable difficulties, for it is scarcely too much to say that it confronts one with a mosaic of geographical units, a jig-saw puzzle of nationalities and a kaleidoscopic picture of States ; one has to work out a method of recognizing order and causation in this complexity, for the three factors cited above overlap and conflict in a most confusing manner. In many cases, the natural unit of the geographer, e.g. the Rhine Rift Valley, the Alpine Highland or the Lower Hungarian Plain, is inhabited by people of more than one nationality and divided among two or more States ; again, the fact that the limits of the nationalities by no means correspond with those of the political divisions is the origin of some of the most serious problems of Europe.

Because the various States bear so little relationship to geographical regions, and also are liable to sudden and catastrophic changes, it seems to the writer impracticable to arrange a study of Europe according to the political divisions ; hence this book has three parts.

Part I makes a general survey of the continent as a whole—its relief and structure, its climates, soils and vegetation, the

types of land-utilization and production and, by combining these factors, the major geographical regions; at this stage, also, a general survey of the peoples and States of Europe is given. The broad pattern of the distribution of the physical and human elements is thus brought out.

Part II presents a more detailed study on the basis of the natural or geographical regions which comprise the continent : the major and minor regions and, except in eastern Europe, the sub-regions. These are treated as units, and in each the interrelations of the physical and human factors are considered. This is the longest section of the book, and in it the economic conditions are given special attention.

In Part III each of the States is dealt with in turn. Their physical and economic foundations are reviewed, the peoples who form their populations are considered, and an examination is made of the boundary changes of recent years and of those international problems which are either influenced by geographical factors or have geographical effects. In this section, facts are stated without prejudice, causes and consequences are pointed out, but judgments are deliberately withheld as unsuitable to a geographical text-book.

The relative space allotted to the various parts of the continent has been determined partly according to their importance as the homes and work-places of large populations or of characteristic groups of people, and partly according to the nearness to Britain.

A large number of maps have been specially drawn to illustrate the text. These deal with all aspects of the geography, but the available space has been used to supplement, not to duplicate, the maps to be found in atlases; it is assumed that an atlas will be constantly used with this book.

Questions have been added, in many cases designed to require a reconsideration of the facts and ideas already given and to promote individual thought.

The writer cordially thanks Mr. L. Brooks, M.A., Mr. G. J. Cons, M.A., Professor C. B. Fawcett, Dr. H. A. Matthews and Dr. S. W. Wooldridge, who have each read the draft of parts of the book and have given advice which has been gratefully accepted.

J. F. U.

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NOTE

IN March, 1939, while this book was being printed, the State of Czecho-Slovakia was dismembered ; Germany established one Protectorate over Bohemia and Moravia and another over Slovakia, while Hungary annexed Ruthenia (Carpatho-Ukraine). The political boundaries on the end-paper maps have been altered to conform with these changes, and on pages 344 and 345 the geographical consequences are described in such a way as to bring Part III of the book up to date. The statements made in Chapter XIX regarding the States of Germany and Hungary must therefore be modified by the facts given on pages 344 and 345.

The account in Chapter XIX of the conditions of Czecho-slovakia, as it was just before March, 1939, explains the fundamental political and economic factors in the problems and relationships of the three States ; many of these factors, though modified in certain respects, still remain and are still important in the human geography of Central Europe. Similarly, the map of the earlier boundary changes in Czecho-Slovakia (Fig. 80) is still useful in showing important features of the areas which have now passed into the possession of Germany and Hungary.

In April, 1939, following disagreement between the governments of Italy and Albania, Italian troops overran Albania. The King fled, a group of Albanians offered the Crown to the King of Italy, and the two States were thus united.

April, 1939.

PART I

EUROPE AS A WHOLE

CHAPTER I

RELIEF AND STRUCTURE

Introduction.—If we want to understand the nature of any region and the manner of life of its people, and we trace back to the reasons for the facts, we find that the most fundamental consideration is the position of the region in the world—its situation on the globe.

That position has, in the past, determined the way in which the region has shared in the great earth movements which have, for example, raised some areas to broad highlands, subjected some to foldings producing mountain systems, or lowered others, in some cases even below sea-level; in other words, the position has determined the broad features of the relief and structure of the region.

The main characteristics of the climate are similarly due to its position on the globe, which exposes the area to the influence of the sun and to that of one or more great wind-systems, while the relief also influences the climatic conditions.

Climate and relief together are directly or indirectly the chief factors conditioning the type of vegetation which can live in the region, and this in turn has a great influence on the agricultural and pastoral work by which many of the people get their living.

Of course, the environment of a people does not *determine* their work, nor their particular manner of life, for different peoples are at different stages of development and have different traditions and habits. Yet the position of a region in relation to other regions, either near at hand or far away, has been one of the main factors in aiding the immigration of peoples and ideas, and so affecting the character of the population and their mode of life. Moreover, the incentives and opportunities which their environment may offer influence their further development.

The position of regions may therefore be regarded from several points of view, and in each of the earlier chapters of this book, which deal with the general characteristics of Europe and its peoples, we shall examine the position of the continent from the particular aspect with which we are concerned. Accordingly, we will now consider how the varied relief and structure of the continent are related to the situation of its constituent regions.

A relief map of Europe shows at once a marked contrast between the relatively level and unbroken east, and the remaining part of the continent which is diversified by many uplands and lowlands and, moreover, is divided by invasions of the Atlantic waters and by inland seas. This fundamental distinction as to relief and outline affects practically all aspects of the physical and human geography of the two contrasted regions, known sometimes as "Trunk Europe" (because it forms part of the great trunk of the Euro-Asiatic land-mass) and "Peninsular Europe" respectively. The cause of the contrast lies in the fact that whereas eastern Europe is situated in a part of the globe which has been relatively stable through much of its geological history, the rest of the continent has been involved in repeated disturbances and dislocations of the crust of the earth.

In Peninsular Europe, on the north-west margin of the continent, one group of highlands stands out clearly and will be first considered.

The North-western Highlands.—The Highlands of Scotland-and-the north of Ireland resemble in many ways, though on a smaller scale, the Highlands of Scandinavia because they have shared the same geological history."

Some of the rocks comprising these regions were formed before the Palaeozoic Era, i.e. before any life appeared upon the earth ; even at that time the surface was contorted, and these earliest rocks were folded into great mountain ranges, but of these denudation has by now removed all but the deepest roots.¹

During the Palaeozoic Era other rocks were formed, and in the Devonian Period there occurred a series of dislocations of the earth's crust which were called the " Caledonian " earth-movements because their effects were studied in the structure of Scotland. At this period the rocks were subjected to great

¹ A time-sequence of the geological periods and the great earth-movements is given in Appendix I.

foldings in a general south-west to north-east direction. As a result the Caledonian mountain system arose, which extended over all the region now forming the north-western margins of Europe (see Fig. 1), including Spitsbergen far to the north of Scandinavia. In the course of these disturbances much of the rock was metamorphosed into crystalline forms, including schists and gneisses, while there are also large areas of granite, gabbro and other resistant igneous rocks.

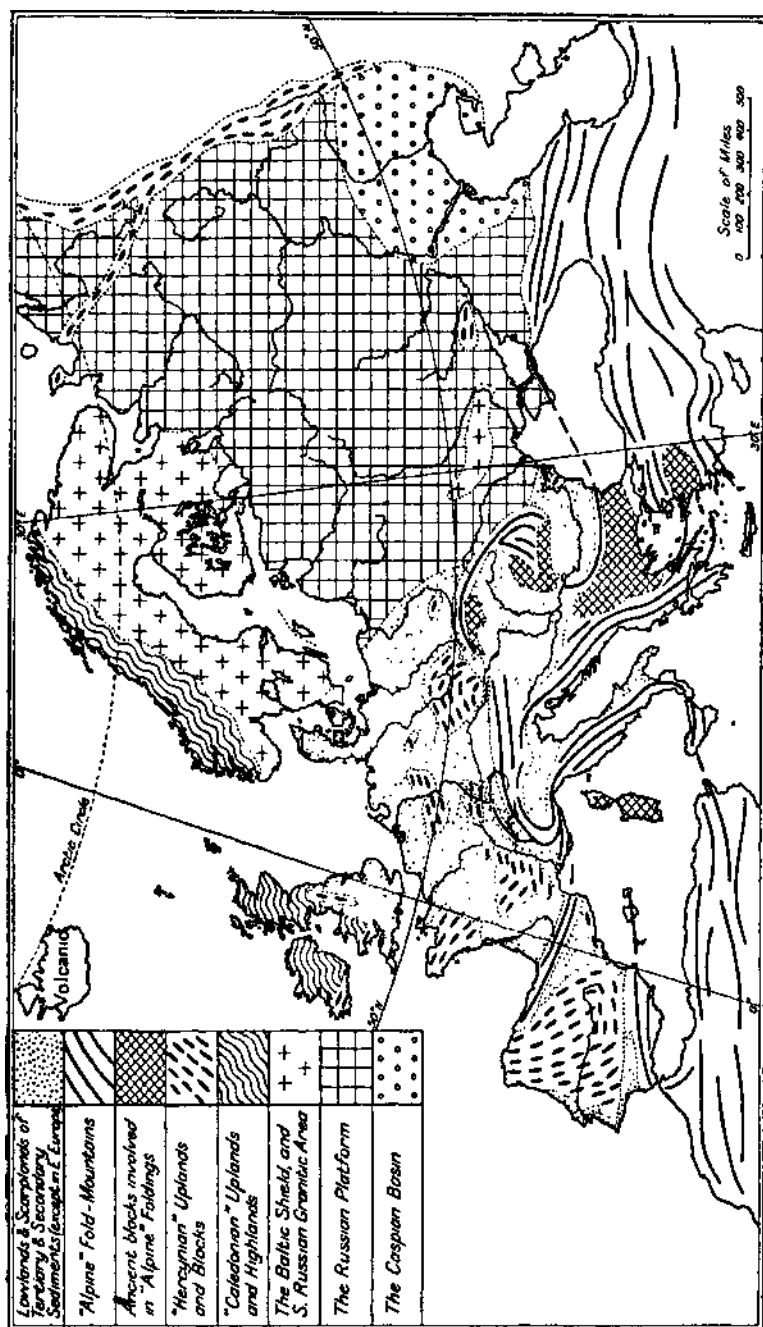
From this period onward through the Secondary Era the great mountain system was worn down to the condition of a peneplain, and only its stumps remained. Then, in the "Alpine" earth-movements of the Tertiary Era, the region again suffered disturbance, this time by faulting and the uplift of some of the resultant dislocated blocks and the subsidence of others. At this time, too, that part of the earth's surface now under the Atlantic waters was detached from the continental platform from which the lands of Europe rise, and the present shape of this margin of Europe was determined.

On the continental side, the blocks were raised probably in more than one stage, so that a low terrace-like step was formed between the sea and the great plateaus which in the Dovre Fjeld now reach over 7,500 feet and in the Jotun Fjeld over 8,000 feet (see Fig. 2). Moreover, the area was dislocated by faults running in several directions, and along these cracks there occurred both subsidences and also lines of weakness along which rivers eroded deep valleys in the plateaus.

Through such cracks and vents in the earth's crust, the pressures associated with the Alpine disturbances forced volcanic material in a number of places, and the Faroe Islands and Iceland in the far north-west are almost entirely formed of these volcanic accumulations.

In the Ice Age, snow accumulated on the high plateaus and ice was formed which worked its way down the valleys, deepening them and changing their section from V-shape to U-shape. In many other ways, too, glaciation played a part in producing the present relief; and its general importance is so great that we may at this point consider it further, although its influence extended far beyond the limits of the North-west Highlands.

At one stage the climate was so cold and precipitation was so great that the great ice-sheet from the Scandinavian Highlands and the smaller ones from the British Highlands extended south-



ward as far as the broken line marked as the maximum extension of the ice on the map showing the distribution of glaciation (Fig. 3). After this period, the climate became warmer, the southern part of the ice-sheet gradually melted and its edge lay progressively farther north ; this continued until the climatic improvement ceased and the margin of the sheet remained in the same position. Here lines of terminal moraine, composed of boulders, gravels, sands and clays, marked the end of this stage in the retreat of the ice. In the area between the outer margin of the earlier ice-sheet and the terminal moraines, there was now visible a layer of boulder-clay, the ground moraine formed below the ice in its wider extension. Also, melted ice-water washed away clayey and sandy material from the later terminal moraines, and much of this was deposited upon parts of the ground moraine ; occasionally such sheets of gravel and sand covered considerable areas. At later periods, with other climatic changes, the ice-edge withdrew farther, and the various stages in the retreat of the ice are therefore marked by alternations of lines of very irregular and often hilly terminal moraines, and flatter stretches of clayey or sandy character. Since the farthest southward advance of ice occurred, there has elapsed sufficient time for streams and weathering to reduce considerably, and to smooth out to some extent, the glacial deposits, but some of the later series remain so little affected that they dominate the landscape and largely control the way in which man uses the land.

An important effect of the ice was to obstruct or alter the courses of the streams, and in many parts this is now shown by rapids in the rivers and by the presence of lakes or swamps. Immature river-development and poor drainage are frequent characteristics of glaciated regions.

In general, the areas from which the ice worked its way outward are those in which its scouring action predominated, while the marginal areas of glaciation are those of deposition. Hence, over parts of the North-western Highlands region the soil was completely worn away and bare rock is the witness of the action of the ice, while in other parts are the coarse gravels and sands of the later terminal moraines. Taken as a whole, in the northern regions glaciation has made surface conditions more difficult for man's occupation and use ; on the other hand, some of the glaciated regions of central and western Europe have

benefited by the finely ground and fertile material brought from the north.

Another very important element in the evolution of the North-western Highlands was a succession of changes in the relative level of land and sea which have occurred several times since the Alpine dislocations, and are still in progress. These changes

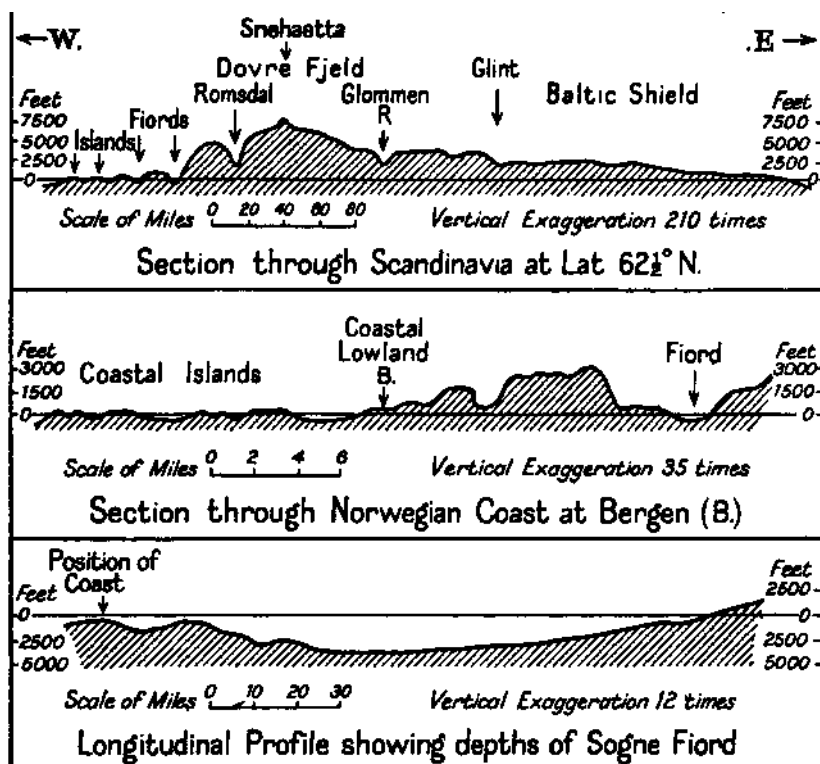


FIG. 2.—SECTIONS SHOWING RELIEF OF SCANDINAVIA.

may be due either to alterations in the level of the sea or to the slow risings, sinkings or tiltings of the land masses; in this part of the world the broad result has been a general sinking of the continental margin as compared with the Atlantic waters, and consequently the shores have been partially "drowned." The low terrace off the Norwegian coast has been reduced either to several small archipelagoes or to narrow patches of lowland extending beyond the highlands (see middle section in Fig. 2).

Also, the lower parts of the valleys, whether due to faulting, to stream erosion, to scraping and deepening by ice, or to a combination of these processes, have been invaded by sea-water and have become the wonderful fiords, with great side-branches leading inland, in some cases for scores of miles. Usually the fiords have steep or even vertical sides, rising to many hundreds of feet, while below the quiet waters are corresponding depths (see bottom section in Fig. 2). Apart from the narrow patches of coastal lowland the only habitable areas are either at the heads of the fiords or at the sides where old terraces interrupt the mountain slopes ; they give landing-places when they are at the water-level, and fields and pastures when they are a little above it.

The influence of this history and its resultant land-forms on human occupation will be considered in detail later. Yet it may be at once observed that it is in the main unfavourable, although the indented coast affords harbours for seafaring. Less obvious is the fact that the enormous amount of denudation has brought the surface of the earth down to the level of the minerals, originally formed in the depths, and now able to be reached by man ; iron and copper ores are therefore among the rather scanty resources of the Scandinavian Peninsula (see Fig. 6).

Another very important result of the geological history is the modification of climatic conditions by the upraised continental margin bordering the ocean. The precipitation of rain or snow is concentrated, as it were, along the coast and on the neighbouring mountains, while in the lee of the great barrier the Baltic lands are relatively dry. Similarly, the moderating influence of the oceanic winds is mainly limited to the Atlantic margins ; behind the highlands continental conditions at once begin, and from Sweden right across north-eastern Europe and far into northern Asia extend regions where the long, severe winters allow the growth only of the tundra or coniferous forest vegetation.

. **The Baltic Shield.**—The Scandinavian Highlands descend, often by a marked drop, known as the Glipt (see Fig. 2), to a great region which dips gently eastward under the Gulf of Bothnia and rises again in Finland, thence sinking in northern Russia till its border is largely covered by the waters of the Arctic Sea, the White Sea and Lakes Onega and Ladoga. Because this

region is slightly concave towards its centre under the northern arm of the Baltic Sea, and thereby resembles an inverted shield, it has been termed the Baltic Shield. It is one of the most ancient land surfaces on the globe, for it is composed of highly resistant granites, gneiss and crystalline schists which, although folded in the dim geological past, before life appeared upon the earth, have remained almost undisturbed during and since the Palaeozoic Era. Faultings have let down parts where relatively small areas of Palaeozoic sedimentary rocks have been preserved,

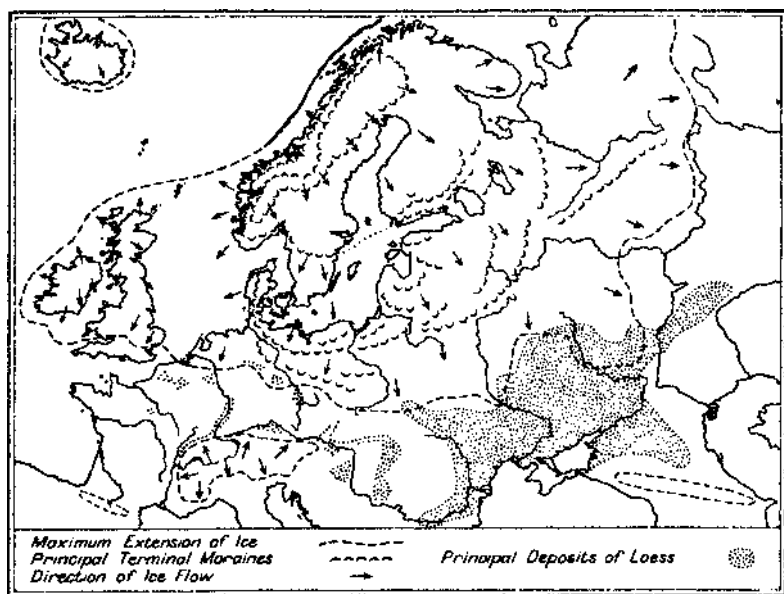


FIG. 3.—DISTRIBUTION OF GLACIATION AND LOESS.

and where the surface is rather lower than the rest, as, for example, in the "Lake Belt" of southern Sweden, in which are situated Lakes Vaner, Vatter and Malar.

For the most part the bed-rock forms undulating country in which the characteristic land-forms are due to glaciation. Near the southern margin there are long lines of hilly terminal moraines, behind which the glacial deposits are still so abundant and so recent that rivers have not been able to develop mature drainage systems. Their courses are irregular, and lakes are numerous. In central Finland, indeed, lakes and marshes cover much of the country and the roads make use of long,

narrow, winding ridges which stand above the waters; these are asar, or eskers, trains of gravel and sand deposited beneath or on the margins of the ice-sheet.

Yet over large areas the naked rock is exposed, for much of the soil was scraped away by the ice and transported to the surrounding regions ; nor was this loss remedied in the lower areas near the Baltic Sea and the Gulf of Bothnia by the deposit of sandy or clayey material when, for a time, the waters spread farther over the land.

Although the ancient rocks contain certain minerals, the Baltic Shield has proved a generally inhospitable region to man, even apart from its climatic conditions.

3. The Hercynian Uplands.—As the mountains of the north of the British Isles are akin to the Scandinavian Highlands, so the uplands of the south of Ireland and of the south-west of England and Wales are akin to a number of others scattered widely over the continent. They are known as the Hercynian Uplands because they represent fragments of mountain systems folded in the Hercynian earth-movements which occurred at the close of the Carboniferous Period. These mountains were continuous over great areas, though their traces are now found only in scattered fragments, and their folds ran in various directions. In the south-west of Britain and the adjoining region of Brittany, the general direction was about west to east with a trend to the south-east towards the centre of France, as is shown by the direction of the lines in these areas in Fig. 1 ; folds running in this direction are referred to as Armorican, from the ancient name of part of Brittany. In central Europe, however, the common direction is from south-west to north-east, termed Variscan, from the name of a tribe long ago living in the neighbourhood of the Fichtel Gebirge.¹ The Variscan direction is seen in the structure of the Rhine Plateau, which is cut across by the Rhine in its course between Bingen and Bonn, and also in the Harz Mountains, the Vosges and the Black Forest Mountains. In the Central Plateau of France both directions are seen, and still others appear in other regions, notably in the central tableland, or " Meseta " of Spain, in the " Diamond " formed

¹ Both the term " Armorican " and that of " Variscan " are sometimes used to denote all these foldings and all the regions of this type, but it seems best to restrict them as is here done, and to employ the term " Hercynian " in the general sense. " Hercynian " is derived from the old name of the Harz Mountains, one of the regions of this type.

by Bohemia and its margins, and in the Lysa Gora -Uplands of Poland. Even in eastern Europe are two similar Hercynian areas, viz. the Donetz Plateau in the south, and the Ural Mountains, with their offshoot, the Timan Uplands, on the borders of Asia.

The various mountains formed by the Hercynian movements have had a history somewhat like that of the older Caledonian mountains ; they were worn down to peneplains, so that the directions of the folds showed only in the strips of the various strata outcropping along the surface, like the graining of the wood in a sawn tree trunk. The Hercynian peneplains later suffered changes : over some areas they were depressed and upon them were laid down sedimentary rocks during the Secondary and early Tertiary Eras, and in the succeeding Alpine earth-movements they were considerably fractured, tilted, upraised or depressed.

Consequently much of what continuity they had previously shown has disappeared, only those parts which stand up above the surrounding lowlands being clearly recognizable as Hercynian Uplands of the usual type. These, which are shown as such on the map of structural regions in Fig. 1, were uplifted to plateau-like form, with more or less level surfaces, but denudation has since removed most of the overlying sedimentary rocks of Secondary and Tertiary date, and has exposed the older rocks of the peneplains with their graining ; even in this older rock the less resistant strips have been etched out so that the more resistant stand up above the general level as ridges running in the direction of the original mountain-folds.

Where an uplifted mass is bounded by clearly marked, and more or less parallel, faulted edges, it is known as a " horst," and such structures are common in the Hercynian Uplands. The converse of a raised horst is a rift-valley, which has subsided between two parallel series of faults. One very important rift-valley is that in which the Rhine flows between Basel and Mainz ; the parallel faults which bound it are shown in the map in Fig 46, and the section in Fig. 47.

In many cases, uplands due to dislocation rise steeply on one side where they are bounded by marked faults, and descend more gently in other directions ; structures of this kind are commonly known as " massifs " and are exemplified by the " Massif Central " or " Central Plateau " of France, which is fault-edged where it overlooks the Rh6ne Valley.

The dislocations which broke up the Hercynian areas allowed igneous material to be forced up along faults and through volcanic vents, and in several parts, notably in the Central Plateau of France, great sheets of lava and the remains of volcanic cones bear striking witness to this part of the history.

In the rocks of the Carboniferous Period which enter into the structure of the Hercynian regions, there were formed widely extending coal-measures containing seams of valuable coal, and these coal-measures were involved in the Hercynian foldings. Where they formed parts of the upfolds which were first denuded, the coal-measures have been worn away, but where they formed parts of downfolds or basins they have, to a certain

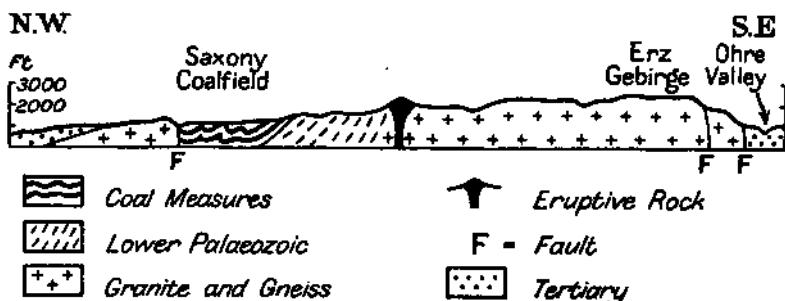


FIG. 4.—SECTION THROUGH THE SAXON UPLANDS, ERZ GEBIRGE AND EGER (OHRE) VALLEY.

extent at least, been preserved. Consequently there are important coal-fields associated with some of the Hercynian Uplands, and these, together with other mineral resources found in their exposed rocks, are the basis of mining and manufacturing industries which have attracted people to the mineral-bearing areas.

The structure of the Hercynian Uplands is illustrated in Fig. 4 by the section through the Erz Gebirge and Saxon Uplands; this area exhibits most of the elements described above.

Yet in general the Hercynian Uplands are not well populated, for they are not productive agricultural regions, since, as they stand above the surrounding lowlands, they have a relatively cool and moist climate, and also they do not usually bear fertile soils. Hence they naturally tend to be heath or moor lands or to be clothed with forests.

4. Central and Western Lowlands and Scarp-lands.—After the Hercynian earth-movements and the later wearing down of the resultant mountain systems, most of Europe, except the north, was submerged under the waters of seas or lakes. This submergence was, however, not uniform over the whole of the southern part of the present continent; some parts were beneath relatively deep seas in which was deposited the ooze from which limestones were formed, while other parts were covered by shallow seas or lakes in which clay-forming muds were laid down, while elsewhere sand was dropped which was changed to more resistant sandstones or remained in an unconsolidated form. Moreover, alterations in the depths of the various parts brought differing conditions first to one region and then to another, and thus at a given place there might occur first the formation of sandstones, then of limestones, and later perhaps of sands or clays.

Thus over wide areas of central and southern Europe there was a succession of deposits of varying composition during considerable parts of the Secondary and Tertiary Eras, and consequently thick strata of sedimentary rock covered platforms of more ancient formation.

Where, in the Alpine earth-movements, the platforms and their coverings of Secondary and Tertiary sediments were broken and upraised, the Hercynian Upland regions were formed as has been described above, but in the less-disturbed areas the strata remained at a lower elevation and the sedimentary cover was less exposed to denudation. In central and western Europe this was the case between and around the blocks of the Hercynian Uplands, where basins were formed such as those of south-eastern England and northern and south-western France, or where there were broader depressions, such as that on the southern shores of the North Sea and the Baltic Sea; in these regions the older rocks are still covered by a succession of sedimentary strata lying above one another in more or less saucer-like form or in an almost horizontal position, as is shown in the section through northern France in Fig. 38. v*

In other parts the rocks have a pronounced tilt, as in England west of the London Basin, in France west of the Vosges Mountains and in Germany east of the Black Forest Mountains; in such cases the less-resistant strata have been worn away, leaving the more resistant as long, tilted slabs, and giving to the

whole region a scarp-land character. This structure is shown in the section in Fig. 48.

Moreover, in the Ice Age, parts of these lowlands were invaded by ice, especially from the North-western Highlands, as was described above, and in such parts various deposits of clays, sands and gravels were laid down.

Frequently, fertile soils have developed upon the rocks of the lowlands and scarp-lands, and agriculture and pastoral work are carried on in such forms as the generally favourable climatic conditions have allowed.

Exceptional fertility marks the soils which have been derived from a mantle of loess covering the earlier deposits in certain parts of the central and western lowlands, and over a great area in south-eastern Europe (see Fig. 3). This loess resembles that of China in its composition ; it is fine-grained, loose and sufficiently porous to allow a free downward drainage of water after rain, and a slow upward movement by capillary-action in dry weather. Its existence in Europe is due to dry climatic conditions which occurred during and after the Ice Age, when southward-blowing winds raised clouds of dust from the finely ground particles of the moraine areas, and deposited them over the surrounding lowlands until a layer was accumulated, in the west often to a depth of scores of feet, and in the east to much greater depths. In central and western Europe the existence of the loess was specially important during the period of man's early settlement and cultivation of these regions, for loess areas were usually free from forest, easily worked and gave abundant return to the simple forms of agriculture then practised.

Minerals are not characteristic of the later sedimentary rocks, though iron ores were formed in some of the Secondary strata (again see Fig. 6), and lignite deposits are found in some of the Tertiary. Yet where the older rocks of the Hercynian Uplands dip down beneath the edges of the basins, the coalfields may extend beneath the younger strata, and therefore in several cases coal-mining has spread from the Hercynian margins some distance into the neighbouring lowlands.

Because of the subsidence of the basins and hollows, the waters of the Atlantic have invaded the lowest parts, and oceanic inlets or inland seas adjoin these lands and bring opportunities for fishing and trading. Hence the lowlands and scarp-lands of central and western Europe have varied resources, and as a

whole have become the most densely populated parts of the continent.

3. The Regions of " Alpine " Folding.—Great as were the changes brought about by the Alpine earth-movements in northern and central Europe, they were but small compared with those which entirely transformed the southern part of the present continent.

It appears that during a very long period about the middle of the Tertiary Era, the block of the earth's crust which forms northern Africa moved northwards towards the similar block forming the platform of ancient and resistant rock which in central Europe underlay the sedimentary strata of Secondary and early Tertiary date. The northward movement was irresistible: the older rock structures of central Europe were broken and displaced, while the younger, sedimentary strata of the south were contorted in a most complicated fashion.

In a general way it may be said that massive sheets of limestones and other sedimentary rocks were ridged up into folds along lines which formed great curves, as indicated in Fig. 1. These curves appear to sweep round from the south of Spain across the Strait of Gibraltar into the Atlas Mountains of northern Africa, whence they are continued across the central narrows of the Mediterranean Sea into Sicily and through the Apennine backbone of Italy into the Alps; even the Pyrenees and the Cantabrian mountains of northern Spain are linked with this system, which therefore almost completely encircles the area of the western Mediterranean. A small spur from the Alpine system is seen in the Jura Mountains.

On their eastern side the Alpine folds appear to spread out, both to the north-east in the Carpathian system and to the south-east in the Dinaric Alps, thus enclosing the lowlands of the middle Danube. The southern part of the Carpathian system swings round into the Balkan Mountains, so that between these and the southward continuation of the Dinaric Alps is another enclosed area in the neighbourhood of the northern part of the *Mæan* Sea. An eastward continuation of the Balkan Mountains is probably to be seen in the Yaila Mountains of the Crimea and in the Caucasus, while those of the southern part of the Balkan Peninsula are continued in the islands of the southern *Mæan* and curve again into the mountains of Asia Minor. Indeed, the whole system extends east-

ward across Asia on a still greater scale and culminates in the highest ranges of the world.

The term "folded" is, however, inadequate to describe the^T contortions which the strata have suffered (see Fig. 5). They have been squeezed together in most complicated ways, and on the outer side of many of the curves, sheets of rock (called "nappes") measuring hundreds or thousands of square miles in area, have been thrust bodily forward over other strata till

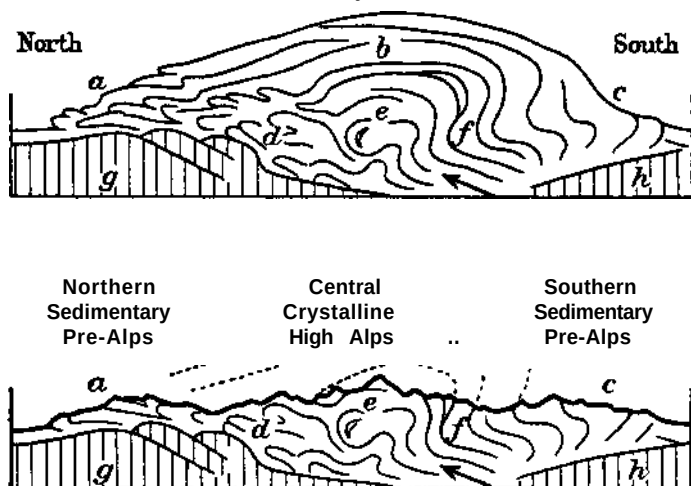


FIG. 5.—DIAGRAMMATIC SECTION THROUGH THE EASTERN ALPS.

(Vertical Scale greatly exaggerated.)

Note.—The upper diagram shows in a simplified form the contortions due to a thrust from the south. The underlying platform, *g* and *A*, is dislocated; the lower sedimentary rocks, *d*, *e* and *f*, are metamorphosed into crystalline nappes; the sedimentary nappes of the upper strata, *a*, *b* and *c*, are thrust northward (except in the extreme south), far from their roots.

The lower diagram shows the present constitution of the Eastern Alps after great denudation. In the central zone the crystalline nappes are exposed, and in the northern zone the sedimentary strata are left widely separated from their counterparts in the south.

they have been parted from their "roots" and now lie in regions far distant from those in which they were formed.

Under the pressures which have brought about such movements, some of the rock was metamorphosed into crystalline form; for example, a large part of the central Alps is composed of crystalline rocks which were thus formed. In some parts, too, molten material was forced up from the depths, and igneous rocks thus add to the complexity. Moreover, volcanoes were formed and are still to be observed, and even now earthquakes show that stability has not yet been attained in this part of the earth's surface.

The Alpine foldings have not only affected sedimentary rocks ; within them have been enclosed masses of older date and more resistant composition. For example, in the central Alps themselves are large areas, including the Mont Blanc massif, consisting of splinters of an Hercynian floor driven up into the folded pile above ; again, in the system of the Carpathians (in the wider sense of the name) is the great and ancient massif of the Transylvanian Alps as well as ancient fragments on the west of Transylvania and in parts of the Tatra Mountains.

Other blocks or massifs occur within the folded mountains of southern Europe, notably that between the Balkan Mountains proper and the western heights of the Balkan Peninsula ; here is the massif of which the Rodopi Mountains form the highest part. Again, within the curved folds of the western Mediterranean, there stand up ancient massifs forming the greater part of the islands of Corsica and Sardinia.

Another very marked, and very important, feature of the region affected by the Alpine foldings is the formation of great basins within the mountain system. These are of varying depth : in the western Mediterranean subsidences have let down the earth's surface over 10,000 feet below sea-level; the Adriatic Sea, however, is relatively shallow, especially in its northern part, and the North Italian Plain is essentially a continuation of this depression now just above the level of the sea. The iEgean Sea occupies another area of subsidence ; it is " half-drowned," and the higher parts of the previously continuous mountain chains form the islands which appear as stepping-stones between the Balkan Peninsula and Asia Minor. The southern part of the Black Sea is another well-marked basin; the north-western edge of the deeper area is the line of shallows showing the earlier connection between the Balkan Mountains and those of the Crimea.

A less-marked basin is that between the Balkan Mountains and the Transylvanian Alps where the relatively recent deposits forming the Walachian Plain stand above sea-level, and thus resemble those of the North Italian Plain.

Broadly similar in origin are the lowlands between the Alps and the great curves of the Carpathian system.

The Alps themselves, and to a less extent other parts of the great fold-mountains, reach such heights that, during the Ice Age, they bore ice-sheets which overrode the highest parts, and

in the case of the western Alps extended into neighbouring regions. The complex results of glaciation in the Alpine Lands and the Alpine Forelands will be described in later chapters.

The effects of the geological history on other conditions than structure and relief are very great; we can here only hint at a few of the results. There is the existence of the Mediterranean and Black Seas which separate Europe from Africa and southern Asia; these seas have physical influences, such as their warming influence upon the winter climate of the neighbouring lands, and influences upon human life, such as the way in which they have enabled civilization to spread all around their habitable coasts.

Corresponding to the variety in the rock structure and the relief of southern Europe is the variety of resources which include mineral deposits, Alpine pastures, mountain forests, broad inland lowlands and hill-sides facing the seas, all capable of human utilization; thus the extraordinary complexity of the geological history has been followed by an extraordinary complexity in the conditions of human life.

6. The Russian Platform.—In eastern Europe the physical development and the human history have been quite different. The ancient rocks of the Baltic Shield dip gently south-eastward, and form the substratum of the great structural region known as the Russian Platform. Apart from its margins, where there are the Hercynian areas of the Ural and Timan Mountains and the Donetz Block, the whole area between the Caledonian Highland system and the fold-mountains of the Crimea and Caucasus has remained almost unaffected by the later disturbances, and the most important movements have been relatively slight alterations in its general elevation as compared with sea-level. Because of these alterations, the area has been covered by the waters of seas of varying extent, and hence the ancient rocks which continue those of the Baltic Shield are covered in the north-west of Russia by deposits of Palaeozoic age, while farther to the south-east these are followed first by Secondary, and then by Tertiary, strata.

But because these deposits have lain almost undisturbed, they have not been subjected to pressures which would have changed their character, and in general even the oldest remain in much the same condition as those of recent formation; stone

which could be used for building or road material is a rarity over large areas of Russia.

The region is not of uniform elevation ; the Valdai Hills are over 1,100 feet above sea-level and form part of the water-parting between the rivers flowing north-west to the Arctic and Baltic Seas and those flowing south-east to the Black and Caspian Seas. The greater part of eastern Europe is less than 600 feet in height, while the land immediately north of the Caspian and the surface of that great inland lake are below the general sea-level of the globe.

Moreover, there have occurred warpings of the underlying platform which, although very slight if measured in degrees of slope, when continued over the great distances of eastern Europe have important consequences. The most marked of these warpings occurs in the south-west, where it brings up to the surface a belt of granite (Fig. 1); through this resistant mass the Dnieper River has been able to cut its southward reach only incompletely, and there are rapids which prevented navigation, but gave water-power now used for industrial purposes.

It must also be observed that all the northern part of the region has been glaciated, with results similar to those found in the plains of the central and western parts of the continent.

Because of its uneventful history, the Russian Platform has in general lacked the formation of mineral ores. Apart from some coal in the Palaeozoic strata near Moscow and iron in the granitic belt, the chief minerals are in the Hercynian areas of the Donetz and the Urals, where industrial development can utilize resources lacking over most of European Russia.

One consequence of the geological history is of the first importance. Undisturbed by the great forces which have led to such a complicated relief in the rest of Europe, the east has remained open, level country in close physical association with the similar lands of western Asia, for the Ural Mountains do not form an effective barrier of any kind. Hence the climates of western Asia are continued across " Trunk Europe " about as far as " Peninsular Europe." Similarly, the belts of natural vegetation, i.e. the tundras, the forests, the steppe-lands and the semi-deserts, extend unbroken from Asia across eastern Europe. Consequently peoples who have adapted their ways of life to each of these types of vegetation have worked their way, either westward or eastward, along almost the whole extent of the

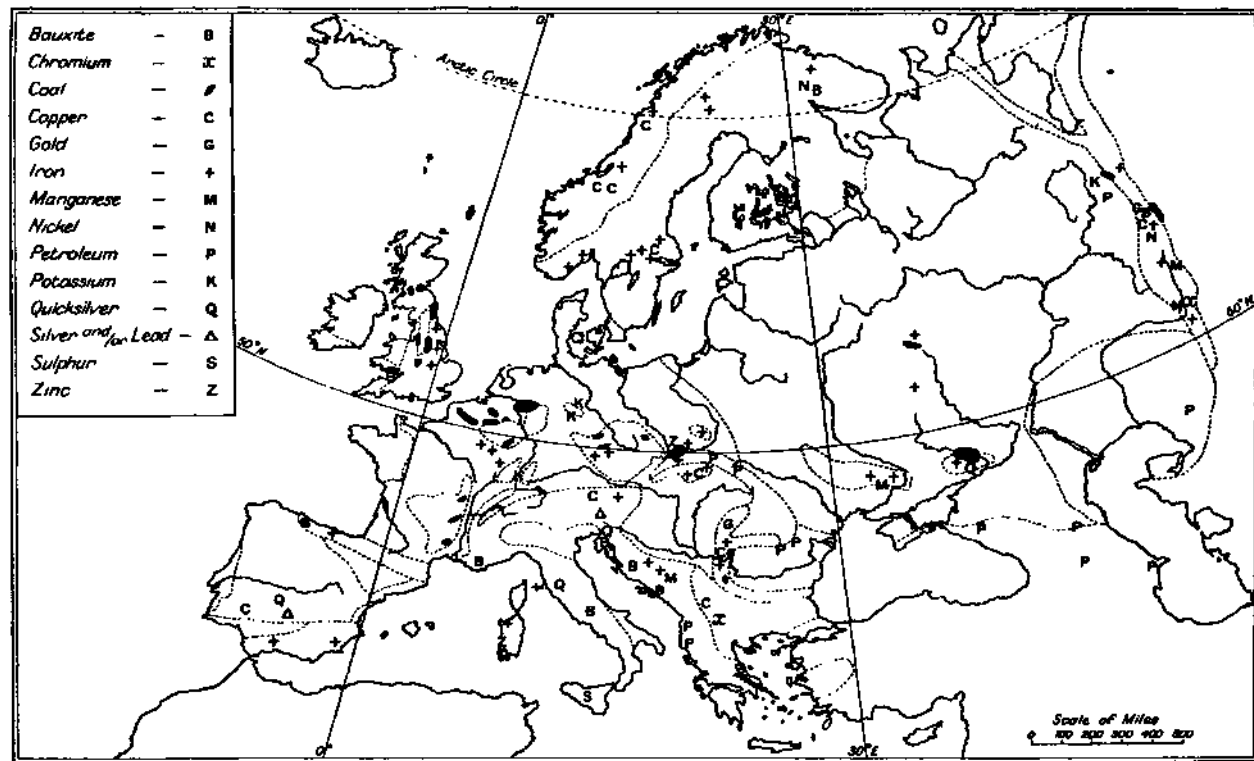


FIG. 6.—PRINCIPAL MINERAL WORKINGS.

Note.—There are also numerous lignite workings, especially in central Europe.

belts, and so kept western Asia and Trunk Europe in very close association from the human point of view.

7. The Caspian Basin.—Here is a region which is certainly more " Asiatic " than " European." It is a part of a great depression which includes the three inland seas : Caspian, Aral and Balkash. To this hollow flow the waters of the surrounding higher lands, and to the Caspian Sea the Volga brings the drainage from a large part of eastern Europe. With the water is brought down the material worn away by the rivers, and the Caspian Basin is covered partly by such recent alluvium and partly by deposits formed when a greater sea than the present one occupied the area.

Moreover, the formation of the Caspian depression, in causing the greatest river of Europe to flow, not towards the Mediterranean, but to the south-east, and to end in a lake without access to the oceans, has tended to hinder close association between eastern Europe and the remaining part of the continent.

QUESTIONS

1. How much knowledge of the Ice Age do you consider necessary in order to understand the present-day geography of the northern half of Europe ? Illustrate by reference to particular areas and their characteristics.

2. Certain parts of Europe may be referred to as being regions of " Alpine folding." Make a sketch-map showing these regions, and consider to what extent they have geographical, and not merely geological similarity.

3. What are the common structural characteristics of the " Hercynian Uplands," and how do these characteristics affect their utilization by man ?

4. Distinguish between four types of coast on account of their structure, and state their location in Europe. Give a description of any two of these types.

5. Define " Trunk " and " Peninsular " Europe respectively, and explain the fundamental causes of the contrasts between these areas.

CHAPTER II

CLIMATE

Wind Systems.—Over much of Europe, oceanic influences play a very great part in determining the climatic conditions, and the belts of wind systems which are developed over the oceans are therefore important. Since these belts lie in certain latitudes, the position of Europe as regards latitude must be first noted. On its southern margin, Europe forms the northern part of the Mediterranean area; Gibraltar is about lat. 36° N. In the north of Europe the Scandinavian peninsula extends well beyond the Arctic Circle; North Cape is about lat. 71° N.

As a consequence of this position, all the continent except the east, i.e. Peninsular Europe as distinct from Trunk Europe, comes under the influence of the great system of winds known as the "westerlies," which appear on wind maps as blowing from a more or less westerly direction, that is, from the neighbouring Atlantic Ocean, whose waters are exceptionally warm for their latitude because they have been brought from tropical regions by the Gulf Stream Drift.

It may therefore be deduced that the climate of Europe, in so far as it is determined by these westerly winds, is not only made equable, but on the average is exceptionally warm for its latitude; further, it may be deduced that these winds bring water-vapour which is precipitated as rain or snow over the land, especially on the windward side of the highlands.

But though there is truth in these ideas, there is the complication that the westerlies are not by any means constant, even in those parts where the maps show that the prevailing winds blow from the west in all seasons. In England, for example, the "prevailing" winds may be shown on a climate map as coming from the south-west, but this is the actual direction of the winds only for about 20 per cent. of the observations. Indeed, the most characteristic fact about the winds experienced in England is that they frequently change, depending upon the passage of low-pressure systems called "lows," "depressions" or, less

frequently, " cyclones," or upon the development of high-pressure systems or anticyclones.

Hence the belt of the westerlies may be usefully considered as a belt in which depressions are common and travel in a generally west-to-east direction. In these depressions are two main streams of air, one coming from a south-westerly or

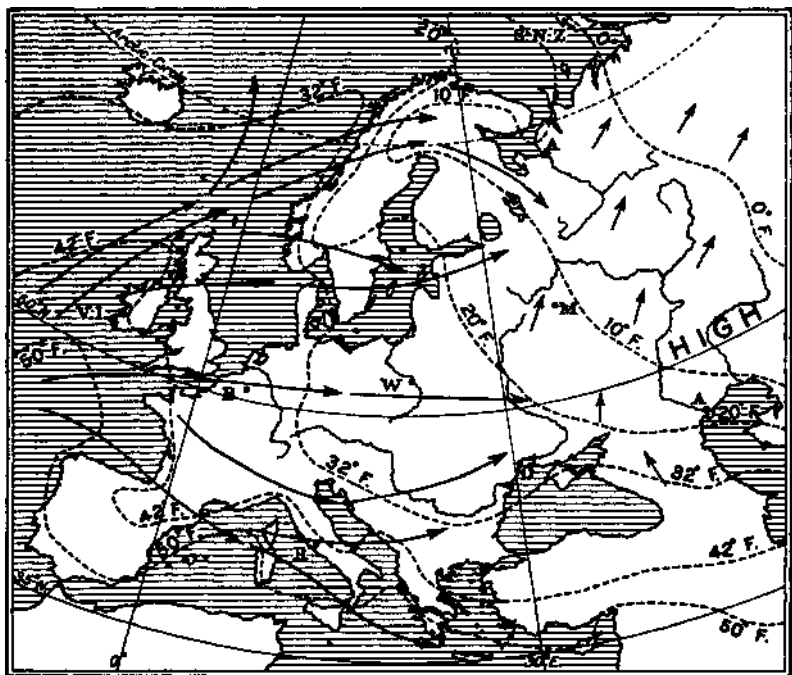


FIG. 7_JANUARY " LOW " TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean January temperatures reduced to sea-level.

southerly direction and bringing warmth and usually rain, the other coming from a north-westerly, northerly or easterly direction and bringing cool and dry weather. As the depressions pass over a given place, there are accordingly changes in the weather as the warmer and the cooler air-streams cover the area in turn ; on the whole, however, the " lows " bring rain, and on their southern side warmth, although cold weather may be found on their northern side. Since the centres pass most frequently over the northern part of Europe, it is their southern sections, with warmth and rain, which most affect the continent.

As the central parts of depressions are areas of low air-pressure, the regions over which they are most commonly found necessarily appear on maps showing the average barometric pressures as areas of lowest pressure, e.g. that between Iceland and north-western Europe.

On the contrary, anticyclonic conditions are marked by high

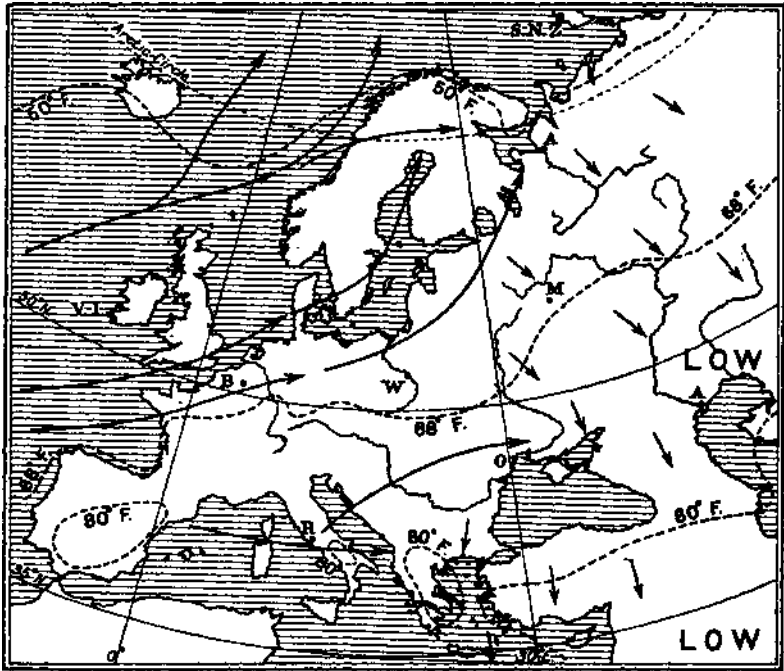


FIG. 8.—JULY "LOW" TRACKS, WINDS AND ISOTHERMS.

Note.—The long arrows show the common tracks of the centres of depressions. The short arrows show the prevailing winds in eastern Europe. The broken lines show isotherms of the mean July temperatures reduced to sea-level.

pressures, gentle winds or calms, and dry weather. Such conditions only occasionally develop within the belt of the westerlies, but they are more common on the southern side of this belt, that is, in the sub-tropical latitudes to the south of Europe, where the climate maps show relatively high average pressure.

Hence, one may shortly say that western Europe is in general under the influence of the belt of the cyclonic, rainy westerlies, while to the south of Europe lies the belt of sub-tropical calms and droughts.

The two belts, however, are themselves not always in the same latitudes, but shift with the sun, southward in winter and northward in summer. Consequently in winter the westerlies cover the whole of western Europe, and their depressions may fairly often pass over the Mediterranean area. In summer, on the other hand, the depressions leave the Mediterranean relatively free, especially in the east, and the south of Europe frequently experiences the calms and drought of the sub-tropical belt of high pressure.

In Figs. 7 and 8 the long arrows show the tracks commonly followed by the centres of "lows," but it must be understood that the area covered by a depression is normally very considerable ; if the centre passes over Berlin, for instance, its influence would probably extend from central Scandinavia in the north to the northern Adriatic in the south. Bearing this in mind, it will be seen from the maps that in winter cyclonic conditions characterize the whole of Peninsular Europe, while in the summer they are generally less frequent, particularly in the Mediterranean region.

In eastern or Trunk Europe the depressions have less influence, for they tend to pass over seas rather than lands, and when they do penetrate the great land-mass, they diminish in intensity. The climate of eastern Europe is therefore more closely related to that of Asia ; it is marked by a reversal of the conditions as between summer and winter which is associated with the monsoonal changes of the greater continent.

In summer the heat sets up a system of continuous low pressure over Asia towards which the winds blow inwards, though deflected, by the earth's rotation, to the right of the most direct path ; consequently in the east of Europe they commonly blow from a more or less north-westerly direction, as is shown by the short arrows in Fig. 8. Even in the eastern Mediterranean this influence is felt, and the prevailing northerly winds of this season were there known to the ancient Greeks as the " Etesian " or " annual " winds, whose onset marked the beginning of uninterrupted easy navigation for their small ships.

In winter the continental land-mass is cooled, high pressure is more continuously developed and the air tends to move outward. The winds, deflected to the right of their direct outward path, usually blow from a more or less southerly direction over most of eastern Europe (see Fig. 7), though in the Mediter-

ranean region they are more frequently interrupted by the passage of cyclones.

Temperatures.—The wind systems combine with the direct heating effect of the sun to determine the temperature conditions,

In the summer the sun's direct influence is the greater, as may be seen from Fig. 8, in which are shown the isotherms drawn from the records of the mean monthly observations of air temperatures in July. (To simplify the maps, the temperatures have been reduced to sea-level; consequently the uplands and highlands have cooler conditions than are indicated.) Where the sun is relatively high in the sky, that is, in southern Europe, the heat is greatest, and over the southern parts of the three peninsulas the lowlands have mean temperatures at, or even over, 80° F. during July. In the far north the temperatures are at about 50°. The course of the isotherm of 68° is worth noting: in the Atlantic area it is well to the south of latitude 50°, for the ocean is relatively cool; in eastern Europe it passes considerably to the north of this latitude because the continental mass is greatly heated by solar radiation; in central Europe the isotherm runs almost along the line of latitude, and places east and west of one another have about the same summer temperatures.

It is convenient to say that when the mean temperature is above 68° F. (20° C.) the climate is "hot"; when between 68° and 50° F. (20° and 10° C.) it is "warm"; when between 50° and 32° F. (10° and 0° C.) it is "cool"; and when below 32° F. (0° C.), it is "cold." Adopting these terms, we may point out that the temperature map shows that in July the climate of most of Europe south of latitude 50°, together with all south-eastern Russia, is hot, that of most of Europe north of latitude 50° is warm, but the lands adjoining the Arctic Sea are cool.

The January map indicates marked contrasts, for in the latitudes of Europe the winter sun is visible for a shorter time in the day and is lower in the sky than in the summer; consequently the sun has much less effect and the winds have relatively more influence, as they bring warm air from the Atlantic Ocean.

The isotherm of 50° is now the highest and, away from the Atlantic, only the southern Mediterranean lands have this temperature. This is due partly to the latitude and partly to the influence of the Mediterranean Sea itself, for this sea remains remarkably warm in the winter because it is shut off

TABLE OF CLIMATIC CONDITIONS

Climate Stations		Lat. N.	Height above Sea-level (Feet)	Temperatures (Deg. F.)				Precipitation (Inches)				
				Mean Monthly		Mean Annual		Annual Total	Seasonal Totals			
									Win. D.J.F.	Spr. M.A.M.	Sum. J.J.A.	Aut. S.O.N.
				Jan.	July	Min.	Max.					
Arctic	South of N. Zemlya	72	50	2	44	—	—	6	0.9	0.8	2.2	1.7
Boreal	Haparanda	66	10	11	59	—27	81	19	4.0	3.2	5.4	6.6
	Archangel	65	50	8	60	—32	84	17	2.5	2.7	6.6	5.0
Sub-boreal	Stockholm	59	150	27	62	—2	83	21	4.6	4.2	7.0	5.5
	Moscow	56	500	12	66	—17	88	21	3.5	4.6	7.7	5.2
Oceanic Temperate	Bodo	67	10	30	55	7	75	36	9.1	6.3	7.7	12.5
	Bergen	60	70	34	59	12	79	84	24.5	15.2	17.6	27.0
	Valentia Is.	52	30	45	59	28	72	56	17.3	11.4	11.8	15.2
	Brest	48	180	43	64	23	90	32	9.5	6.2	6.2	10.6
	Santiago	43	890	45	66	28	95	65	21.7	17.1	6.9	19.1
Mid-Temperate	London	51	20	39	63	18	88	25	5.6	5.2	7.3	7.0
	Brussels	51	200	34	63	14	88	30	6.6	6.0	8.7	8.3
	Paris	49	180	37	65	12	93	21	4.1	4.8	6.0	5.9
	Karlsruhe	49	390	33	66	8	91	38	7.3	8.7	12.1	9.7
	Lyons	46	570	36	70	10	95	40	7.0	8.7	10.1	11.1
	Milan	46	480	34	75	14	93	40	7.7	10.2	9.3	12.5
	Bordeaux	45	250	41	68	18	95	33	8.0	8.0	7.4	10.0
Interior Temperate	Konigsberg	55	20	27	63	—2	90	25	4.1	4.6	8.8	7.8
	Berlin	52	160	31	64	7	91	23	5.0	5.0	7.6	5.1
	Warsaw	52	440	26	66	6	90	22	3.8	4.7	8.5	5.0
	Munich	48	1,700	27	63	0	86	35	4.8	8.6	14.2	7.6
	Budapest	47	500	28	70	10	91	25	4.6	7.0	7.0	6.7
	Sona	43	1,800	27	69	2	95	26	4.3	7.1	8.0	6.2
Mediterranean	Genoa	44	180	45	75	28	90	52	13.2	11.7	6.9	20.3
	Marseilles	43	250	43	72	21	91	22	5.2	5.2	2.8	8.3
	Borne	42	160	44	77	27	95	32	9.8	7.7	3.2	11.9
	Oporto	41	270	48	67	32	93	48	15.8	13.4	3.4	15.4
	Madrid	40	2,100	40	76	18	104	16	4.0	5.4	2.1	4.9
	Valencia	39	70	49	75	32	99	19	4.5	4.8	1.6	8.2
	Palermo	38	230	50	76	39	99	29	11.7	6.7	1.5	9.3
	Athens	38	350	49	81	28	100	15	5.9	2.9	1.4	5.2
Steppe	Orenburg	52	360	4	72	—23	97	15	3.1	3.3	5.0	3.7
	Odessa	46	210	26	73	0	91	16	2.9	3.5	5.6	4.1
	Bucharest	44	280	25	73	—4	95	23	4.0	6.2	8.0	4.9
Arid	Astrakhan	46	—50	19	77	—15	97	6	1.3	1.5	1.7	1.3

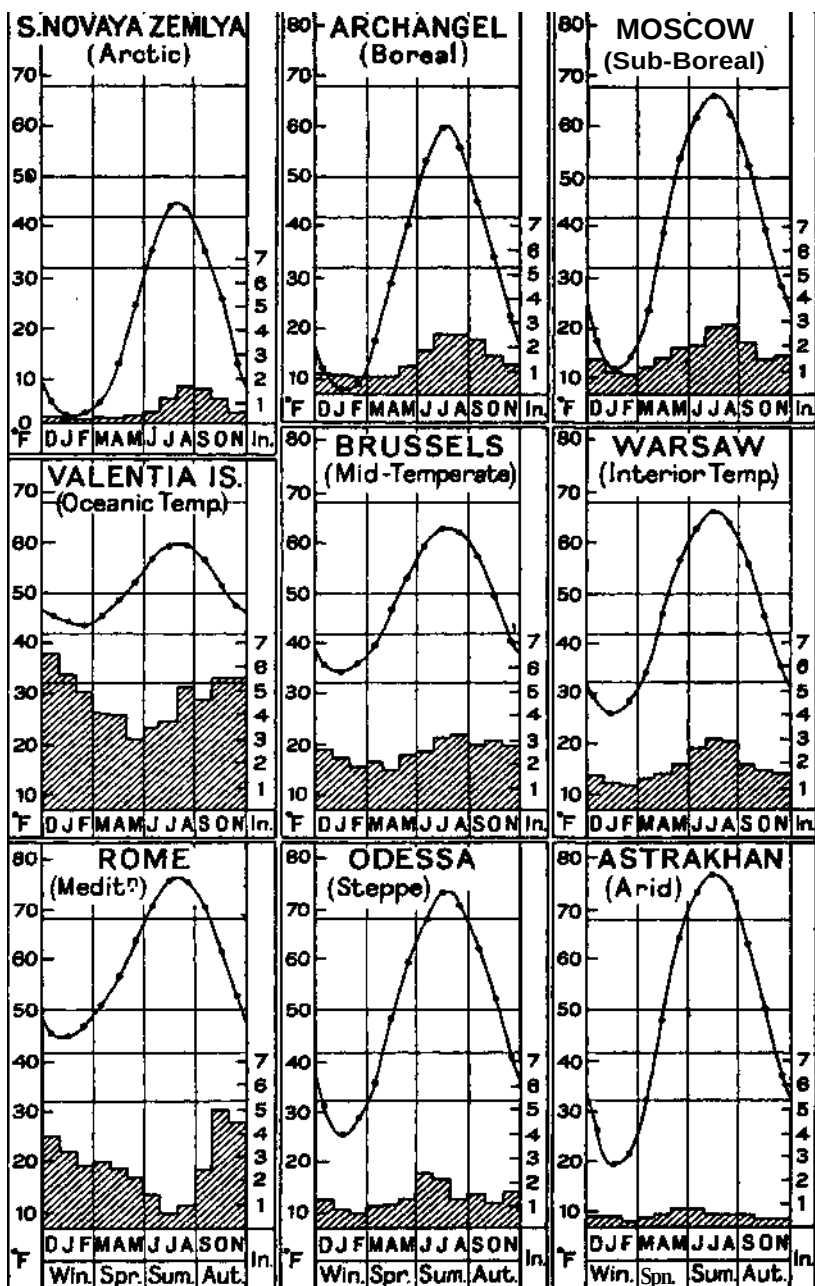


FIG. 9.—TEMPERATURE AND RAINFALL GRAPHS OF CLIMATIC TYPES.

from the cold waters in the depths of the Atlantic by the narrow and shallow entrance at the Strait of Gibraltar.

Most of the other isotherms of the January map have a course broadly similar to that of 50° : in the Atlantic area they run from north to south, showing that the oceanic west is warmer than the continental east, while towards the interior of Europe they run more from west to east because it is colder in the north, where the sun has very little effect.

The isotherm of 32° F. is of special interest, for it marks out an area to the east and north of it where, during a normal January, the average temperature is below freezing-point. As a consequence, within this area, precipitation in January normally takes the form of snow instead of rain, and if the snowfall is heavy there is a snow-cover to the land lasting for at least a month. Moreover, except in a narrow belt adjoining the course of the isotherm, inland waters are normally frozen over and harbours are closed by ice for a month or more ; the chief exception to this latter rule is that the warm Atlantic waters drifting along the coast of Norway keep the harbours of all the west coast of Scandinavia open throughout the year. The extremely cold winters in north-eastern Europe should be observed ; in the neighbourhood of the northern Ural Mountains the mean temperature in January is 0° F., i.e. 32° below freezing-point.

Employing the terms " cool," " cold," etc., as stated above, we may summarize the conditions in January by saying that in eastern Europe as a whole, together with most of Scandinavia and the eastern part of central Europe, the climate is cold ; in most of western Europe it is merely cool, while the south of the Mediterranean area has even warm conditions in this month.

By comparing the mean temperatures in January with those in July, as shown either on the maps or in the table on p. 26, it may be seen to what extent the climate of any place may be regarded as extreme or equable. Subtracting the figure for January from that for July, the annual range is obtained : e.g. for Valentia Island it is only 14° , for Warsaw it is 40° and for Moscow it is 54° . A climate with an annual range of about 30° or less may be regarded as equable, and western Europe as a whole and most of the coast-lands around the Mediterranean Sea have an equable climate. One with an annual range of over 40° is extreme, and all eastern Europe has an extreme climate.

Between these well-marked types comes central Europe, transitional in this respect.

The map of mean temperatures for January shows the average reading of the thermometer in that month, but the actual conditions are at some times above, and at other times below, this average ; hence the winter temperatures are at times more severe than the mean temperature suggests. The lowest temperature which is normally experienced in winter (i.e. the average of the lowest taken over a number of years) is called the mean annual minimum, and for certain stations is given in the table on p. 26. In this table it will be seen that, for example, while the mean January temperature at Moscow is 12° F. (20° below freezing-point), the mean annual minimum is -17° F., i.e. 29° lower (49° below freezing-point). Again, at Archangel the normally lowest reading in January is -32° F. (64° of frost).

Similarly the July map shows the mean temperatures for that month, but the summer temperatures actually rise much higher than these ; the table shows that while at Moscow, for example, the mean July temperature is 66° F., the mean annual maximum, which is the mean of the highest July readings, is 88° F. In the south of Europe the mean annual maximum at Athens is 100° , and at Madrid it reaches even 104° F.

All the conditions hitherto considered relate to those of the coldest or hottest months, but it is also important to know what is happening during other times of the year. This is to some extent shown by the graphs in Fig. 9, which indicate by dots the mean temperatures of each month and join these by curves depicting the normal " march of temperature " throughout the year. From such curves useful deductions may be made ; for instance, at Moscow the mean temperature falls below freezing-point (shown by the line at the level of 32° F.) about the beginning of November and does not rise above it until about the end of March ; we may therefore conclude that normally there is a period of frost lasting about five months. Similarly it may be deduced from the graphs that the period of frost at Archangel is about six months, while at Warsaw it is rather more than three months ; a map showing by lines the lengths of the normal period of frost in all parts of Europe is given in Fig. 10.

Another example of the deductions that can be made from graphs of the normal march of temperature is the duration of the " warm " period, i.e. the time during which the mean

temperature is above 50° F. (10° C). At Valentia Island, off south-west Ireland, the curve rises above the 50° F. line at the beginning of May, and falls below the 50° F. line again near the end of October; the warm period therefore lasts about six months; compare the curve for Archangel, where the warm period lasts only about three months. A map showing the

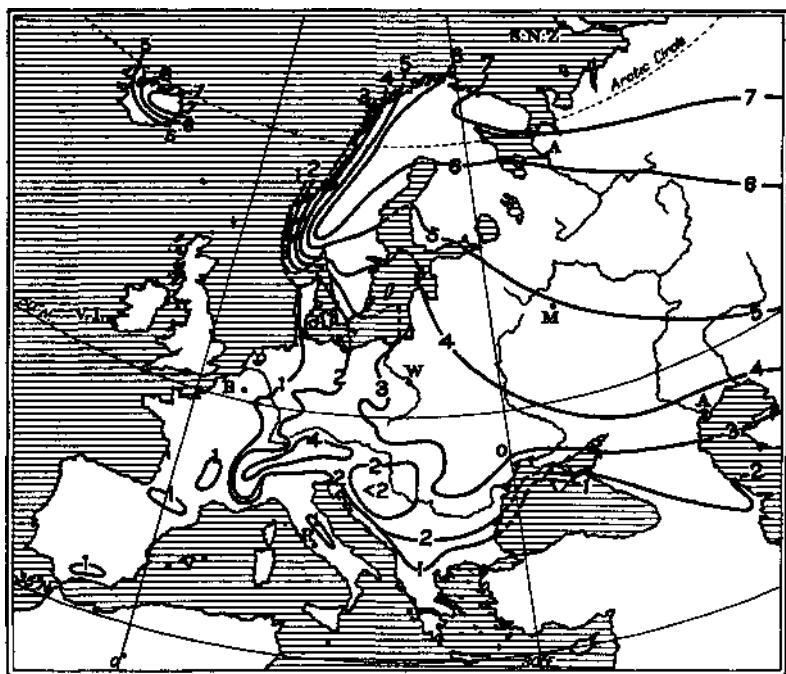


FIG. 10.—DURATION OF FROST PERIOD.

Note.—The lines show the number of months during which the mean temperature is below freezing-point (32° F., 0° C), the calculations being based on actual temperatures (not reduced to sea-level). On the Alpine margins the lines of 3 and 4 months are so close that the former has been omitted, and for a similar reason the 1-month and 2-month lines have not been separately indicated on the margins of the SE. Alps and Dinaric Alps. Note that the area of the Central Danubian Lowlands, marked < 2, has a period of less than two months of frost.

duration of the warm period in all parts of Europe is given in Fig. 11.

From the point of view of the relation of climate to plants the mean temperatures for the hottest month give a very inadequate idea of the temperature conditions which affect growth. For example, the figures for July show that the mean midsummer temperature is about the same at Valentia Island as at Archangel, and yet the graph shows that the warm period is twice as long at the former place as at the latter.

An important fact regarding the relation of climate to plant-life is that for a number of plants growth can begin only when the mean temperature rises above about 42° F. (6° C.). This level is shown by another horizontal line on the temperature graphs, and it may be deduced from the curves that, for example, wheat can begin to grow earlier at Brussels than at Moscow, although the latter place has a higher midsummer temperature.

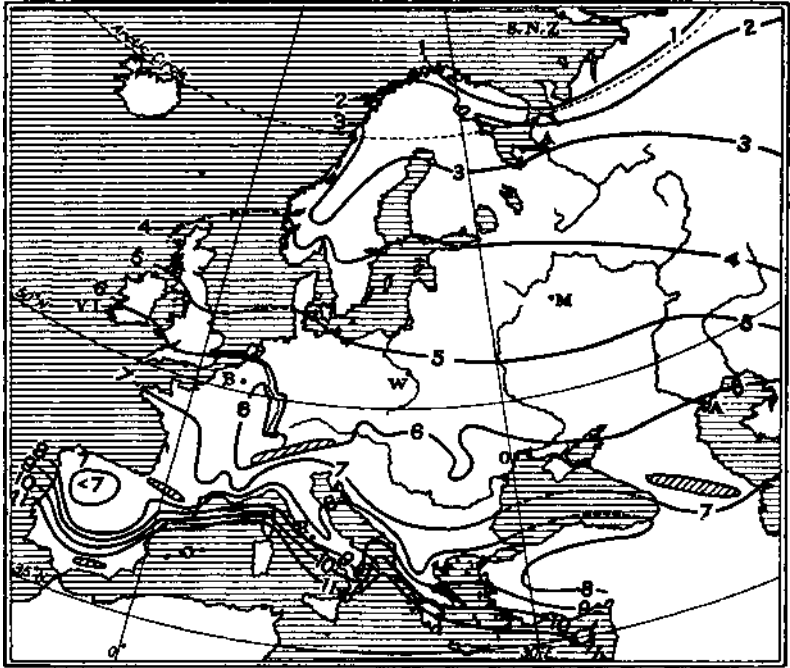


FIG. 11.—DURATION OF WARM PERIOD.

Note.—The lines show the number of months during which the mean temperature is above 50° F. (10° C.), the calculations being based on actual temperatures (not reduced to sea-level).

Conditions in the Alps and other high mountain regions vary so greatly that these areas have been excluded from the map. Note that in the interior of Spain an area marked < 7 has a period of less than seven months of warmth.

Precipitation.—The next element of climate to be considered is precipitation in the form of rain or snow, and this study may well be begun in connexion with the wind systems for July and January respectively.

In July, depressions advance from the Atlantic over northern and central Europe, and since in them the warmer air from the Atlantic rises, it is cooled and water-vapour is precipitated in the form of "cyclonic rains." In eastern Europe the prevail-

ing winds come from the north-west, and have sufficient water-vapour for rain to occur, although in less amount than in the west (see Fig. 13). The greatest precipitation is on the highlands which compel the air currents to rise and to produce "relief rains." In the Mediterranean region and in southern Russia depressions seldom occur, and cyclonic rains are therefore slight, though relief rains give a rather better water-supply

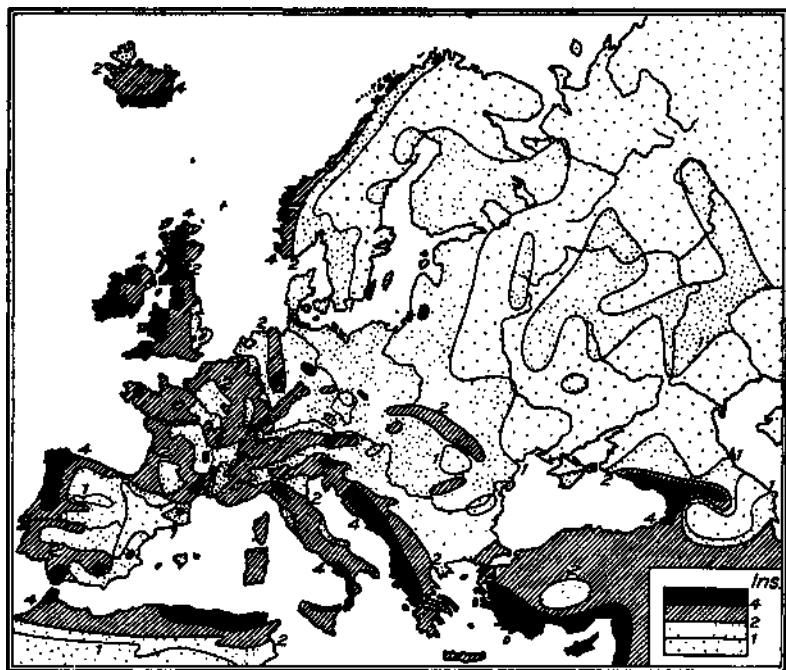


FIG. 12.—MEAN JANUARY PRECIPITATION.

to the mountains, especially to the Caucasus. In the far north there is little rainfall, even in connexion with the depressions, for the cool air can hold but little water-vapour and though the air is further cooled by ascent only a small precipitation can result.

Where cyclonic influence is weak, settled weather is the general rule, but during a period of such weather in summer there may occur thunderstorms and heavy rains, due to the relatively great heating and the consequent rising of the air in particular localities ; such " convectonal rains " account for a considerable proportion of the precipitation in central and eastern Europe.

In January, depressions normally affect the whole of the continent except the extreme east, and where the air is warm enough to contain much water-vapour, precipitation may be considerable. This is the case particularly along the Atlantic margins, where there are the heaviest rains, and in the Mediterranean region ; moreover, on the highlands relief rains add to the total (see Fig. 12). But away from the relatively warm areas adjoining the Atlantic and the Mediterranean the air is so

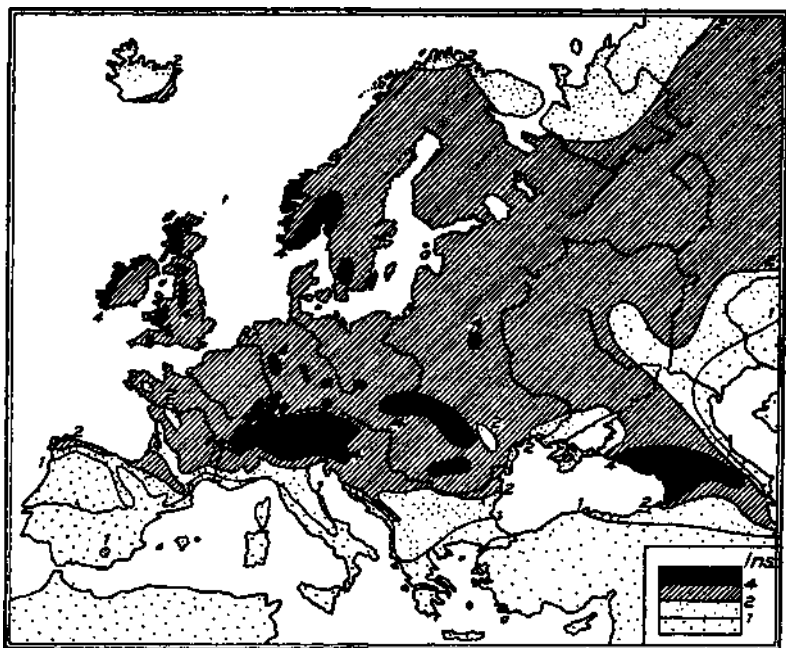


FIG. 13.—MEAN JULY PRECIPITATION.

cold that it can contain little water-vapour and precipitation is generally slight, though relief rains, or falls of snow, occur on the highlands. (In reading maps or statistics of precipitation, it must be remembered that in their compilation one foot of snow is taken as the equivalent of one inch of rain.) In eastern Russia the cold, out-blowing air from the Asiatic high-pressure area is necessarily dry, and this part of Europe would be rainless in winter but for occasional depressions.

The maps for January and July are in general indicative of the whole of the winter and summer seasons respectively ; this

can be seen by the rainfall graphs in Fig. 9, in which the three winter months of December, January and February and the three summer months of June, July and August are marked off by vertical lines.

The rains of spring and autumn are equally important, but as they are to a considerable extent transitional between the more extreme conditions of winter and summer, they are more evenly distributed over the continent. Near the Atlantic and in the Mediterranean region, however, the autumn rains are frequently heavier than those of any other season. These statements about the rainfalls of spring and autumn should be verified by examining the graphs for the stations given in Fig. 9 and the accompanying page of statistics.

A useful summary of the distribution of precipitation during the year at any particular place can be made by adding together the amounts in each group of three months to get the totals for the four seasons respectively, and this has been done for certain places in the table on p. 26. Further, the total for the whole year for the selected stations is given in the same table, and the distribution of the total annual precipitation over the continent is shown by the map in Fig. 14.

By putting together the facts given in the maps, the graphs and the table, a fairly complete idea of the precipitation can be obtained, and some of the main conclusions may be summarized as follows : (i) The regions adjoining the Atlantic have a heavy rainfall fairly well distributed through the year, although greatest in autumn and winter, (ii) Central Europe has an annual total varying according to elevation, considerable on the highlands and moderate on the lower lands ; on the whole, the rainfall is fairly evenly distributed through the year, although the greater amounts occur in summer and autumn and the tendency to a summer maximum increases towards the interior, (iii) Eastern Europe, including most of Scandinavia, has a rather small total precipitation with a summer maximum, and in the extreme north-east and south-east the amounts at all seasons are very small indeed, (iv) In the Mediterranean region the total annual rainfall varies from being very considerable on the highlands behind the Adriatic to being very slight over most of eastern Spain, but the common characteristic is that of summer drought; in the northern part of the Mediterranean region the period of drought is short, but towards

the south the period becomes longer and the intensity of the drought may be severe.

Indeed, throughout all southern Europe, including the south of Russia, the summer is normally a time of drought, for the high temperatures cause rapid evaporation, and the efficiency of what precipitation may occur is thereby greatly reduced. Conversely, in northern Europe evaporation is much less and the rainfall is correspondingly more effective.

Another important consideration is the variability of the rainfall from year to year. This variability is, in the main, greatest where the total amounts are least, and it is consequently quite considerable in the east and in some parts of the Mediterranean region. Moreover, while in a well-watered region a decrease from the average is not a serious matter, in the areas of scanty rainfall it may have calamitous results; thus, in particular years the normal summer drought of the Mediterranean may be unusually prolonged and may even become disastrous, while in southern Russia in years of sub-normal rainfall harvests fail and famines result.

One more point must be noted: when there is little rainfall either during the whole year or during one season of the year, that rainfall tends to occur in short, sharp downfalls; this is frequently the case in the Mediterranean region and with the summer thunderstorms of eastern Europe. A rapid fall means that the immediate run-off of water to the streams is great, and the plants cannot use so much of it; also, after the rain bright weather quickly follows, and evaporation may dispose of much of the water and thus further reduce the value of the already small precipitation. The rapid run-off, moreover, tends to wash away the soil, and therefore soil erosion is a serious factor in the utilization of the Mediterranean and other areas of short and sharp rainfall.

Other Climatic Elements.—The frequent passage of depressions over the Atlantic margin has effects upon the climate of that region besides the equability of the temperature and the heavy precipitation; there are, for instance, the facts that the winds are often violent and the sky covered with cloud. On the contrary, the relative absence of depressions in the Mediterranean region, even in winter, allows a clearness of the sky and an abundance of sunshine which are important factors in attracting visitors from north-western Europe. Similarly eastern Europe has in general clearer skies than the west.

The importance of the element of light in climate is, of course, great, and in this connexion latitude is the main factor. In northern Europe, which lies near and even beyond the Arctic Circle, there is a very marked contrast between winter and summer. In summer the days are very long, and within, the Arctic Circle the sun is above the horizon for the whole of the twenty-four hours during a period which at the Arctic Circle is

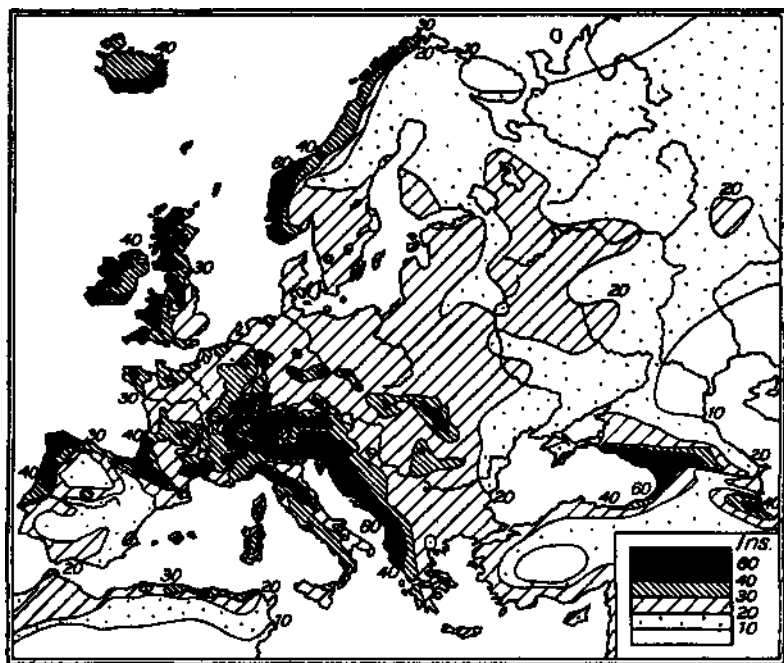


FIG. 14.—MEAN ANNUAL PRECIPITATION.

limited to one day, but at North Cape in Norway extends to over two months.

Conversely, at midwinter the sun is invisible at the Arctic Circle for twenty-four hours, and at North Cape for more than two months. Moreover, even during the short periods in winter when the sun is visible, it rises but little above the horizon.

Climate Regions.—The various elements of climate, e.g. winds, temperature, precipitation and light, of course all exist in the closest association ; they influence one another and have a combined effect upon other geographical phenomena and upon mankind. Regarded in this way, climate is seen to differ very

markedly in different parts of Europe, and it is useful to divide the continent into several regions, in each of which the climate has distinct characteristics. Yet climatic regions seldom have definite boundaries, and it must therefore be emphasized that, when maps are made like those in Fig. 15, the various regions usually "shade off" into one another and the descriptions are only generalizations which apply best to the central parts of the respective regions.

It is convenient, however, to draw lines to serve as approximate boundaries of climatic regions, and for this purpose two devices are commonly employed. In the first place, there are lines based upon meteorological records, like those drawn on the maps showing the conditions of temperature and precipitation. Such lines may be without much significance if they are based merely upon some arbitrarily selected numbers, such as 68° F. (rather than 70° F.), or a duration of frost for one month (rather than three weeks), or a rainfall of 10 inches (rather than 12 inches). It is often better, therefore, to employ the second device, i.e. the adoption of some more natural indication of the climates, and for this purpose vegetation, either natural or cultivated, is a useful guide. In the following chapter the main types of vegetation will be described, and it will there be pointed out how these types are related to climatic conditions ; in some cases it appears that the limits of the growth of particular plants correspond with a line indicating certain climatic conditions ; e.g. the northern limit of trees is found where the period of warmth (over 50° F.) decreases to one month. Hence the line indicating this condition on the map in Fig. 11 has been adopted on the map showing climatic regions (Fig. 15) as separating the "Arctic" from the "Boreal" type of climate. Similarly the other lines showing boundaries to climatic regions have been adopted because of some special significance which will be stated when the climates are described.

The conditions of the climates of Europe may now be summarized in the following paragraphs :

The Arctic climate is experienced around the Arctic Sea, and in the main within the Arctic Circle. Its "winter" is very long, with about seven months of frost, very cold, and for a considerable period almost sunless ; for most of the year the ground is covered with snow, and the subsoil is always frozen. The "summer" is correspondingly short, and although at mid-

summer the daylight is practically continuous, the sun is low in the sky; consequently the mean temperatures rise little above the limit of plant growth, and that only for a short period. Most of the scanty precipitation comes during the time of relative warmth, and is therefore available for plant-life; moreover, evaporation is little and the "effectiveness" of the precipitation is considerable.

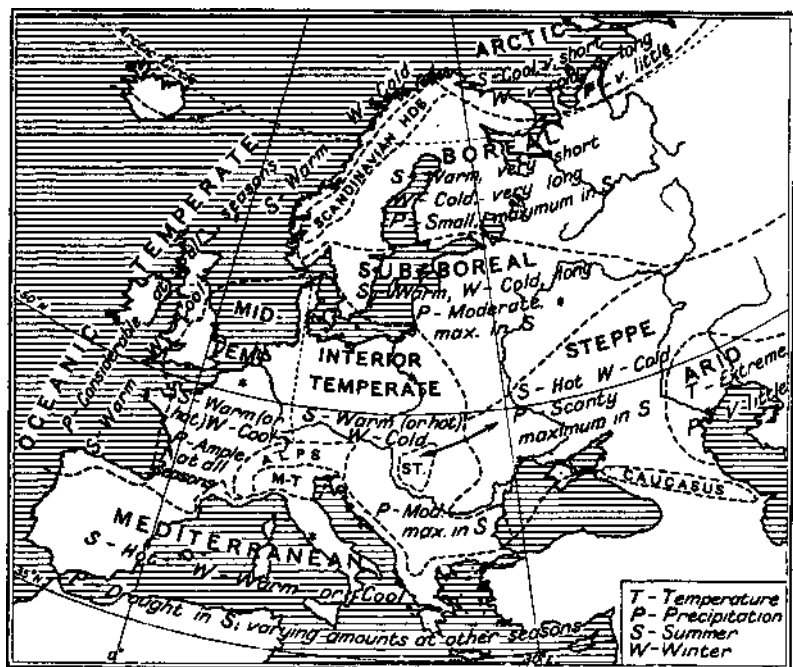


FIG. 15.—CLIMATE REGIONS OF EUROPE.

Note.—In all regions, the uplands or highlands show modifications of the general conditions, but the Alps, Caucasus and Scandinavian Highlands are shown as independent regions.

Except in areas of very marked relief, the boundary lines represent transitional belts rather than definite divisions between the regions. The asterisks indicate the situation of the stations for which graphs are given in Fig. 9.

The Boreal climate, or northern climate, is so called because it extends over much of the northern lands of the world which border upon the Arctic Circle; in Europe the belt begins immediately behind the Scandinavian Highlands, which largely exclude it from Atlantic influences. The cold is about as severe as in the Arctic climatic region at midwinter, but it has a shorter duration, and the thick cover of snow due to the winter precipitation lasts for less than half the year. In spring there is a

rapid rise of temperature above the limit of plant-growth, and the summer has from one to four months of warmth, with a small but effective rainfall. The contrast between the light conditions in summer and winter is very marked, though not so extreme as in the Arctic region.

The Sub-boreal climate is transitional between those of markedly continental character and those largely influenced by the Atlantic Ocean; it is experienced in a region in which Atlantic influence can just penetrate into eastern Europe, between the barriers of the Scandinavian Highlands on the north and the Alps and Carpathians on the south. The annual range of temperature is not much less than that of the European part of the boreal climatic region, but both in summer and in winter the temperatures are higher. The period of warmth lasts four months along the northern limit of this region, and increases southward. Also, during this period as well as during the rest of the year there is greater precipitation than in the boreal region. Hence conditions are more favourable for plant-growth, and for the utilization of the resources by man, than under the boreal type of climate.

The Steppe climate is a convenient label to apply to those conditions under which have developed the various forms of steppe vegetation which will be described in the next chapter. This type of climate, like all the others of eastern Europe except the transitional sub-boreal type, is definitely continental and extends far into Asia. It is exceptionally complex, especially as regards the interaction of the temperature and the precipitation, and demands a separate consideration of each of the four seasons.

For about three months or more there is a winter during which the mean temperature is below freezing-point, and for a considerable period the ground is covered by snow. In spring there is a rapid rise of temperature above the limit of plant-growth, and this growth is aided by the melting of the snow-cover and by a moderate amount of rain. In summer the precipitation as recorded by a rain-gauge is greater, but it tends to occur in heavy and short showers, while the weather becomes "hot" (over 68° F.) for about three months; consequently evaporation is great, the effectiveness of the rainfall is small, and the summer is a season of drought during which plant-growth ceases. In autumn, as in spring, the temperatures are moderate,

and the rainfall is consequently more effective ; yet it falls upon parched ground, and a reawakening of vegetable life is soon followed by the cold of winter.

As the complex climatic conditions are closely reflected in the periods of growth and rest which are characteristic of steppe vegetation, the approximate limits of this vegetation are here taken as the boundaries of the region.

In addition to southern Russia, there is an area in the central Danubian Lowlands which has a climate of this type, and may therefore be regarded as an " exclave " of the main steppe region.

The Arid climate is characteristic of the Caspian-Aral depression in the heart of the Eurasian continent, and is therefore only experienced on the south-eastern margin of Europe.

While in the north of the continent it is low temperatures which cause limitation of certain forms of life and activities, and while in the steppe region both the cold in winter and also the drought in summer are the critical phenomena, here in the Caspian-Aral region the precipitation is so scanty, irregular and ineffective, that aridity is the characteristic of the region during the whole year.

That is not to say that the temperature conditions are negligible. In the first place, the ineffectiveness of the precipitation is due to the high summer temperature, for a rainfall of less than 10 inches per annum, which here marks out the arid region, is accompanied by wet surface conditions in summer in north-eastern Europe. In the second place, the extreme character of the climate is in itself of geographical importance ; during the year a " cold " winter, which lasts about three months, is followed by a spring in which the climate rapidly passes through the " cool " and " warm " stages to a summer during which the weather is " hot " for three months, while the mean and maximum temperatures are among the highest in Europe.

The Temperate climate.—None of the regions of eastern Europe has climatic conditions which can be considered " temperate,"¹ for they all experience either considerable heat or considerable cold at some season of the year. In the south-east, moreover, there is a period of deficient moisture, and this characteristic of seasonal drought exists also in the Mediterranean lands.

¹ In accordance with the dictionary definition: " temperate = moderate in degree of any quality . . . cool, mild, moderate in temperature...."

Only in north-western and central Europe is there a comparative moderation of climatic conditions throughout the year ; hence the term " temperate " is restricted to the climate of this region. Within this region, however, conditions are by no means uniform, and three varieties of the temperate climate may be distinguished in Europe.

The Oceanic Temperate climate of the Atlantic margins of north-western Europe is markedly affected by depressions, accompanied by strong or even violent winds and by precipitation which, though heaviest in winter and autumn, is abundant at all seasons. The frequency of winds from the warm waters of the Gulf Stream Drift results in the warmth of the winters and the marked equability of the climate.

The extent of the region thus affected by the westerlies at all seasons is great from south to north ; hence there are considerable differences, especially as regards temperature, between the areas bordering on the Mediterranean climatic region at the one end, and those beyond the Arctic Circle at the other. Contrast the figures given in the table on p. 26, for Santiago in Spain, for Valentia Island, and for Bodo just within the Arctic Circle on the Norwegian coast.

The region which may be termed oceanic is clearly limited inland by the Scandinavian Highlands in the north, and almost as clearly by the uplands of the Iberian Peninsula ; but between these extremes there is a more gradual transition towards central Europe. In the British Isles the English lowland is less equable and less rainy than the uplands of the west and north, and may be better classed with the region next treated.

The Mid-Temperate climate has rather warmer summers, and the winters are so much less influenced by the maritime influences that there is a period during which plant-growth is checked ; also the precipitation is not so heavy. Except in the winter the conditions of heat and water-supply are sufficiently favourable to allow a considerable variety in the forms of plant-life which can here develop.

The North Italian Plain may be grouped with the warmest part of the Mid-Temperate climatic region, for its temperature and rainfall conditions closely resemble those of the nearest part of this region, viz. the Rhone Valley just below Lyons. (Compare the figures for Milan and Lyons in the table on p. 26.)

The Interior Temperate climate shows a further reduction in

the effects of proximity to the ocean. Apart from the higher areas, on which the temperatures are necessarily lower, a line drawn southward from the peninsula of Jutland separates the regions south of the North Sea, where in the coldest month the mean temperature is above freezing-point, from those south of the Baltic Sea, where the winters have a cold period lasting one, two or three months. Also, the precipitation is lower, and has a maximum in summer.

Eastward, conditions gradually approach those of the sub-boreal and steppe climatic regions, and it is convenient to take as the eastward boundary the approximate limit of the beech, which, because of its need for a fairly long vegetative period, is often regarded as a criterion of temperate as distinct from continental conditions.

The region extends far to the south-east, the main modification being a lengthening of the warm period and an increase in the midsummer heat, as may be seen by comparing the July temperatures at Berlin and Budapest.

The Mediterranean climate requires separate consideration for each season. In winter the temperature is almost everywhere above the limit of growth, and in the southern part it is definitely warm, while the rainfall is considerable ; hence neither plant-growth nor the outdoor activities of man need cease. In spring there is everywhere warmth, and in most parts there is sufficient rainfall for the processes of plant-life, enabling flowering, fruiting and ripening to continue. In summer there is a period of three months or more of heat (above 68° F.), and the maximum may be very high ; the rainfall becomes scanty or even fails, and with the high temperature this season is one of drought in which plant-growth ceases, except for deep-rooted types. In the autumn there is still warmth, and usually sufficient rainfall for a resumption of the growth of vegetation ; indeed, in much of the European part of the region the autumn is the season of maximum precipitation.

It is convenient to summarize the more striking features of the Mediterranean type of climate as "winter warmth and summer drought," but, as in the case of the steppe type, no simple meteorological formula can adequately express its character. For this reason the limit of the growth of the olive,, the most typical plant, is adopted as the northern boundary of the Mediterranean region save where, as in the interior of the

Iberian Peninsula, altitude modifies the climatic conditions and prevents the growth of this plant. (Compare the map showing the distribution of the olive in Fig. 18 with that of the climate regions.) It should be noted that, apart from the special case of the interior of the Iberian Peninsula (which will be discussed in a later chapter), the Mediterranean climate in Europe is rather closely restricted to the coast-lands of the Mediterranean Sea, together with the southern shores of the Crimean Peninsula.

Uplands and Highlands.—To simplify matters, it is lowland conditions which have been indicated in the text and in the map of climatic regions. In some parts, however, there are considerable complications, due to the lower temperatures and the greater precipitation which occur with higher altitudes. Such modifications will be taken into account in the more detailed regional studies which will follow, but here, and on the map in Fig. 15, attention can only be briefly drawn to the outstanding highland regions of the Alps and in Scandinavia. In several respects the latter highlands continue southward the characters of the Arctic climate, while conditions in the Alpine region are so complex that they must be specially described in a later chapter.

QUESTIONS

1. State the characteristics of the wind-belts which affect Europe. Explain how they influence different parts of the continent.
2. Draw a graph showing the annual "march of temperature" at any one place you name. Show (*a*) what deductions you can make from the graph, and (*b*) its incompleteness as a record of the temperatures.
3. For any one selected part of Europe, state and account for the essential characteristics of its rainfall.
4. Discuss whether it is possible to find and express definite limits to climatic regions.
5. Examine the truth of the statement that the critical element of climate in Europe is temperature in the north, and rainfall in the south.
6. "The Mediterranean climate has a mild winter and dry summer." Show in what ways this dictum is too simple.
7. Trace the normal succession of climatic conditions through the seasons in the steppe-lands of Europe.
8. Show by reference to one or more particular regions how the various elements of climate interact with one another.
9. To what extent can the climate of "Peninsular Europe" be regarded as a contrast to that of "Trunk Europe"?

CHAPTER I I I

VEGETATION, SOILS AND LAND- UTILIZATION

NATURAL VEGETATION

IN England and in other parts of Europe which have long been settled, the natural vegetation has been either greatly modified or entirely superseded by cultivated plants, but over other parts of the continent the natural vegetation still dominates the landscape and greatly influences mankind.

It assumes many forms, according to the climate, soil and other factors which determine its growth, but certain main types may be perceived ; we will consider each of these in turn, beginning with those of eastern Europe, where the contrasts are clearly displayed.

Tundra and Alpine Vegetation.—In the preceding chapter it was pointed out that trees cannot grow where the period of warmth is less than one month. The Arctic climate, therefore, with its cool and very short vegetative season, can support low woody shrubs only on the margin of the forest, and the characteristic vegetation of the tundra region consists of mosses and lichens, in addition to many kinds of small flowering and berry-bearing plants. On the drier parts of the tundra lichens grow together so as to form close mats ; in wetter situations mosses grow in abundance, and peat accumulates from dead vegetation and may form hillocks covered with living moss. Wet meadows occur, and swamps with cotton-grass and sedges occupy hollow places.

The region formed by the Scandinavian Highlands, known as the Fjeld, continues Arctic-like conditions southward, the change of latitude being largely offset by increasing altitude ; consequently, below the ice-fields of the highest parts, the mountain flora closely resembles that of the tundra, and may be considered as of the same type.

There are, however, considerable areas on the Scandinavian Highlands, where in the summer there is a thick growth of grasses and herbaceous plants, which afford a fairly rich pasture of the Alpine type. This pasture is so named from the

zone of the Alps situated above the tree-line but below that of perpetual snow ; it is found also on other mountain regions—for example, on the Urals, Carpathians and Pyrenees.

It is impossible to show such a zonal arrangement of vegetation, varying according to altitude, on a small-scale map, and consequently only the type which occupies the greatest area has been indicated in Fig. 16. Thus, while the northern Urals and the Fjeld have been marked as belonging to the tundra and Alpine type, the other mountain regions have been shown as being mainly forested, but with Alpine pasture.

The Coniferous Forest.—Between the tundra and lowland forest is no sharp line of demarcation. Outposts of forest extend northwards into the tundra region, and patches of tundra vegetation are found within the limits of the forest. The dwarf birch which grows on the borders of the Arctic region is replaced by a larger kind farther south, while the spruce and pine increase southwards in number and size till they form the dominant trees in the great unbroken region of the coniferous forests.

In the eastern part of this region, extending into Siberia, the forest is known as the taiga ; here Siberian species of spruce and pine are found, and fir and larch are subordinate members of the plant associations. In the west, the forest is composed of European species ; the pine is that often known as Norway pine or Scots pine, and a zone of birch frequently forms the boundary towards the tundra or the fjeld. Throughout the coniferous forest, on the drier soils the pine predominates, and on the damper soils the spruce, while in the areas of poorest drainage moors with sphagnum moss are common.

Adaptation to the climate, with its short period of warmth, is shown by the needle-like form and leathery surface of the leaves. They are thus protected against the cold winds, and against the loss of moisture by transpiration at seasons when the water in the soil is frozen and there is therefore a time of " physiological drought." Yet the leaves do not fall in winter and are ready to take advantage of every spell of growing-weather ; the forest, therefore, is evergreen. A store of food in the form of starch in the tissues of the wood is another adaptation to the climatic conditions, and the coniferous forests supply timber which is " soft," as compared with the " hard " woods of the deciduous forests.

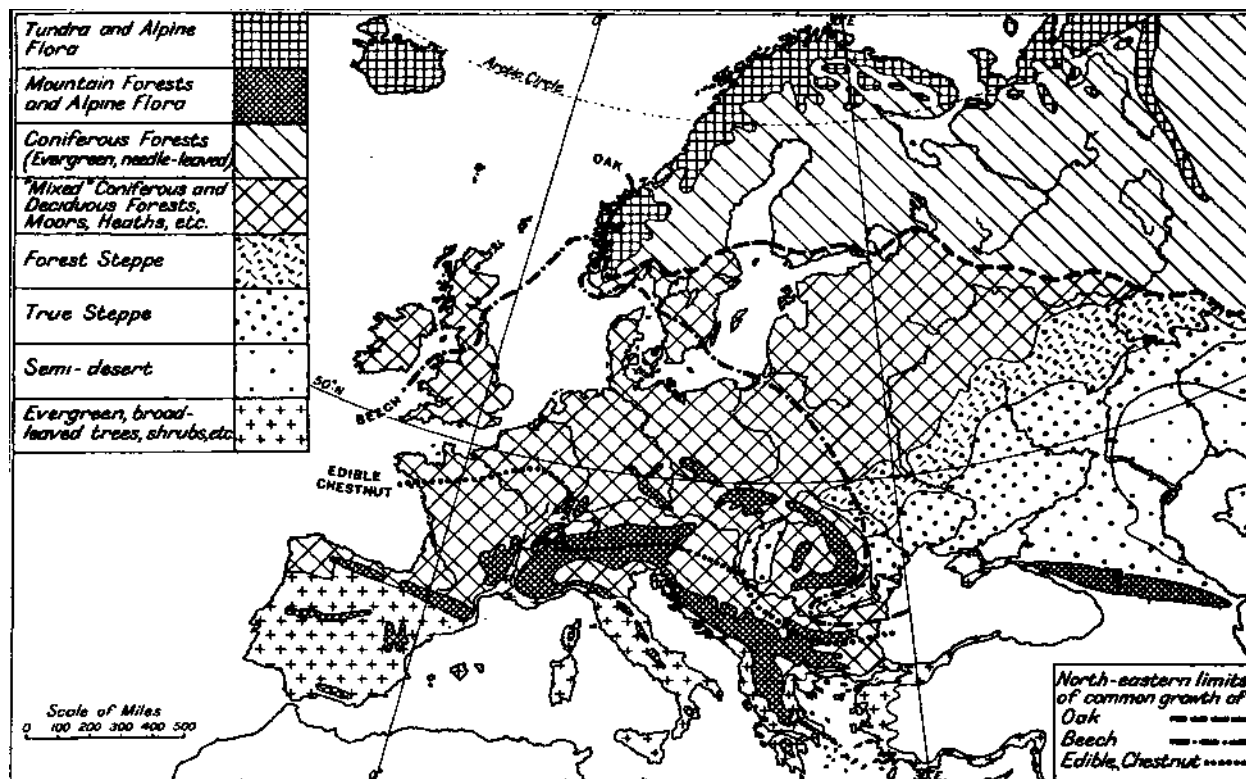


FIG. 16.—NATURAL VEGETATION REGIONS OF EUROPE.

The trees rise tall and straight, almost like poles, from a carpet of fallen needles, for there is little undergrowth in the coniferous forest. Factors which hinder the development of undergrowth are the lack of light beneath the high canopy of leafy branches, and the frequent freezing and thawing of the soil in spring and autumn, with the consequent injury to rootlets.

The "Mixed" Forest.—Even in the coniferous forests, there are representatives of the deciduous broad-leaved trees—for example, the birch, alder and poplar—and in more southerly regions these become more abundant, while others, such as the oak, appear and at last become common. Indeed, the occurrence of the oak is commonly taken as indicating the limit of the forests known as "mixed," and this criterion is here adopted on the map of natural vegetation. Yet the limits of even one species of tree cannot be accurately shown by a definite line, and those of the oak, beech, etc., shown on the map are necessary simplifications.

The annual leaf-fall of the deciduous trees is a protection against the cold and the consequent physiological drought of the winter, but this adaptation can occur only where the summer vegetative period is long enough, first for the growth of the new leaves, and then for their functioning. It appears that for this purpose it is necessary that the mean temperature should be above 42° F. for over five months.

The increasing length and warmth of the summers towards the south-west allow the growth of other species of trees which add to the variety, and in some cases to the value, of the deciduous forests. On the map in Fig. 16 this is illustrated by lines showing the approximate limits of the areas within which the beech and the edible chestnut are widely grown.

The varying nature of the mixed forests of coniferous and deciduous trees depends partly on the climate of the particular localities. In this respect, altitude, with the accompanying modifications of temperature and precipitation, is the main factor in causing the uplands and highlands to have forests of distinctive character; in central Europe the lower slopes are largely covered with deciduous trees and the upper with conifers, until the limit of forest growth is reached. Soil conditions as well as relief affect the character of the natural vegetation, and upland heaths and moors and lowland fens occupy considerable areas.

Over the greater part of the mixed forest region man has modified or transformed the original tree-cover. This has been done either intentionally, by cutting down the trees for timber or to clear the ground for agriculture, or unintentionally by fire or by allowing the young shoots to be eaten by goats[#] and other animals. Once destroyed, forests may be gradually replaced by a natural extension from neighbouring regions ; more commonly, however, new species are deliberately planted, in some parts forming woods of particular broad-leaved trees, and in other parts woods of conifers. In the main, however, cleared forest land has been utilized for agriculture or pasture.

On its southern margin, a climatic limit is set to the deciduous forest by an interruption of the period of summer growth. In the south-west and south this interruption is caused by the summer drought of the Mediterranean region, though the greater precipitation on the higher lands of that region allows trees to extend along the mountains far into the southern peninsulas of Europe.

In the south-east of the continent the hot and dry summer prevents tree growth in general, though there are tongues of forest stretching down the river valleys and " islands " of woodland or scattered trees in the damper places beyond the general limit. Indeed, the transition is so gradual that the northern belt of the steppe region is often known as the forest-steppe.

The Steppe Vegetation.—South-east of this transitional belt is the extensive region of the true steppes in which grasses and herbaceous plants, either annual or biennial, form the characteristic vegetation. As stated in the preceding chapter, the spring is the main season of plant activity ; the grasses and herbs appear above ground, grow rapidly, flower and produce their seeds in the short period between the winter cold and the drought of midsummer. Then they die down, and life is hidden beneath the surface, where, in tubers, bulbs, etc., a store of food is formed and preserved in readiness for the next season. A second short and less pronounced period of plant activity occurs in the autumn, but for most of the year until the next spring the ground appears bare.

According to differences of climate and soil within the steppe region, there are differences in the kinds, and the abundance, of the plant-forms. In the better-watered, northern and western parts of the true steppe there are areas of " meadow

steppe," of tall tufted grasses and gay flowering plants such as campanula and clover, which make a continuous thick cover to the ground ; even in a natural state, this can be mown to obtain a rich harvest of hay for use in the dry and cold seasons. In the less-watered districts, less succulent grasses and herbs which grow closer to the ground and are rather sparsely scattered form the greater part of the vegetation ; this can be utilized for grazing rather than for the cutting of hay.

As in the case of the more fertile forest regions, so here on the steppes the more productive areas have been much changed by man, both by pastoralists mowing or grazing the natural growths, and by agriculturalists cultivating the land for crops.

The Semi-desert Vegetation.—In the poorer steppe lands there appear some shrubs which have deep and long roots to obtain as much water as possible, and whitish, felted leaves from which the moisture is but slowly transpired ; there are also plants which are protected against the wind and the resultant loss of moisture by growing close to the surface of the ground. In the semi-desert, such forms of life adapted to an arid climate represent an increasing proportion of the vegetation as the grasses and herbaceous plants become fewer ; the amount of vegetation of any kind is but small and the bare soil is everywhere visible. As protection against still greater aridity, the woody growths commonly have their leaves reduced to spines. Also, as the conditions approach those of the deserts in which there are only occasional rains, the annual plants remain dormant below the surface for longer periods ; but whenever in the summer the soil receives a supply of water, they may appear, and pass rapidly through their very short vegetative period.

In the small areas in the extreme south-east which may properly be called desert, the vegetation is very scanty indeed, and only the " halophytes " adapted to living in salty soils, or plants which can find sufficient moisture in the sand-dunes, can exist.

The "Mediterranean" Vegetation.—As the winter temperatures are generally above the limit of growth, trees and woody shrubs which live throughout the year are the characteristic plant-forms ; they are protected against the loss of water in the dry summer by various devices, including deep and wide root development, a thick, rough bark, such as cork, and leaves of a different kind from those of the more northerly forest trees.

As the winter allows growth, there is no common period of leaf-

fall, nor need there be the extreme adaptation of a reduction of the leaves to needle-form ; the trees are evergreen and the leaves are broad, but their glossy and hard surface prevents rapid transpiration. The evergreen oak, cork oak, olive, holly, laurel and myrtle are of this kind and are typical of the region, although some of them may grow also in the south-western parts of the deciduous forest region where the winters are sufficiently warm.

Yet these broad-leaved evergreen trees are not the Only plants which can live under Mediterranean conditions, and an important group consists of low shrubs : e.g. heaths which are evergreen but have small and narrow leaves ; thyme, lavender and other aromatic shrubs ; the brightly flowering cistus, and many others.

Originally the Mediterranean region was largely forested, but these forests have almost disappeared ; now the natural vegetation, in the sense of that not deliberately planted by man, is only exceptionally forest or woodland, and that is found mainly on mountains or uplands where the temperatures are lower and the rainfall is greater than is normal. In such situations there are woods of evergreen oak or cork oak, as in the Iberian Peninsula, and there are also areas where the trees are those which are more common in other vegetation regions, such as the beech and edible chestnut, which extend southwards along the mountains of Italy, or the pines which grow on the uplands of the Balkan Peninsula.

Much more extensive are the thickets of evergreen shrubs which have replaced most of the original forests ; these growths may include low trees, such as the laurel and myrtle, and bushy plants, such as tree-heaths, cistus, broom and juniper. Such thickets are known as maquis in France, macchia in Italy and monte bajo in Spain.

Still poorer growths of lower bushes are formed of thyme, sage, lavender, small heaths, etc., with thistles and various flowering herbs, such as the asphodel and iris. These associations show bare earth between the plants; they are widely developed on the drier soils and are known as garrigues in France, tomillares in Spain and phrygana in Greece.

Meadows of the north-western European type are rare ; in well-watered situations there are associations of grasses and bulbous plants which give pasture, but these commonly dry up in the summer.

On the other hand, in very dry areas, such as the interior plateaus and the south-eastern lowlands of Spain, the climatic conditions and the vegetation approach those of the steppes of eastern Europe ; here grasses may predominate, and esparto grass is still the vegetation cover of some districts in Spain.

The natural or semi-natural vegetation is now found mainly on the higher parts, the steeper slopes and the poorer soils of the Mediterranean region ; most of the lowland and much of the hill-country has been taken in for cultivation.

SOILS

It might be expected that the nature of the soil is largely determined by the geological factor—the rock from which it is derived, for in England differences between soils often correspond to differences of the parent material. This view was generally held until Russian scientists, studying the soils of their vast country, which has such contrasted climates, realized that the climatic conditions are the main cause of the striking contrasts in the soils. To appreciate this, as well as to understand the essential character of the soils and their relation to agriculture, we may examine in turn the main soil types and soil regions of Europe, beginning with those of eastern Europe.

The Podsoles.—Beneath a thin superficial layer formed of fibrous vegetable material, the podsoles have an upper level, or "horizon," of an ashen-grey colour from which they were named (Russian : pod = under, zola = ash). This upper horizon has a loose structure, and consists of sandy and gravelly material. Both colour and structure are due to the washing down, or leaching, of the soluble salts, the lime constituent (calcium carbonate) and the clay from the uppermost to the second horizon, situated a foot or more beneath the surface. This second horizon, because of the materials washed into it, is usually compact, and often contains a layer cemented together by iron into an impermeable "pan." The essential process of leaching is the consequence of the downward drainage of water, and this occurs when the precipitation exceeds the combined loss by evaporation, the surface run-off and the transpiration of water by plants.

Hence climate is the main control of the development of the podsoles, and, moreover, the degree to which soils are leached is, directly and indirectly, due to the climate. The map in Fig. 17

shows the distribution of two types, the strongly leached and the moderately leached. The former extends widely over north-eastern Europe (excluding the tundra and mountain areas, which will be considered later), where the summer warmth is not enough to cause great evaporation. Also, the climate has here an indirect effect, since it allows the growth only of the coniferous forest, of which the vegetable residues tend to accumulate as a peaty layer, giving almost permanently wet conditions. The abundantly watered western side of Scandinavia also has soils of the same type. Farther south the coast-lands around the south-eastern corner of the North Sea have similar conditions, for the predominantly sandy character of the subsoil allows easy downward movement of the rain-water.

Soil conditions react upon the vegetation ; for example, the northern limit of the oak is partly determined by climate and partly by the difficulty with which this tree grows on the more strongly leached podsoles. Moreover, these strongly leached podsoles, having lost much of their plant-food constituents from the upper horizon, are unfavourable for cultivation ; to be productive, they need to be supplied with a considerable amount of lime and other manures and to be very thoroughly tilled.

The moderately leached podsoles are found in warmer well-watered regions, and in these the less-marked grey colour of the upper soil and the usual absence of a compact and cemented lower horizon bear witness to the retention of more of the plant-foods in a condition available for plant-life. The deciduous forests, too, supply an annual leaf-fall which is incorporated with the soil.

The map shows that the moderately leached podsoles extend over the deciduous forest regions of eastern Europe and over much of the north-western coast-lands of the continent, excepting the mountain areas ; they are also found on interior uplands. As there are no definite limits to climatic conditions and seldom sharp changes in the vegetation, so the resultant soil types usually merge into one another.

In areas of abundant water together with poor drainage, the podsol regions are characterized by the development of peaty soils. Moorland peats form acid soils of little value to man, but since the fen peats found in lower situations form less acid soils and contain more plant-food, they may prove productive when drained.

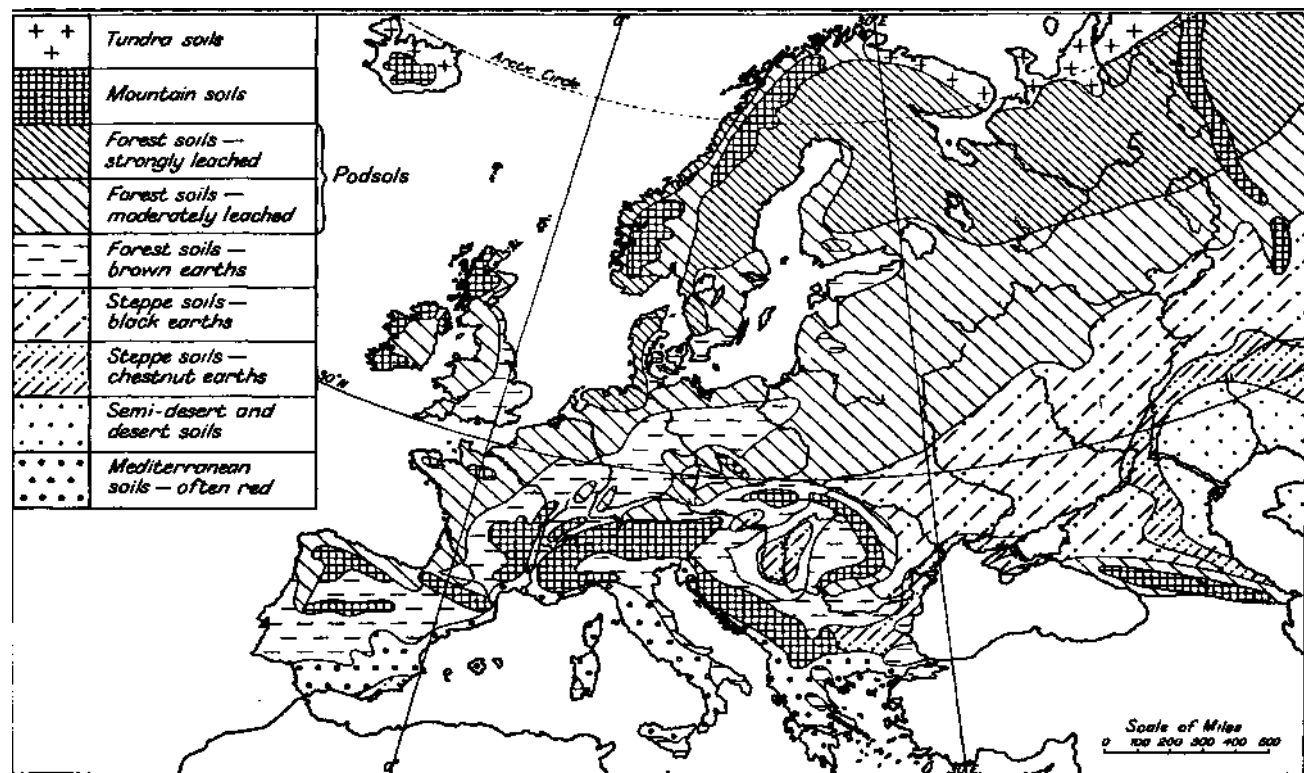


FIG. 17.—SOIL REGIONS OF EUROPE.

The Tundra Soils.—These soils of the far north are largely the result of their water-logged condition and the low temperatures. Evaporation is very slight and the subsoil is permanently frozen below a depth of 2 or 3 feet. Humus, the partially decomposed organic matter formed from plant residues, remains as a surface layer, for downward leaching is impossible, and the low temperatures hinder chemical or other changes ; peat is commonly formed.

It thus appears that an abundance or an excess of water is the main factor in determining the soil conditions in all the northern part of eastern Europe. In the south-eastern part, on the contrary, seasonal or permanent aridity is the controlling factor.

The Black Earths are the characteristic soils of most of the steppe areas, where they are known as chernozem. The black colour is due to a large proportion of humus in the upper horizon, which is usually about 3 feet in depth, and at the base of this there is an accumulation of calcium carbonate, before a transition to the parent material. This parent material is often, but not always, loess.

The humus is derived from the annual addition of vegetable matter from the grasses and herbaceous plants ; the decomposition remains incomplete, because it depends upon the activity of bacteria and other soil-organisms, which is limited, like that of the vegetation, by winter cold and summer drought.

Of great importance is the occurrence of rains and the melting of snow in spring followed in summer by heat and drought. In spring the calcium carbonate is washed down from the surface ; in summer the surface soil becomes dry, and by capillarity the water rises from below and brings up soluble matter, including calcium carbonate, which is then deposited as the water evaporates. There is thus an accumulation of the calcium carbonate at the base of the upper horizon—an indication of a balance in this black earth region between the downward leaching of the well-watered north and the upward movement which becomes most important in the arid south-east.

In the black earths there is an abundance of plant food, and cultivation is made easy by the crumbly structure of the humus-bearing layer ; consequently the black earths stand among the best of the world's soils from the point of view of fertility.

The Chestnut-coloured Soils.—On the northern side the

black earths pass through grades of greyness to the ashy soils of the forest regions ; on the south-eastern side they change to a light-brown, chestnut colour, since the dark humus decreases in amount as the plant-life from which it is derived becomes more scanty. Because of the increasing aridity there is still less leaching than in the black earths, and there is more calcium carbonate in the upper horizon. In themselves, these soils are nearly as valuable as the black earths, but the climate is not so propitious to agriculture.

It should be noted that the steppe soils, besides covering most of south-eastern Europe, are found in the middle Danubian lowlands and in other areas of central Europe too small to be shown on the map.

The Semi-desert and Desert Soils.—The marked aridity in the Caspian Depression continues the change just described, and the upper horizons of the soils progressively contain less humus and more calcium carbonate. Their colour changes through brown to grey, and their fertility decreases. In the most desert-like areas, blown sand is accumulated and even heaped up in dunes. Also, in some parts there appear upon the surface thin crusts, or efflorescences. These are formed by water from the occasional rains sinking some distance into the soil, which then again dries ; the water, after a period during which it dissolves the salts in the soil, works upward by capillarity and evaporates on the surface, where it leaves saline or alkaline deposits.

In these arid regions soil conditions combine with climate to make them inhospitable to man.

Brown Forest Earths.—From the point of view of the formation of productive soils, northern Russia suffers from an excess, and southern Russia from a deficit, of water ; the best balance occurs in the central Russian regions. A similar balance as regards the water-supply occurs in much of central and western Europe, and here it is associated with less severe temperature conditions than in the eastern part of the continent.

Consequently in these regions there is less leaching than in the case of the podsoles, while a greater activity of the soil organisms reduces the amount of humus as compared with that of the black earths. With a natural vegetation of deciduous forest, there is an annual leaf-fall which UNIVERSITY LIBRA

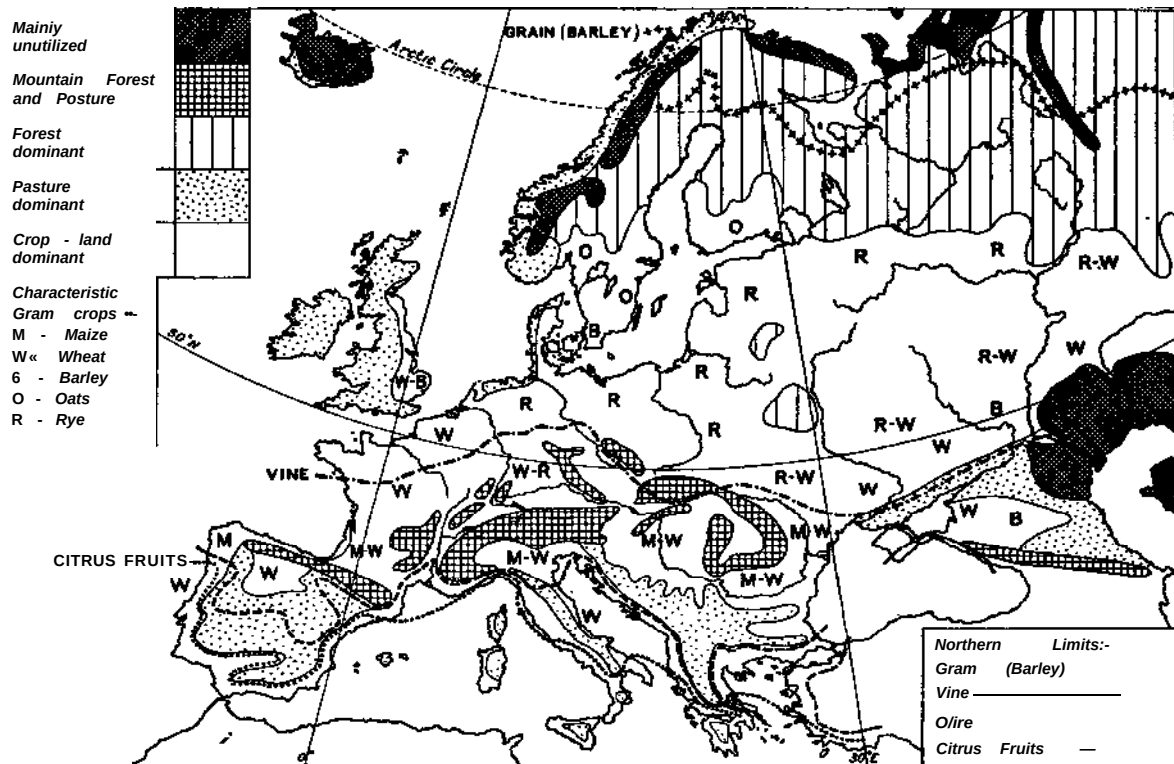


FIG. 18.—LAND-USE REGIONS OF EUROPE.

[Adapted from Jonasson.

the soils for cultivation, and their generally crumbly structure aids tillage.

This group of soils is a large one, and there are many differences in the colour and the other conditions, partly because with this "balanced" type of climate differences in the nature of the parent rock show themselves in the soils, as is well illustrated in the case of south-eastern England.

Moreover, since these soils are generally quite remunerative and have been worked by farmers for centuries, they have often been transformed from a natural to an artificial state.

Mediterranean Soils.—These are varied in character, but frequently have a reddish colour, and although they are often derived from limestone, they are typically fairly heavy clays; unfortunately soil science has not advanced far enough to reach an unquestioned explanation of their mode of origin. In several parts of the Mediterranean lands the red clays provide "oases" of cultivable land in otherwise almost barren limestone areas.

Mountain Soils.—Because of the low temperatures the weathering of the soils of mountain regions has been largely physical, and their development has not in general proceeded far. In the soils of areas above the forest limit there may be a humus layer, recalling that of the tundra, and below this a tendency to a podsol character shows itself. On the slopes there is usually only a thin covering of coarse rock fragments, while the finer material may be deposited as a deeper, and sometimes fertile, soil in the valleys.

LAND-USE AND CULTIVATION

The use that men make of the land depends partly on their desire for particular necessities and comforts, partly on their knowledge and equipment for obtaining these, and partly on natural conditions of climate, vegetation and soil.

Hence the map showing the main forms of land-use (see Fig. 18) shows certain broad similarities with the maps showing the climatic regions, the natural vegetation and the soil types.

Like those maps, that of land-use regions has had to be generalized, and the respective forms of utilization overlap considerably, but the following regions can be distinguished.

The "Mainly Unutilized" Areas.—In the cold north there are the tundra lands which offer practically nothing except a little pasturage for reindeer, the northern Urals and the parts of

the Scandinavian Mountains to which at best cattle may be driven for a few weeks in the year, and the greater part of Iceland, in which there are some areas of summer feeding for sheep. In the arid south-east of Europe there are only poor exclaves of the steppe-lands and small areas where irrigation is possible.

Dominant Forest areas are those of the coniferous forests in the broad belt of country forming the northern portions of Sweden, Finland and Russia. They are still mainly unbroken, although there are occasional clearings in which some agriculture and pastoral work are carried on. In the extreme north only vegetables can be grown, but in the remaining area barley, the grain crop which can ripen in the shortest vegetative period, is cultivated. . It should be noted that this grain is the " six-row " barley which is used for man's food ; it is an entirely different plant from the much more productive " two-row " barley which is grown in England mainly for malt, and in the south-west Baltic lands also as food for pigs. Farther south there are many " islands " of uncleared forest in the region marked on the map as dominant crop-land ; two of these are diagrammatically shown, one being the lake-studded area where Latvia, Lithuania and Russia adjoin, and the other the great Pripet Marshes.

Mountain Forest and Pasture.—These regions are the uplands and highlands of Central Europe and the Caucasus Mountains. In general, they are characterized by having deciduous forest with coniferous forest at higher levels, and then alpine pastures, and in some cases these are succeeded by culminating areas of bare rock and perpetual snow ; only in the valleys is cultivation possible. The use of the land varies from region to region, as will be explained in more detail in later chapters.

Dominant Pasture areas are those in which the main occupation of the people is the keeping of animals and in which a high proportion of the land is used for growing hay or for grazing, although there may be some crops grown either for fodder or for human use, and there may also be forests, moors or heaths. These largely pastoral areas fall into three main groups :

(i) Over much of north-western Europe, including the southern coast of Iceland, the climate is too wet for grain growing to be the most remunerative form of farming. In

Iceland sheep are reared ; in Britain both sheep and cattle are kept; in Norway, and in parts of the North Sea Lowlands, the keeping of cattle and the production of milk, butter and cheese are the main objects of farming. Grasses, clover and root crops are therefore grown and, as food for men, potatoes and oats—a grain which can ripen in relatively cool and wet summers.

(ii) In the Mediterranean region poor pasture has to a considerable extent superseded the forests of the uplands, while in parts woods of evergreen oak yield acorns as mast for animals. Not all the upland areas are used for pasture, however, for there are woods of cork oak, as well as of chestnut and other trees which yield their fruit. Sheep and goats are the animals most commonly kept, and in the Balkan Peninsula swine, too, are numerous. In the northern uplands of this peninsula, where the climate is not of the Mediterranean type, the forests have been so largely cut that even here pastoral work is now dominant ; cattle are relatively more important in these Balkan regions than in the other two southern peninsulas of Europe.

(iii) In the steppe-lands of south-eastern Europe the growing of crops gradually becomes less, and the work of the people becomes more restricted to the keeping of animals, towards the south-east. Cattle are reared in the rather better-watered part of the predominantly pastoral area around the Sea of Azov, and sheep mainly on the still drier country draining to the Caspian Sea.

Dominant Crop-land areas form the largest, as well as the most productive, group of agricultural regions of Europe. They are very varied in type, and one useful way of distinguishing them is according to the grain which is most commonly grown, although almost everywhere the keeping of animals is one aim of the farming, and generally vegetables are a product of considerable importance.

Grain Crops.—*Oats*, as stated above, form the characteristic crop over much of the pasture-lands of the north-west, and the crop-land in which they are predominant extends over southern Scandinavia to the lands north of the Gulf of Finland. Yet other grains, as well as root crops, are grown in the same area, and the two-rowed barley is particularly important in the region around the entry to the Baltic Sea. In eastern England, too, barley is largely grown, and here it rivals wheat as regards the amount of land devoted to it.

Rye.—The rye belt stretches from central Europe south of the North Sea and Baltic Sea across the middle of Russia as far as the Ural Mountains. Although rye requires a longer vegetative period than barley, and drier conditions for ripening than oats, it is a hardy grain and is largely grown on the inhospitable podsols of Russia and the glaciated areas of Germany and Poland. Rye bread has now been displaced by wheaten bread in western Europe, but it is still largely used in central Europe, and remains the staple food in the east. In Russia buckwheat and oats are also grown in the region in which rye is dominant.

Wheat.—The wheat zone is the most extensive, for its northern margin forms a great curve stretching from eastern England into central Europe and across Russia south of the rye belt, while it is largely grown in the warmer parts of central Europe and in the Mediterranean region. Thus wheat overlaps with barley in England, with rye in the Rhine-lands and in the black-earth areas of Russia, and with maize in the southern part of central and western Europe. Comparing the map of crop distributions in Fig. 18 with that of the duration of warmth in Fig. 11, it will be noticed that the northern part of the rye belt has a warm period lasting about four months, that of the wheat belt about five months and that of the maize belt over six months.

Yet the climatic conditions are, of course, by no means uniform over the whole range of wheat production of Europe, and the methods of cultivation consequently vary. In the west "winter wheat" is cultivated; that is to say, the grain is sown in autumn, remains dormant during the winter, grows as soon as the vegetative period begins in spring and is harvested in late summer. In the east the winters are too severe for this type of wheat, and "spring wheat" takes its place; though it is not sown until well in the spring, the hot summers allow a rapid growth and the harvest occurs rather late. In the Mediterranean region the wheat is sown in autumn, slowly continues its growth during the winter and ripens in the dry weather of the early summer.

On the map showing the crops, wheat is marked as the "characteristic" grain of certain regions, either with or without others indicated on this map, but it is almost always only one of several crops grown in rotation in successive years.

Maize.—In its climatic requirements this is the most exacting of the common grain crops of Europe, for it requires both con-

siderable heat and also a good supply of moisture ; hence it is grown in the parts of temperate Europe which have the warmest summers, but not commonly in the Mediterranean region nor in the eastern part of the steppe-lands, where there is a lack of rain in summer.

Barley.—Barley, and particularly the six-rowed varieties, can mature with little heat and with little moisture. Accordingly, barley is the marginal crop, not only in the cold north, but also in the dry south-east ; here and in the neighbouring parts of Asia it is the grain grown by the semi-nomadic peoples in the areas dividing " the desert " from " the sown."

Other Crops.—Space does not permit a separate comment on the distribution of all the other crops. Some are grown as food for men or animals, including grains such as rice, buckwheat and millet, potatoes, root crops, and vegetables of many other kinds. Other are " industrial " crops from which other products are obtained ; e.g. sugar-beet, flax and tobacco. Among these, the sugar-beet is largely grown over an area which almost coincides with the northern part of the wheat belt, that is, from eastern England across the north of France into Belgium and Germany, and thence across Poland and Czechoslovakia into the black-earth region of Russia. Flax is another important industrial plant, from which the fibre is used for manufacturing linen and the seed is crushed for oil and cattle - food. It has a fairly wide climatic range and is cultivated in districts as far apart as northern Ireland, and northern and southern Russia.

Fruits.—The northern part of the area shown as crop-land can allow the growth only of the more hardy kinds of fruit, notably apples and cherries ; in the central part appear others, such as pears and plums ; in the south there is an increasingly great variety. The northern limits of three fruits of considerable importance are drawn on the map. The vine is very widely cultivated, and the wine made from it is used both as a common drink in many of the vine-growing countries and for export as a luxury in cooler lands. It is significant that although the greatest amount of wine is produced in the Mediterranean region or on its margins, some of the most valuable kinds are obtained from near the northern limit of the vine, e.g. in Champagne in France and by the middle Rhine and its tributaries in Germany.

The olive, the most characteristic tree of lands with the Mediterranean type of climate, yields oil which is locally used to supply fat in the diet as butter is utilized in the cooler cattle-rearing countries. Citrus fruits, mainly oranges and lemons, need higher temperatures for ripening than generally occur in the northern part of the Mediterranean region ; therefore, although their limit is shown on the map to approach this margin in the Riviera district of the Gulf of Genoa, the yield here is neither so good nor so great as farther south. Indeed, the distribution of the citrus fruits indicates fairly well the extent of a " very warm," as distinct from a " warm," variety of the Mediterranean climate. As in the case of the other fruits of southern Europe, the oranges and lemons are grown partly for local use and partly for export, particularly to central and north-western Europe.

Besides citrus fruits, olives and grapes, many other fruits are cultivated in the Mediterranean region, e.g. apricots, peaches and edible nuts, such as almonds and walnuts.

So important is fruit growing, and so much of the work of the people is directly or indirectly bound up with it, that the area of the Mediterranean climate may almost be labelled as the fruit-growing region of Europe.

QUESTIONS

1. Describe the *transitions* between tundra, forest, steppe and desert in Russia.

2. Show how the natural vegetation is adapted to the climatic conditions of the " Mediterranean " region.

3. Give a description of the typical " black earth " of Russia, and account for its characteristics.

4. Distinguish between the various types of pastoral work in Europe, and give reasons for the differences.

5. To what extent, and in what ways, is the cultivation of wheat related to climatic conditions.

6. Explain how the differences between types of forest found in Europe are related to climatic differences.

7. Describe the nature and distribution of the podzols of Europe, and show how they are interrelated with both climate and natural vegetation.

8. Discuss the truth of the statement: "Natural vegetation regions are also regions of characteristic types of farming."

GEOGRAPHICAL REGIONS

IN the preceding chapters we have considered separately the most important factors in the geography of Europe, viz. relief and structure, climate, natural vegetation, soils and the use of the land ; in connexion with each of these factors a map has shown its special regions. Now, as geography concerns itself with the interaction of the various factors, we shall indicate regions, each of which has a character depending upon a special grouping and a special form of interaction of all the factors. These regions we call " geographical," preferring that term to " natural," which is likely to be regarded as equivalent to " physical," because here the human factors are also considered ; indeed, in some of these geographical regions man has very greatly modified, and even transformed, the natural conditions.

The geographical regions form definite and distinct environments of man, where people work in certain ways and in which they have developed characteristic modes of life ; in one sense, however, the regions are more than environments, for man himself is an essential element in them.

From the preceding chapters it will have become evident that climatic conditions occupy a pivotal position in this study of Europe ; in the first place, they depend upon the position and the relief of the constituent areas of the continent, and, secondly, climate very largely determines the natural vegetation, the soils and the use that is made of the land. Hence it is not surprising that the larger geographical regions correspond very closely with the climatic regions, as may be seen by comparing the maps in Figs. 15 and 19. That is true of the major geographical regions, but within these there are minor geographical regions which are distinguished from one another sometimes by minor climatic differences, and sometimes by other differences, particularly those of relief and structure.

Because the climatic conditions in the east and south of Europe extend over the adjoining parts of Asia and Africa, the major regions of eastern and southern Europe stretch far

beyond the limits of this continent; the map in Fig. 75 should be studied to see the relation between Europe and the other continents in this respect.

The Arctic Region.—The Arctic Region is primarily characterized by its cold climate, which has already been described, and it is to be noted that the region is considered as including both the tundra lands within the Arctic Circle and also the higher areas of the Scandinavian Highlands. When the minor regions of Arctic Europe are studied separately, the differences between these two parts must be taken into account. It may here be pointed out that the common climatic conditions of extremely long, cold and dark winters, with very short and cool summers, in both parts of the Arctic Region have resulted in similar conditions as regards the soil, which is wet in summer on the surface, but below this is permanently frozen. Consequently the natural vegetation is mainly of small growths, such as mosses, lichens and low shrubs, and man has been able to make little use of the region.

To the southern part of the Scandinavian Highlands cattle are driven in summer from the neighbouring lowland areas of Norway, while the northern part of these uplands and the tundra region are traversed by reindeer, which seek as food the sparse pastures of "reindeer moss," growing so slowly that it needs several years to form a fresh pasture after it has been cropped by a herd. The people who own the reindeer are necessarily nomadic and few in number; they retire in winter to the forest, where hunting is possible, and in summer advance to the coast, where fishing adds to their scanty resources. Since this region offers little which can be exchanged for the products of other regions, and since its position is so remote and the means of communication are so poor, there is very little contact with the rest of Europe, and the inhabitants live in a relatively primitive manner.

The Boreal Forest.—This is the region with the Boreal type of climate and with a natural vegetation cover of coniferous forest; the soils have been in general strongly leached and the surface is often swampy. Largely because of the unfavourable physical conditions, only small clearings have been made in the forests. This is most markedly the case in the east, where the winters are coldest and longest, and where the rivers, which offer the easiest routes, drain to the Arctic Sea. During the

winter the snow accumulates on the land, but with the rapid rise in temperature in spring it melts and floods the country; in this region the thaw occurs in the southern part while the lower courses of the northward-flowing rivers are still ice-bound. The inundations are therefore serious, and work on the land and traffic on the rivers are both delayed; the effective period of activity in summer is thus curtailed, and agriculture, pastoral work and trade are further handicapped.

In the north vegetables are the main crop; in the south barley is grown, and some oats and rye; some cattle, sheep and horses are reared, but the amount of farming is very small in relation to the great extent of the region. The maps in Figs. 18 and 19 show that only along parts of the southern margin have crop-lands extended into the Boreal Forest region.

In the main, forestry is still the characteristic occupation, and even this is largely limited to the southern part and to the neighbourhood of the rivers. Another resource is the hunting and trapping of the fur-bearing animals, though these have now been much reduced in numbers. With the exception of some towns situated on the rivers, and mostly either by the northern seas or near the southern margin, the settlements are small and widely scattered, and the population is scanty.

On the eastern margin of the region in Europe, the Hercynian block of the Urals yields mineral ores which have made possible industrial development.

The western part of the Boreal Forest region, in Finland and Sweden, is made more accessible by the existence of the Gulf of Bothnia, towards which the rivers drain; here there has been more development in connexion with all the resources of the lands and the waters. This is especially the case at the mouths of the rivers and around the coasts of the Gulf of Bothnia, where agriculture and pastoral work gain from some amelioration of the climate, and where the timber from the forests is worked up in saw mills and factories run by water-power from the streams. Moreover, in this western area the ancient rocks of the Baltic Shield emerge from below the sedimentary deposits of the Russian Platform; some minerals are obtained, and by the Gulf of Bothnia a little iron-working utilizes ore from inland mines. The population following these occupations is therefore more considerable in this narrow coastal belt than elsewhere in the Boreal Forest region.

The Sub-boreal Farmed Forest.—The more favourable conditions of the Sub-boreal climate region are reflected in the "mixed" character of the natural vegetation and the less thorough leaching of the soils. To these conditions is added greater accessibility from central Europe, whence came the greater developments in regard to the use of the land. Consequently the clearings have been more extensive than farther north, and now the region may be conveniently labelled "farmed



FIG. 19.—GEOGRAPHICAL REGIONS OF EUROPE.

forest." There are considerable areas of still virgin forest where timber is cut for export, but most of the region may be regarded as crop-land, oats and rye being the chief grain crops.

In the Baltic Shield area in Sweden there has been a development of mining and manufacturing, and around the shores of the Baltic Sea there have grown up a number of towns and cities dependent upon the agricultural and industrial occupations and the associated commerce. In the Russian area are the past and present capitals, Leningrad and Moscow, while industries and trade have grown up at a number of other large centres.

Yet in general the Sub-boreal Farmed Forest region is predominantly agricultural, and it is one of the less densely populated regions of the continent, with the exception of the Tundra, the Boreal Forest and the arid Caspian depression. The map of the geographical regions should be compared with that in Fig. 82, showing the density of population in Europe.

The Steppe Lands.—The steppe lands offer greater returns to agriculture than the forests situated north of them, because of their easier working and the greater fertility of their soils, especially in the belt of the black earth. The climate, too, is more favourable, with its longer summers and the higher temperatures in the growing season, except where the supply of water is scanty, as on the south-eastern margin. Although agriculture has only relatively recently superseded a primitive form of pastoral work, and although modern scientific methods of cultivation have still more recently been introduced, nevertheless this region has a wide range of products and is capable of giving high yields. This is particularly true in the western part of the steppe-lands, where the more valuable grains, maize and wheat, are grown in great amount, together with beet, flax and other industrial crops, and where the vine and other fruit trees are cultivated.

Towards the east the variety of products is reduced by the more extreme temperatures and the poorer supply of water; also the normal yield of the crops is less, and the keeping of animals is relatively more important than in the west. Moreover, the rainfall is more variable in the eastern steppe-lands and failure of the harvests is a serious menace. For these reasons, the population dependent upon agriculture is considerable in the west, but decreases greatly towards the east.

Mineral resources are associated with the two areas where the older rocks come to the surface in southern Russia. Within the eastward bend of the Dnieper the ancient rocks yield ores of iron and manganese, and where the river cuts through the resistant outcrop the rapids give enormous water-power, which is used for the production of electricity. In the Hercynian block of the Donetz region is a large coalfield which has also led to the growth of industries in southern Russia. There are oilfields on the margins of the Carpathians in the south-west, and of the Caucasus in the south-east, of the steppe-lands.

In spite of various drawbacks to navigation, the rivers, as

well as roads and railways, carry traffic through the steppe-lands between the Black Sea and the interior of Russia and Rumania.

With these varied resources and activities, the western part of the steppe-lands has much urban as well as rural development, and the density of population is greater than in any other part of eastern Europe. Indeed, the manner of life of the people is becoming similar to that of the central countries of the continent.

At its south-eastern margin, the region adjoins the Caucasus Mountains, which are geographically more closely related to the highlands of south-western Asia than to the neighbouring regions of Europe.

The Arid Caspian Lowland.—The low and irregular rainfall, the infertility of the soils, the lack of other resources and the remoteness of the position combine to make this extreme south-east of Europe a region of difficulty to man, and comparable in this respect with the extreme north-east of the continent. The lower valley of the Volga, with its port, Astrakhan, is the main exception to this rule.

The Mediterranean Lands.—To its position on the globe this region owes both its general climatic conditions of a mild, moist winter and a hot, dry summer, and also its general structural characteristics of fold-mountains enclosing sea-filled subsidence basins, as a result of which there are commonly narrow coastal lowlands rising rather steeply to hills or mountain ranges.

In the eastern part of the Mediterranean lands of Europe the climate tends to dryness and there is relatively little lowland ; here the growing of the characteristic fruits is one of the main occupations of the people, who have terraced the lower slopes for this purpose, while at higher levels there is little more than poor pasturage.

Around the western basin of the Mediterranean Sea and by the Atlantic coast in the same latitude, there is generally a better rainfall or better possibilities of irrigation, while there is also a greater area of lowland. Consequently there is a wider range of products, and grain and vegetables, in addition to fruits, are grown to a considerable extent.

The interior of the Iberian Peninsula is largely plateau, and while some higher ranges are well watered and bear a vegetation cover of woodland, much of the remainder tends to aridity

and is dependent upon an artificial water-supply for its utilization.

Coal deposits are lacking, and only in scattered areas are there other forms of mineral wealth, and in the Mediterranean region industrial development is mainly limited to certain ports at or near river-mouths.

The Mediterranean Sea and its extensions, the Adriatic, Ægean and Black Seas, give access from the ocean to a great part of southern Europe, and with the cutting of the Suez Canal the Mediterranean Sea links Europe with the Indian Ocean and the Far East. But the mountain-folds encircling the sea impede communications between the Mediterranean lands and those of the remaining part of the continent, and land traffic is restricted to a few breaks or passes in the mountain barriers ; hence in a few ports on the northern shores is concentrated a considerable amount of commerce, both in local products and in goods of wider origin. (The situation of the chief ports and their relation to the routes leading to central and north-western Europe is shown in the map in Fig. 20.) Trading is therefore important in certain parts of the Mediterranean region, and this occupation and the intensive agriculture and horticulture of the larger coastal lowlands have together given rise to some great cities and some areas of dense population.

Temperate Europe.—The region with a temperate climate is the only major geographical region which is entirely European, with the exception of the adjacent Sub-boreal Farmed Forest, for all the other major regions extend far beyond the limits of the continent. As shown on the map of Europe in Fig. 19, this temperate-climate region appears very extensive, but the map in Fig. 75 of the major regions of Europe and north-western Asia shows that its area is not remarkably great as compared with those which overlap the continents.

It has within it, however, such a variety of relief and structure that its constituent areas vary considerably, and no single descriptive label, such as " lowland " or " forest," would be applicable to it as a whole. It is, therefore, convenient to term it simply " Temperate Europe." The differences within it are so marked that it is necessary to divide it into three minor regions, as shown on the maps in Figs. 19 and 21, and these minor regions will now be separately considered.

The Atlantic Margins.—The characteristic feature of the

climate of Temperate Europe is the influence of oceanic winds during the whole year. This influence is particularly marked along the Atlantic Margins from the north of the Iberian Peninsula to the northernmost part of the continent, and throughout this extent it produces a very equable and rainy climate.

Also, along this marginal belt, the earth's crust has suffered dislocations which have resulted in the drowning of large areas and the upraising of most of the remainder, and hence the lands have a considerable elevation. Their altitude combines with the rainy character of the climate and the associated leaching of the soils to handicap agriculture. Forests, moors and heaths cover the highland and upland areas, and the relatively small areas of lowland are mainly given over to grass ; with the rather higher temperatures of the southern part, however, there is more cultivation.

There are scattered deposits of minerals, but only the coal of the British portion has served as the basis of manufacturing to any extent. Elsewhere, besides farming the chief resource is fishing, for the region is too remote from the busier districts of the continent for trading to be important. Hence the population is, with small exceptions, rather scanty. Even in Britain, as was explained in Volume I of this series, the Atlantic Margins differ markedly from the English Lowland, which belongs to the next minor region.

The Developed Lowlands and Wooded Uplands.—The map of climate regions in Fig. 15 shows that within this minor region there are modifications in the climate, particularly noticeable in an approach to extreme conditions towards the east. Moreover, a relief map shows that, apart from the Alps, there are in Central Europe considerable upland areas which are high enough to have distinctly cooler and wetter conditions than the adjoining lowlands ; these uplands areas are indicated also on the map of structural regions in Fig. 1 as belonging to the Hercynian group or as due to foldings of the Alpine type.

Putting these facts together, it will be seen that this minor region of Temperate Europe comprises (a) lowlands of sedimentary material, and (b) uplands of generally older and more resistant rock, and that each of these groups is composed of a number of relatively small areas with climatic differences corresponding to their respective positions (see Fig. 21).

The former group is here labelled as " developed lowlands,"

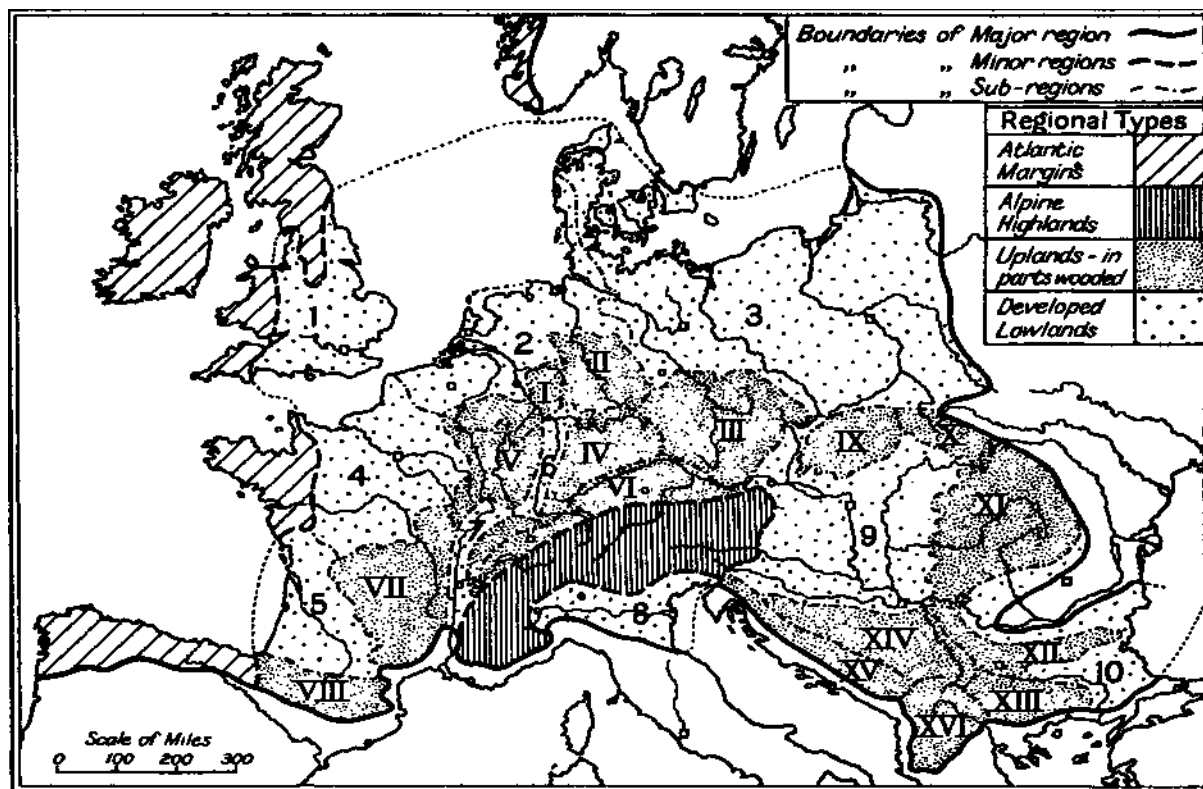


FIG. 21.—REGIONAL TYPES OF TEMPERATE EUROPE.

because their resources have been very thoroughly exploited and in them a number of districts have been largely transformed by human agency. In general, the climate and soil favoured early settlement, and for centuries men have used and improved the natural conditions, while even less-favoured parts, such as the marsh areas near the delta of the Rhine, have for various reasons also attracted settlers, who have converted them into productive lands.

Practically the whole of the lowlands are farmed, and much of the area is cultivated in an intensive manner, with a high yield as well as a great variety of products. According to the varying climatic conditions, rye, barley, wheat and maize are characteristic in different localities, generally associated in a rotation with other grains, industrial crops or fodder crops. Pastoral work in many parts is carried on in its most remunerative form, viz. dairy farming, to meet the needs of large urban populations. Minerals, too, have been exploited where they exist, particularly where coalfields dip down from the Hercynian Uplands under the margins of the lowlands, and some of the greatest and most densely populated industrial regions of the world have grown up in these lowlands.

The "drowning" of the continental margin has brought the sea far into the region, and from much of the interior of Europe the rivers bring traffic to the English Channel, the North Sea and the Baltic Sea. Because of the great amount of manufactured goods produced in the region, and the need of the dense populations for raw materials and food, commerce has developed here as in few other parts of the world and many important trade routes meet in the lowlands, as is shown in Fig. 20; there are also great ports, especially near the mouths of the rivers on the continental and English shores of the North Sea. Manufacturing and trading have thus led to immense urban development in the more northerly of the lowlands, viz. the English Lowland (numbered 1 on the map in Fig. 21), the North Sea Lowlands (2), the South-West Baltic Lowlands (3), and the North French Lowland (4).

On the other hand, some of the more southerly regions have more favourable climatic conditions and give a greater return to agriculture, as is exemplified in the Basin of Aquitaine in France (5), the Rhine Rift Valley (6), the Rh6ne-Sa6ne Trough (7) and the North Italian Plain (8). On the eastern side a lack

of rain may be a handicap in the Middle Danubian Lowlands (9), while a transition to steppe-like conditions is observed in the drier South-eastern Lowlands (10), which include the Walachian Hill-lands and the East Balkan Lowlands.

Each of these ten areas has sufficient unity within it, and sufficient difference from its neighbours, to be regarded as a distinct sub-region of the " Developed Lowlands and Wooded Uplands " of Temperate Europe.

The uplands of Temperate Europe, with their cooler and wetter weather, are less suited to crop growing ; they have considerable areas given to pasturage, but their characteristic vegetation-cover is forest. There is quite a variety of trees, and forestry is one of the chief occupations. The minerals, which in a number of districts first attracted settlers, have in several cases been largely worked out, and only relatively small industries are based upon them. Trade naturally avoids the higher areas (again see Fig. 20), and because of these combined conditions, the uplands are, in general, the homes of much smaller populations than the lowlands.

These uplands form a number of distinct sub-regions, which may be grouped according to their position. The Central Uplands of Europe comprise the Rhine Plateau (marked I in Fig. 21), the Weser-Saale Hill Country (II), the Bohemian Diamond and its margins (III), the East Rhine Scarp-lands (IV), the West Rhine Scarp-lands (V), the Jura Mountains and the Alpine Foreland (VI). In western Europe are the Central Plateau of France (VII) and the Pyrenees (VIII). On the eastern side are the three Carpathian sub-regions (IX, X and XI), and five more constitute a great part of the Balkan Peninsula (XII—XVI).

The Alpine Lands.—The great differences in elevation make it difficult to summarize the characteristics even of this relatively small minor region. It may be briefly said that the valleys provide sites for settlement, and offer opportunities of farming and other occupations which support the comparatively small numbers of inhabitants, while through some of the valleys pass routes connecting central and north-western Europe with the Mediterranean region. At higher altitudes forests supply timber, and still higher are summer pastures to which animals and people migrate for a few months. Above this habitable zone, dwarf shrubs, low cushion-like growths, lichens and other forms of alpine flora appear in summer and recall, in the heart of

Temperate Europe, the plant-life of the Arctic Region ; in the highest zone of all, only steep slopes and culminating peaks of bare rock emerge from snow-fields.

Peninsular and Trunk Europe.—We may regard Peninsular Europe as that part of the continent which adjoins the Atlantic Ocean and has been given peninsular form by the penetration of the North and Baltic Seas on the north and the Mediterranean Sea on the south. It may be broadly limited eastward by a line drawn through the Gulf of Bothnia and the Baltic Sea to near the mouth of the Niemen (Memel) River where Temperate Europe adjoins the Sub-boreal Farmed Forest Region, and thence the limit approximately follows the boundary of Temperate Europe to near the delta of the Danube.

By such a division, both Peninsular and Trunk Europe include portions of several geographical regions, but the former is more open to maritime and western influences, while the latter has a continental and eastern orientation. The physical causes of the differences have now been shown ; corresponding contrasts in the human geography of the two areas will be brought out in several sections of the next chapter.

QUESTIONS

1. Define the limits of the " Arctic " region of Europe, and show how the geographical factors within it interact with one another.
2. What justification is there for regarding the Boreal Forest region as a geographical unit ?
3. Describe the common characteristics of the Mediterranean geographical region, apart from its climate.
4. Discuss whether it would be better to incorporate the region here termed " Sub-boreal Farmed Forest " into one or more of the neighbouring regions.
5. Consider whether the areas marked as " Atlantic Margins " should be distinguished as a separate minor region of " Temperate Europe."
6. It is difficult to find short names which well denote geographical regions. Discuss, and suggest alternatives to, two names adopted here for major regions, which seem rather unsatisfactory.
7. Discuss the possibility of dividing Europe simply into two great regions, " Peninsular " and " Trunk," on the basis of their general character.

THE PEOPLES OF EUROPE

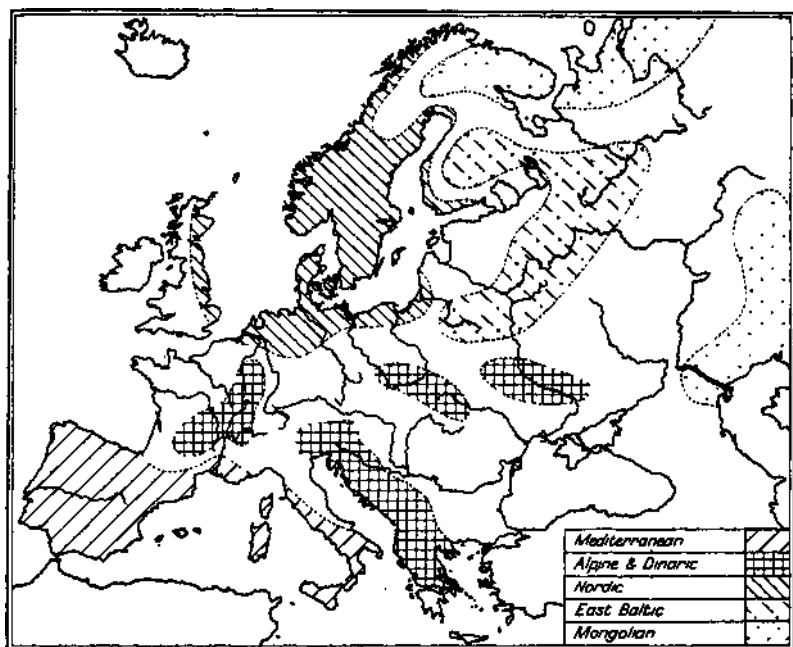
IN the preceding chapters the people who live in the various parts of the continent have been referred to mainly in relation to their respective environments ; we will now consider the peoples themselves.

The Racial Elements.—The physical characters of people are fundamentally determined by their descent, being handed down from generation to generation, and are therefore taken as indications of the race to which people belong. It is important to restrict the term " race " to groups of people who have in common a number of physical characters due to a more or less common ancestry, and never to use the term to denote groups who, although speaking the same language, or having the same religion, or being members of the same political State, nevertheless differ from one another physically because they have a mixed ancestry.

Anthropologists classify the greater part of mankind into three main racial or ethnic groups, distinguished from one another by the structure of the hair and the colour of the skin. These three groups are : (i) that of the negroes with woolly hair and black or very dark skin ; (ii) that represented by the Chinese and other Mongolians with straight, lank hair and yellowish skin ; (iii) the group to which the peoples of Europe mainly belong, with wavy or curly, yet smooth and not woolly hair, and with skins which are more or less white or light brown.

Among the Europeans, the various shades of skin colour are often, but by no means always, associated with the colour of the hair and eyes : a fair skin is in many cases accompanied by light-brown or even yellow hair and by blue or grey eyes, while the rather darker-skinned people commonly have dark-brown eyes and black hair. These contrasts between fair and dark are very clearly seen by comparing the typical Scandinavians showing the former characters with the inhabitants of southern Italy showing the latter, and they are so marked that they are taken as indicating distinct racial or ethnic stocks, to which the terms

"Nordic" and "Mediterranean" are respectively applied. People belonging to the Nordic type constitute a considerable proportion of the inhabitants of the northern plains of Europe west of Russia, and those of the Mediterranean type form a majority of the population of the western Mediterranean lands (see Fig. 22). Between them, in the highlands and uplands of Central Europe, most of the people have an intermediate



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• FIG. 22.—DISTRIBUTION OF PREDOMINATING RACIAL TYPES.

Note.—The shaded areas are those in which the respective racial types are common. In the intervening areas the mingling is so great that no type can be regarded as characteristic.

grade of coloration with chestnut-brown to black hair, and hazel-grey to brown eyes. Moreover, the people of the Nordic stock are generally tall, those of the Mediterranean stock are relatively short, while those of the central uplands and highlands are of medium height.

Yet these intermediate conditions of coloration and stature do not result from a mixing of the other two racial stocks, for they are commonly associated with a quite different shape of the head. Both the Nordic and the Mediterranean stocks are

characterized by " long " heads, that is, the length of the skull from front to back is markedly greater than the breadth from side to side, whereas the inhabitants of the central uplands and highlands usually have rather broader heads. Hence the peoples here are representatives of another racial stock, and to these people the name " Alpine " is applied.

Closely associated with these Alpine peoples are another group who are also broad-skulled, but do not resemble them in appearance, for they have a greater stature, a more slender figure and a longer face. They are numerous in the coastlands north-east of the Adriatic Sea, and for that reason this group is known as " Dinaric " or " Illyrian." Judging by the physical criteria, members of this stock spread northwards and now form one of the important racial elements in the plains of Silesia and south Poland.

The three ethnic groups—Mediterranean, Alpine-Dinaric and Nordic—together comprise the greater part of the population of Europe, and it is therefore commonly stated that there exist these three European races.

The ancestors of these groups worked their way into Europe thousands of years ago, displacing or mingling with the scattered hunting peoples who had occupied the south of the continent during the Ice Age and had moved northward as the climate improved and the ice retreated.

Of the three main races, the Mediterranean stock peoples were the first comers. It was probably before 4000 B.C. that they settled on the warm and fertile shores of the great sea ; there they had opportunities for growing grain and fruit, and for extending westward in Europe the civilization which had arisen in Egypt, Mesopotamia and the lands around the eastern part of the Mediterranean. In course of time they passed around the Iberian Peninsula to the Atlantic coasts, and thus reached the west of France and the British Isles (see Fig. 23).

Later, when climatic conditions in central Europe had become more favourable, the Alpine peoples migrated from Asia Minor and extended their settlements along the uplands and the neighbouring lowlands drained by the Danube. The loess areas of central Europe, fertile and free from forest, favoured the agriculture and pastoral work upon which they depended. They gradually worked their way westward into the valleys of the Alps and over the upland areas of what are now southern

and central Germany, Belgium and central France. The related Dinaric peoples followed those of the Alpine stock by much the same routes through the Balkan Peninsula and into central Europe, but they did not penetrate so far westward.

At a very much later date one branch of the Alpine stock spread from the Carpathian region into the adjoining plains to the north and east which now form part of Poland and Russia. These peoples are known as Slavs, and their descendants form a considerable proportion of the Russian people. A further migration southward gave rise to another group, the South Slavs or Yugoslavs, who occupied much of the Balkan Peninsula.

The ancestors of the Nordic peoples seem to have entered Europe after the Mediterranean and Alpine immigrants; originally pastoralists, they migrated across the plains of southern Russia, and eventually settled in the lands around the Baltic Sea.

Associated with the greater stature of the Nordics is usually greater physical strength than that of the peoples of the other stocks, and this doubtless helped them, at a much later date, to spread southwards and, in many instances, to conquer other peoples and to occupy parts of western, central and even southern Europe. For example, there were the settlements in Britain by the Angles, Saxons, Jutes and Norsemen, the incursions of the Goths into the Balkan Peninsula and Italy, and the penetration by the Vandals into the Iberian Peninsula and even into northern Africa.

Besides these peoples who have been so long established in this continent that they are regarded as truly "European," there are others whose origins are more recently Asiatic, and who are related to the Mongolian races of Asia. The Samoyeds have migrated from Asia into the northern forests and tundra of Russia, and the Lapps have spread even into the north of Scandinavia. They belong to the Ugrian racial group, who are characterized by broad heads and rather short stature, and often have a flat face and prominent cheek-bones ; the slanting eyes which are shown most strikingly among the Chinese and Japanese appear among the Samoyeds, and occasionally among the Lapps.

Allied to the Ugrian folk are the Finnish group of peoples who had earlier worked their way across the Ural Mountains into

northern Europe, and now occupy the greater part of Finland and the adjoining region of Karelia across the Russian border. Yet the Finns of the present day do not show the characteristic Mongolian features to the same degree as the Lapps or the Samoyeds, probably because the original Finnish immigrants here settled in an already populated area. It frequently happens that a group of intruders may dominate an area and intermarry with the inhabitants, upon whom they impose their name,

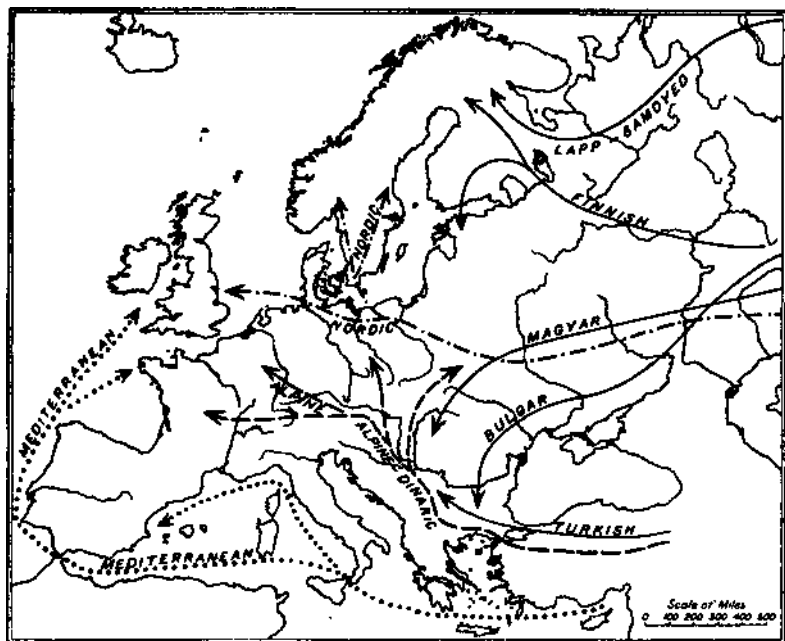


FIG. 23.—RACIAL MIGRATIONS INTO EUROPE.

language and traditions ; yet, if these subject people are relatively numerous, in the course of generations the blood of the dominating group becomes progressively diluted, as it were*. Hence, anthropologists are frequently faced with the fact that the name and speech of a people suggest one origin, and their physical features another. In the case of Finland it is certain that, in spite of the absence of Mongolian features, some of the ancestors of the present Finns migrated from northern Asia.

South of the Gulf of Finland are the Ests or Esths of Estonia, who are closely related to their Finnish neighbours. Moreover, in all the East Baltic region there are many individuals of a

type which seems to have resulted from a mingling of stocks of northern Asiatic and Nordic origin. These people are regarded as having by now been welded into a distinct ethnic sub-group, called East Baltic (see Fig. 22), and they form part of the population of a very wide area extending into Prussia on the west, Russia on the east, Finland on the north, and Latvia, Lithuania and Poland on the south.

Rather more recent immigrants from Asia of definitely Mongolian origin and speaking Ugrian languages came by a more southerly route along the steppe-lands. The Bulgars were nomadic horsemen, who in the seventh century A.D. crossed the lower Danube, conquered the Slav inhabitants and gave their name to Bulgaria. But though their name and some of the traditions of the invaders have survived, the language of the Bulgarians is now in the main Slavonic, and the people show little of the original physical characters of the immigrants.

A century or two later, other Asiatic tribes swept across the steppes, and some of these worked their way across the Carpathian Mountains into the Pannonian or Hungarian Basin. One group of these invaders spoke a language which was compounded of two Asiatic elements, the Ugrian and the Turki; the people of this speech were the Magyars, and the present inhabitants of Hungary still retain the name Magyars and speak the Magyar language, though their physical appearance shows that they have altered but little the predominating Alpine stock of the Slavs whom they conquered.

At about the same time that south-eastern Europe was thus invaded, the Moors of northern Africa crossed into the Iberian Peninsula and for a time ruled much of that region; yet they did not make great changes in the racial composition or the language of the people of the Peninsula, and the results of their occupation will be referred to in later sections.

The last of the great invasions was that of the Turks, i.e. tribes speaking a Turki language; they came from central Asia, and one group, the Osmanli Turks, overran Asia Minor, occupied Constantinople in A.D. 1453, and forced themselves as masters upon the people of the Balkan Peninsula. But throughout their long and victorious advance, they freely intermarried with their subjects, and accepted as "Turks" many who adopted their Moslem religion. Thus the Turkish State known as the Ottoman Empire spread from south-western Asia over much

of the Balkan Peninsula, and imposed its rule upon that region, but, nevertheless, the Balkan peoples still remained mainly of Alpine, Dinaric or Mediterranean descent and retained Slavonic, Albanian or Greek languages.

Other movements of peoples have occurred, some of which must be referred to in the next section in connexion with the spread of languages, but it may already be realized that the contacts and conflicts of the various migrant peoples have resulted in a mingling of the population in such a way that few districts show a uniformity of type.

Languages.—To use the words "Aryan race" for the Nordic ethnic group is doubly misleading, for in the first place the word Aryan applies only to languages, and in the second place it denotes a widespread group spoken by the great majority of Europeans (see Fig. 24). The Aryan languages have extended over almost the whole of the continent of Europe and through south-western Asia into India. Hence they are also known as Indo-Germanic, though they include not only the German or Teutonic family of languages, but also Greek, the Romance languages which have derived from Latin, the Slavonic family and the Celtic languages, as well as others spoken by some of the smaller communities.

Although in some areas, as in Wales, two languages exist side by side and many individuals may speak both, it is nevertheless possible to show the broad distribution on a map. This is done in a generalized form in Fig. 24, and in more detail for the central part of Europe in the end-paper map within the back cover of this book.

It is not possible to say what were the languages of the earliest folk who came into Europe; only the later movements of people, during historical times, can be definitely associated with the spread of the present-day languages.

By the generally westward migrations of conquering tribes the pre-Aryan languages became extinct, the one striking exception being the Basque speech, which has survived in the mountainous borderland of South-western France and Northern Spain. With the language there have remained old customs and traditions, and even a feeling of a distinct nationality among the Basque folk; nevertheless, the physical characteristics of the people do not show a uniformity of racial origin.

Another early language which has survived in the west of

Europe is the Celtic tongue. It is a member of the Aryan group carried across Europe in successive waves of settlement about 1000 years B.C. by folk probably of mixed descent ; later these people were themselves displaced or forced to adopt the languages, Teutonic or Romance, of other conquerors. Hence Celtic is now found, in several varieties, only in the peninsulas and islands of the Atlantic Margins in Brittany, Wales, north-western Scotland and Ireland.

The Greek language is spoken in the southern part of the Balkan Peninsula, and on the islands of the *Mgesm* Sea and Krete.

The Romance languages have a very wide distribution, for their spread resulted from the great extension of the Roman Empire. Italian is most directly derived from Latin, and is now spoken in the Italian Peninsula, the islands of Sicily and Sardinia, the North Italian Plain and some of the coast-lands north-east of the Adriatic ; it is also spoken in the part of Switzerland which projects southward to the edge of the North Italian Plain between Lakes Maggiore and Como.

East of Lake Como there are several small areas of the Alps in which the inhabitants of the mountain valleys speak distinct Romance dialects : Romansch or Rhaetic, Ladin and Friulian,

In the Iberian Peninsula, apart from Basque, are several languages belonging to the Romance family. The difference between them may be related to the invasion by the Moors, who at one time occupied all the Peninsula except the northern mountain regions, where the Christians held out and whence they reconquered the land. One line of reconquest spread the dialect of the north-west corner, Galicia, southward along the Atlantic region, thus leading to the growth of a distinctive language in all this western part of the Peninsula. Later, most of this area formed the independent State of Portugal, in which evolved the present Portuguese language. Hence the Galicians, or Gallegos, speak a dialect akin to Portuguese and markedly different from the Spanish language.

Spain was mainly reconquered from the north by way of the plateaus of Castile ; the Castilian rulers gradually extended their power over the whole of Spain, and thus Castilian became the standard form of the Spanish language.

In the north-east of the Peninsula the defeat of the Moors allowed the return to Spain of refugees from France who brought

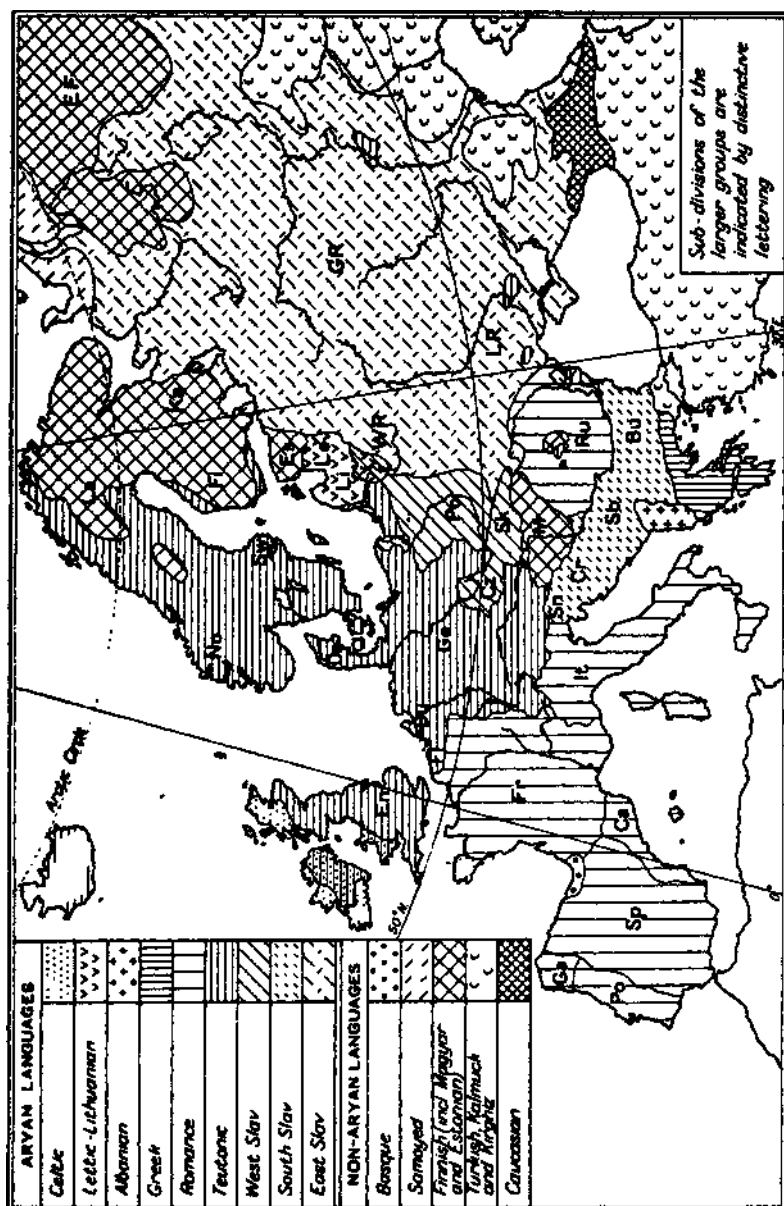


FIG. 24.—DISTRIBUTION OF LANGUAGES.

with them a dialect of the " Languedoc " spoken in the south of that country and akin to the modern French dialect Provençal; in eastern Spain this language became Catalan, and has spread to the Balearic Islands. In Catalonia, the north-eastern part of the Iberian Peninsula, the Catalan language has developed a considerable literature, and the distinctive language, traditions and literature have made the Catalonian people conscious of possessing a unity among themselves, and differing from the other peoples of the Peninsula.

The extent of the French language does not coincide with the territory of the French State, for while on the west Breton is spoken together with French, on the east the boundaries of the language and of the State diverge at several points. This is especially the case in three areas : (i) where the French speech extends into Switzerland, being spoken by about one-fifth of the population of that country ; (ii) where German-speaking peoples live in French territory in Alsace and Lorraine ; (iii) where French is the language of the Walloon people who form the population of the southern part of Belgium, viz. south of a line running approximately from east to west a little south of Brussels.

Rumanian is derived from the Roman language, as is clearly suggested by the native spelling of the name of the country—" Romania." It has been handed down from the provincials of this north-eastern outpost of the Roman Empire, but it has been greatly modified by the Slav-speaking and other peoples who have since then occupied the country. In most other parts of the eastern portion of the Roman Empire in Europe the later invaders have imposed their Slavonic speech, with the exception of Greece and Albania. In the latter mountainous country the Albanian language appears to be a survival of a primitive Aryan tongue.

The Teutonic family of languages probably had its home among the Nordic folk living in the plains around the west of the Baltic Sea and the south-east of the North Sea ; thence settlements and conquests in all directions led to the development of distinct Teutonic languages among peoples of varied origin. In the north there are the Scandinavian languages, of which Danish and Norwegian are almost identical; Swedish is closely related to the other two.

The English language is based in the main upon the speech

of the Teutonic invaders, modified by Romance elements introduced as a result of the Norman conquest. Other westward migrations of Germanic peoples have resulted in the development of the Dutch language in Holland and of Flemish in Belgium. This latter language is very closely akin to Dutch ; it is spoken by the Flemings, who form rather more than half the population of Belgium and occupy the part of the country north of the Walloon area.

Southward the Teutonic languages have had a wide extension over lands in which the people show relatively little influence of Nordic stock, i.e. from the racial point of view. German is spoken not only throughout Germany, but also beyond its borders in the Alsace-Lorraine portion of France, over the greater part of Switzerland, and in the upper Adige basin in Italy (see the end-paper map).

Eastward and south-eastward are " islands " of German speech, some of which are due to past wars between the Teutonic and Slav peoples. The Teutonic Knights won back East Prussia from Slavonic invaders and dominated the country now forming the States of Estonia and Latvia. In Poland, too, there are many German communities bearing witness to a similar ebb and flow of conquest. German settlers also went far into south-eastern Europe—into the Danubian plains and the upland basins and valleys of Transylvania, and even into the steppe-lands of Russia.

The Lithuanian and Latvian (or Lettish) languages, like the peoples of those countries, have a mixed origin. They are alike, and are regarded as a survival of an archaic Aryan type ; in each country the ancient tongue has been modified by the introduction of Slavonic and other elements.

The Slav languages have spread over the greater part of east-central and eastern Europe. There is the western group, including Polish and the closely related Czech and Slovak languages. There is the southern group, which includes Slovene, Croat and Serbian spoken by the three peoples who form the bulk of the population of the Yugoslav State. Bulgarian is another of the South Slav group of languages.

The widest extension of the Slavonic-speaking peoples has been eastward into the previously scantily occupied forests and steppe-lands of Trunk Europe. Of the East Slav languages " Great Russian " is the standard literary form, and is spoken

by the vast majority of the Russian people ; " White Russian " approximates to Polish, as its geographical distribution would suggest; " Little Russian " is the language of the Ukraine. The word " Ukraine " means borderland, and here the Russians had to oppose, and in course of time were to some extent influenced by, the invading horsemen from the Asiatic steppes ; consequently the Ukrainians developed differences from the Great Russians in several respects, and now Little Russian or Ukrainian is claimed to be a distinct literary language.

Lastly, there are non-Aryan languages of relatively recent introduction from Asia. In northern Europe, in addition to the speech of the relatively few Samoyeds, there is the Finnish group ; in the north-east are people speaking East Finnish dialects, while the West Finnish languages are spoken by the Karelians, the Lapps and the Finns themselves. These last people have developed the Finnish language proper and created a Finnish literature. Another west Finnish speech has spread southwards across the Gulf of Finland and has there become the Estonian language.

Magyar belongs to the same Finno-Ugrian family, although it has been carried into distant regions and imposed upon other peoples ; hence the Magyar speech of Hungary and Transylvania contains quite different elements from those of the Finnish group.

Of the other " Asiatic " languages, Turkish is now spoken by few people beyond the borders of the Turkish State, and the allied tongues of the Kirghiz, Kalmucks and other peoples of the south-eastern margins of Europe are giving way before the advance of Russian colonization and government. In the Caucasus and Transcaucasia there are spoken various non-Aryan Caucasian languages.

It will be observed that while Peninsular Europe has been influenced by many language developments and their associated forms of culture, Trunk Europe has seen the extension only of the Eastern Slav and the relatively late Asiatic groups of languages.

Religions.—It would be out of place here to attempt to state the faiths of the various religions or the effects they have upon individual people, but the religions have a geographical significance because the churches into which they are organized have had effects upon political, social and economic affairs, while their distribution is related to geographical conditions.

Christianity was adopted as the creed of the Roman Empire, and its spread was influenced by the extent of that power, but Christian missionaries carried even beyond the Empire both their faith and also such advances as reading and writing, better methods of cultivating the land, and various handicrafts ; hence the spread of religious ideas was often marked by a spread of other forms of culture.

Because the Roman power extended over a great part of western Europe the allied religious and cultural influences had more effect in transforming the lives of the " barbarians " in the west than was the case in the east of the continent, and these influences were one factor in bringing about the greater development in knowledge, in arts and sciences, in forms of government, and in economic matters, which long characterized western as compared with eastern Europe.

In the eleventh century the Christian Church was permanently split into two portions : in the east was the Greek or " Orthodox " Church ruled from Byzantium (now Istanbul), and in the west was the " Catholic " Church ruled from Rome. From the original home of European civilization in the Mediterranean region the line separating the areas influenced respectively by the Roman and Orthodox Churches runs from the head of the Adriatic Sea first north-eastward and the northward to the Arctic Sea, as can be seen from the map in Fig. 25.

In the east of Europe the influence of Christianity was greatly weakened by exposure to the attacks of Asiatic intruders. In the Balkan Peninsula the Turkish occupation resulted in a widespread adoption of the Mohammedan religion, and although the Turkish rule has been withdrawn from nearly all the region, nevertheless the people of parts of Yugoslavia and Bulgaria and of most of Albania remain Mohammedan. Here, in south-eastern Europe, the tall minarets of the mosques give an " oriental " appearance to the villages and towns, and from their summits the muezzins call the people to prayer. The Moslem women are still veiled, and the men still wear the round, tasselled fez, although in Turkey itself these distinctive marks of the Mohammedan religion are banned in order to avoid religious animosities between the different sections of the Turkish population.

Farther to the north-east, over most of Trunk Europe, the spread of religious and cultural influences was hindered by geo-

graphical conditions, for between the Mediterranean region and the homes of the early Russians in the clearings of the "farmed forest" region lay the steppe-lands; along these open lands passed wave after wave of nomadic invasion from Asia, which prevented effective contact between north and south. For the many centuries before the Russians dominated the steppe-lands, the advances made over the rest of Europe could reach the

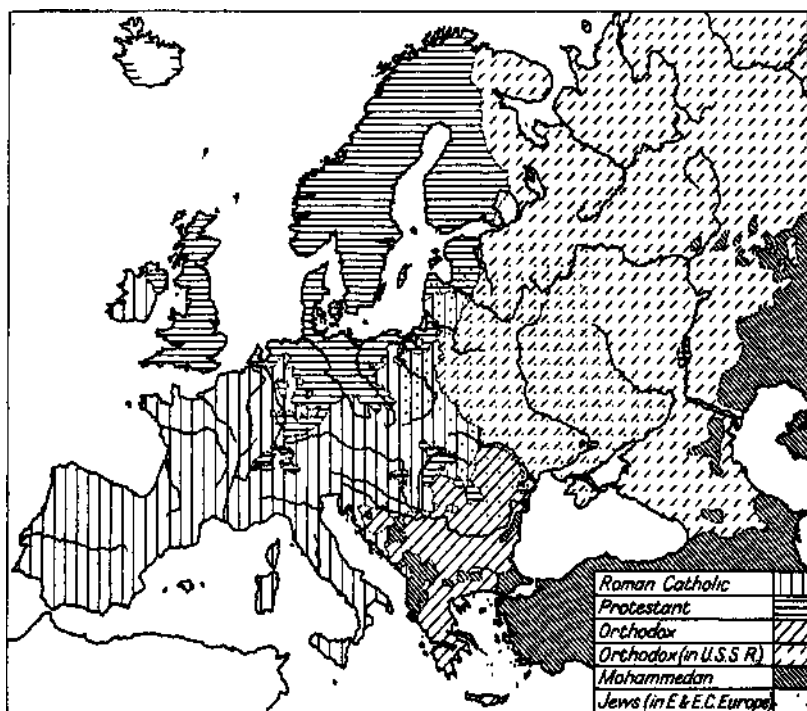


FIG. 25.—DISTRIBUTION OF RELIGIONS.

Russians only by a roundabout route through the Baltic Lands. This retardation is an important factor in explaining the differences between the peoples of Peninsular and Trunk Europe respectively.

The Orthodox faith at last spread over most of Russia and had a great influence for several centuries, but after the revolution of 1917 the new Government was so hostile to the Christian religion that now it is held, as a rule, only by people of the older generation who were brought up in that faith.

Yet one effect of its previous power is shown by the fact that here, as in the other countries in which some form of the Orthodox religion exists, the present alphabet is based upon the ancient Greek alphabet; on the other hand, in the countries to which the Roman Church extended the Latin alphabet is used, even though the language is not of the Romance family. The exception to this rule is Rumania, where the religion is Orthodox, but the Roman characters are used.

Yugoslavia illustrates the influence which religious differences may have on political conditions. The three peoples comprising the majority of the population are the Serbs, Croats and Slovenes, and, as stated in the preceding section, they speak similar languages, but while the Serbs are in the main of the Orthodox faith and have an alphabet derived from Greek, the Croats and Slovenes are Roman Catholic and use the Latin alphabet. These differences add to the difficulty of welding the three groups into one harmonious and firmly knit State.

After the close of the Middle Ages, a number of the States of northern Europe broke away from the Roman Catholic Church, and several Protestant Churches were formed; in determining the distribution of these new Churches the political power of the princes of that time was a greater factor than geographical conditions, and although the religious differences had very important consequences two or three centuries ago, they now count for less when one region is compared with another.

Separate reference must be made to the Jews as a religious community. Although a proportion of the Jews show a facial resemblance by an aquiline nose with a depressed tip and wide nostrils (characteristic of an " Armenoid " ethnic group related to the Alpine race), they have a very mixed racial origin. They have a language of their own—Yiddish—a blend of Hebrew and German elements, but they also speak the languages of the countries in which they have settled. The essential bonds between them are their religion and the traditions associated with it, and their feeling of difference between themselves and other peoples has been greatly intensified in several countries by their being forced into living apart from others. The map shows that they are relatively numerous in the transitional region between eastern and central Europe; here they are largely town-dwellers, engaged in trade, and are not easily

assimilated into States which are mainly composed of peasants. In all Europe, the Jews number nearly 8 millions.

Nationalities.—When a considerable group of people have lived together in one area and feel themselves to be bound by common ties to the extent that they wish to form a Government of their own, they may be said to constitute a "nationality." The ties that unite the members of a nationality are various : belief in a common racial origin (whether this belief is justified by scientific knowledge or not) ; the use of a common language and the enjoyment of a common literature; sharing of a religion ; living in one political state ; association in defence against enemies. Any one or more of these factors may be powerful in creating a feeling of national unity, but any one or more may be lacking among the members of a nationality. Perhaps the most usual indication of a feeling of national unity is the possession of a common language, for this is the result of long association and helps intercourse between those speaking it ; hence the map showing the language of Europe is, as a whole, useful as showing the nationalities of Europe. There are, however, some marked discrepancies ; e.g. the Swiss people certainly form a definite nationality, for they feel among themselves a unity which demands that they form a State independent of any other, yet among them are spoken four official languages—German, French, Italian and Romansch.

If a nationality is able to form a self-governing State, it is fortunate ; if it cannot, it may become a minority within some State in which it is held against its will, and in that case its discontent may be a danger to peace.

Political States.—A State is an association of persons living under one Government and inhabiting a definite territory. The reasons for the existence and extent of a particular State are generally complicated and reach far back into history ; it is clear from what has already been written that the members of a State are not necessarily bound by all the ties which have been discussed, though a feeling of a common nationality usually unites a considerable proportion of the subjects of a State. In the case of Switzerland we have an example of a State coinciding exactly with a nationality, but the Russian Empire as it was in the early part of the present century comprised a number of different nationalities.

It is important to consider the relation of States to geo-



FIG 26 —STATE BOUNDARIES BEFORE AND AFTER THE WAR OF 1914-18.

Note.—The various shadings show the extent of the States before the war of 1914-18; the thick In 1938 Germany incorporated Austria and the north-western margins of Czechoslovakia, and smaller areas of Czechoslovakia were lost to Hungary and Poland.

graphical conditions, and an examination of a map of the political units in Europe shows that they seldom bear any close relationship to natural or geographical regions (see the end-paper map at the front of this book). Indeed, there is a strong tendency to the contrary, for a State may be tempted, if an opportunity arises, to make itself stronger by extending its territory into a region which is of a different type and possesses resources which it has hitherto lacked. A desire to be self-sufficing, or to secure access to trade-routes by which commodities can be secured from abroad, has in many instances been a factor in advancing the frontiers of States across regions of contrasting geographical character.

For this reason, political frontiers seldom coincide with the boundaries of geographical regions, although well-marked natural features, such as rivers or water-sheds, maybe adopted as convenient and definite limits of States ; this is particularly the case when such a frontier offers a useful means of defence.

The difference between geographical and political units is brought out still more clearly when one thinks of the great and sudden changes which the States of Europe have undergone during the last few hundred years : old ones have disappeared, new ones have been formed, and others have expanded or shrunk to various degrees. In the last quarter of the nineteenth century—during the lifetime of many people now living—the Balkan States were carved out of the former Ottoman or Turkish Empire. In the present century, the political map of a broad belt running from north to south of the continent, and overlapping Peninsular Europe on the west and Trunk Europe on the east, has been completely transformed. There is no certainty that political conditions are yet stable in Europe, particularly in this " belt of political change."

The present-day geography has been greatly affected by the alterations brought about by the war of 1914-18; these are shown in Fig. 26. Particular attention must be drawn to the break-up of what were two of the greatest States of Europe before 1914, viz. the " Dual Monarchy " of Austria-Hungary, in which the Austrian Empire and the Kingdom of Hungary were united under one sovereign, and the Russian Empire. Under the strain of war, these great Powers fell to pieces, and several of the nationalities which had been unwillingly included obtained independence.

In the case of Russia, the Finns, Ests, Letts and Lithuanians set up the new States of Finland, and the three "Baltic States" of Estonia, Latvia and Lithuania, and the Poles of Russia united with those of Austria and Germany to re-create an older State of Poland.

Over most of the remaining part of Russia, after a period of revolution, there was formed the "Union of Soviet Socialist Republics" (U.S.S.R.), comprising eleven republics, which may be arranged in four groups on a geographical basis, (i) The "Russian Soviet Federated Socialist Republic" includes the greater part of European Russia, and all the northern and eastern portion of Asiatic Russia; it is the predominant partner in the Union, and at its capital, Moscow, is centred much of the administration of the whole of the Russian territories, (ii) The White Russian Republic (capital Minsk) and the Ukrainian Republic (capital Kiev) make up the remaining portion of Russia in Europe (see the map of eastern Europe in Chapter 17). (iii) The three republics of Georgia, Azerbaijan and Armenia together form the Russian territory of Transcaucasia, (iv) Across the Caspian Sea, in the south of Asiatic Russia, is another group—the Turkmen, Uzbek, Tadzhik and Kirghiz republics.

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When the Austro-Hungarian Monarchy fell to pieces, the hitherto subjected Czechs and Slovaks formed the new State of Czechoslovakia in the north, the Slovenes and Croats united with Serbia and Montenegro to form Yugoslavia in the south, the Rumanians of Transylvania were united to those of independent Rumania across the Carpathians. Thus the previously dominant peoples, the Austrians and the Magyars of Hungary, shorn even of parts of lands they themselves occupied, were left in 1919 to constitute the new small States of Austria and Hungary. Nineteen years later, in 1938, Austria was taken into the German Realm, "Deutsches Reich," and became one of the provinces of Germany.

In thinking of the relation between natural and political units, it must be borne in mind that States may have considerable influence on the geographical conditions of the regions they include, and in particular they may modify economic activities. Thus, in later sections of this book instances will be given of the way in which traffic may be diverted from natural routes because of political frontiers. Here special mention must be

made of the policy of "self-sufficiency" adopted very widely after the war of 1914-18.

With a desire to help their own subjects, and often to assure within their boundaries supplies of food and of materials and armaments which would be required for warfare, many Governments adopted measures such as giving bounties to the producers of particular commodities, and erecting "tariff walls" around their territories; by this latter method duties had to be paid when certain goods passed the Customs barriers at the ports or along the frontiers, and thus such goods were prevented either partially or entirely from entering the country. By such means States have stimulated certain forms of production at the expense of others, and have thus modified the natural economic development of the regions they comprise.

QUESTIONS

1. How can the "race" of peoples, as related to their descent from a common stock, be determined? Illustrate by reference to the Nordic race.

2. What is the "Mediterranean race"? Why is it so called, and in what ways might the term be misleading?

3. What are the Romance languages? Give an account of their spread in southern and western Europe.

4. To what extent does the extension of the German language correspond to the distribution of people of Nordic race?

5. Which peoples may be termed "Slavs"? Give reasons for your decisions, and comment upon any doubtful cases.

6. Magyars and Finns may be grouped together as regards their language. To what extent are they alike (a) in their speech, and (b) in other respects?

7. The Roman Catholic and Orthodox faiths have a markedly contrasted distribution over much of Europe. How is this distribution related, either as cause or effect, to geographical conditions?

8. Show how the entry of Mohammedanism into Europe was connected with the physical geography, and how it has affected the human geography.

9. Distinguish between (1) "language group," (2) "nationality," and (3) "State," quoting examples from Europe.

10. Discuss what truth, if any, there is in the statement that the people of European Russia are more Asiatic than European.

PART II

THE REGIONS

CHAPTER VI

THE NORTH SEA LOWLANDS

THE traveller from England to the Continent, crossing the Strait of Dover towards Calais, sees before him the chalk cliffs of France which are the counterpart of the North Downs. As he nears the coast, however, he observes that his boat passes to the east of the chalk country and approaches a low shore which stretches eastward as far as the eye can see.

Calais marks the beginning of a great lowland region, which forms the north-eastern corner of France and extends behind the North Sea through Belgium, Holland and northern Germany, and along the western side of Denmark (see Fig. 30).

With occasional breaks there is a coastal strip of dunes, and this has behind it a belt of natural marsh-lands, much of which is now transformed into polders, interrupted by shallow inlets of the sea. Behind the marsh-lands is a rather higher area, partly sandy country to which the term "geest" is applied, and partly fertile agricultural plains or low plateaus. Near the uplands of central Europe which form the boundary of the lowlands occur coal deposits, and associated with the mining of the coal are important industrial areas (compare the map in Fig. 80 with the section in Fig. 27). Thus the whole of the North Sea Lowlands region is composed of a series of belts running in a general south-west to north-east direction as far as the south-eastern angle of the North Sea; here, in the peninsula of Jutland, the coastal belts change their direction and run from south to north, while the belt of fertile plains is no longer to be observed, but gives place to another type of country near the Baltic Sea. The North Sea Lowlands region has characteristics marking it off from the neighbouring areas, and it may therefore be regarded as one of the sub-regions of the "Developed Lowlands and Wooded Uplands" of Temperate Europe (marked "2" in Fig. 21).

The surface conditions of the region are in the main due to its position on the south-eastern margin of the shallow depression now invaded by the waters of the North Sea. To this depression rivers drain through the North Sea Lowlands from all the surrounding regions: the Schelde (Scheldt or Escaut) and its tributary the Lys from the scarp-lands of northern France; the Meuse (Maas), the Rhine and the Weser from the Central Uplands of Europe; the Elbe from the South-west Baltic Lowlands and the Central Uplands. Consequently these rivers deposit alluvium in the marsh-lands of this lowland. The sea, too, plays its part in the building up of the coast; strong tidal currents drag sand eastwards along the shores, and the prevailing and occasionally stormy westerly winds heap it up to form the belt of dunes.

In the past, however, conditions have been different, particu-

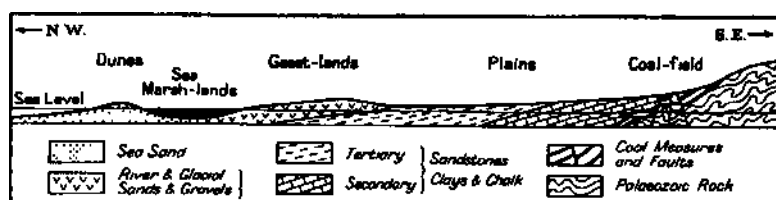


FIG. 27.—DIAGRAMMATIC SECTION THROUGH NORTH SEA LOWLANDS.

larly because of changes in the relative levels of land and sea. During parts of the Secondary and Tertiary Eras, the sea covered much of the region, and beneath its waters were laid down marine clays and sands, and in parts even chalk, which now constitute the fertile interior plains. In the later part of the Tertiary Era, moreover, the rivers accomplished much more work than they do at present: they deeply dissected the uplands to the south, and with the eroded material they built up the huge accumulations of sand and gravel which form much of the geest type of country.

Oscillations of level have characterized also the later geological history of the region. Thus at the close of the Ice Age the land was relatively higher, and the present area of the North Sea was above the sea-level. Since then, however, there has been a general rising of the sea-level, and in early historical times the waters had advanced to the line indicated by the islands and dunes on the outer edge of the present coast. Here

was a continuous line of dunes behind which lay marshes broken only by one great lake in the Zuider Zee hollow. These marshes were gradually drained and occupied by men, but Nature has worked against them: the alluvium tends to consolidate and settle down, and very possibly a relative sinking of the land occurred, and in consequence in the Middle Ages the sea broke in; moreover, wars caused the neglect or destruction of the defences, and altogether some thousands of square miles were lost. In modern times the work of protection has been resumed, and now, in spite of occasional and local floodings, the struggle goes in favour of man.

The position of the region determines its climate, which is broadly similar to that of eastern England, although its continental situation gives it rather colder winters, particularly in its eastern portion (compare the temperature statistics for London and Brussels, given in the table on p. 26). Consequently, the farming possibilities of the North Sea Lowlands are in general like those of eastern England, and differences in production are due largely to soil or economic conditions. We will now consider in turn each type of country constituting this region.

The Dune-lands.—The sand is least in amount in the French and Belgian part of the region, where the available material is mainly that which has been driven through the Strait of Dover, but becomes far more abundant by accumulation towards the east. Moreover, the dunes are highest and broadest where a stretch of north-to-south coast directly faces the westerly winds, as in Holland and in Denmark. The line is, however, broken at areas of relative depression, and channels are kept clear where the currents due to the high tides of the region sweep up and down the entrances to the great rivers.

Where the sand-dunes form a protection against the flooding of the marsh-lands, they have been strengthened by the planting of grass, shrubs or trees and by the construction of groins. Upon the dunes have been built fishing villages and health resorts, e.g. Scheveningen near The Hague in Holland, and Ostend in Belgium; the latter town is also a port with rapid communication across the North Sea to England. Similar ports, but with much more traffic, are Calais, which has the shortest crossing, and Dunkirk (Dunkerque), for these are the French outlets of the industrial area which depends on the coalfield of north-eastern

France. Farther east are " out-ports " at the entrances to the great rivers, e.g. in Holland are Flushing by the *Sehelde*, and the Hook of Holland by the Rhine.

In Germany, the dune-lands are represented only by the Frisian Islands, but in the Danish part of Jutland they again form part of the mainland. Here has been constructed the port of Esbjerg, connected by railway with the east of the country in order to facilitate the rapid transit of its dairy produce, especially to England,

Throughout their extent, the dune-lands are of similar origin and characteristics, and they therefore constitute a distinctive though small region, to which we give the term " tract." It must be observed, however, that this tract is not continuous, as most others are, because it is broken by the waters ; it may therefore be regarded as a " discontinuous tract."

The Marsh-lands.—Behind the line of dunes and islands, the shallows are constantly covered by water only over a relatively small extent. There are other areas, particularly marked behind the various Frisian islands, which are mud-flats at low tide, but water-covered at high tide. These are known as *watten* or *wadden*; they may be regarded as land in the making, and the natural deposition of mud and sand is aided by fences built out from the land, the resultant accumulation being used for summer grazing as soon as it is covered by vegetation.

The Sea-marshes.—Much more work has been required to form the polder-lands. Near the coast are the sea-marshes, which in Holland are even below the mean sea-level, and everywhere are liable to inundation at high tide or in times of storm ; farther inland are the river-marshes, which, though well above sea-level, need protection from flooded streams.

Reclamation of the sea-marshes is still going on. The *Zuider Zee* (the name " South Sea " was given by Frisian fishermen) is now shut off by a dyke across its mouth, and four polders with a total area of about 800 square miles are being formed on its margins, the water area being limited to a central " IJssel Lake " fed by the waters of the IJssel distributary of the Rhine, as shown by the broken lines in Fig. 30.

The utilization of the polder-land varies partly according to the nature of the soils, sometimes clayey and sometimes sandy, and partly according to the traditions of the people or the economic demands of the neighbouring regions. In the small

strip of the French marsh-lands behind Calais and Dunkirk there is intensive cultivation of industrial crops, mainly beet, flax and chicory, which is associated with the manufacture of their products, sugar, linen and chicory ; wheat and barley are also grown. In the Belgian strip similar crops are produced, though cattle-rearing assumes some importance. In the broader polder-land region of Holland, there are again the cereal and industrial crops, but pastoral work predominates, and butter, cheese and milk are the main objects of the farming.



[Netherlands Information Bureau.

FIG. 28.—VIEW NEAR HAARLEM.

Note.—The polder-land has been adapted for the cultivation of bulbs by drainage (note the canal), and by making the clay lighter by mixing sand from the pine-clad dunes shown in the background.

In Holland are two areas of special character. In a narrow strip behind the dunes near Haarlem the sand has been mixed with the muds and clays of the marsh-lands to produce a soil exceptionally well adapted to the cultivation of flowers. The horticultural industry, like several others, began when the Netherlands were one of the foremost maritime peoples of Europe ; tulips, hyacinths and other plants were brought from the East, and centuries of experience and organization have made the growing and export of many kinds of bulbs, flowers, shrubs and fruit an important occupation. The proximity of the port

of Rotterdam, with its rapid communications, has been a significant factor, and now a neighbouring aerodrome offers still quicker facilities for transport.

Farther south, the shelter of the dunes allowed woods to grow in past centuries, and here the counts of Holland had a hunting-box. This became their residence and was called " s'Graven - hage "—"the Counts' Hedge," in its English form, The Hague ; it has now grown into a city of nearly half a million inhabitants, for it is the capital of Holland, and is also the seat of the International Court of Justice.

In Germany the marsh-land again narrows to a belt bordering the coast and the estuaries of the Ems, the Weser and the Elbe, while in Denmark it is not quite continuous but appears as areas surrounding lagoons. (These lagoons are known as Fjords, but like the neighbouring Lim Fjord, they are shallow depressions quite unlike the Fjords of Norway.) In the eastern part of the North Sea marsh-lands cattle rearing is the main occupation, and supports a less dense population than the more intensive farming common in the central and western polder-lands.

The River Marsh-lands.—Although lying above sea-level, these areas are subject to inundation by the rivers ; in some parts they have needed reclamation, but in other parts they require only protection by dykes from occasional floods. These floods generally occur in winter, for most of the rivers have a " regime " in which the flow of water is greatest in the winter season, after the relatively heavy rainfall of autumn and when the run-off into the streams is least reduced by evaporation and the demands of the plant-covering of the land. The Rhine has a more uniform regime than that of the other rivers, for its headwaters come from the Alps, where the melting of the snow in the upper part of its basin provides additional water in summer; consequently, the main stream brings down a summer supply which balances the winter maximum of the tributaries of the middle and lower parts of the basin, which are dependent upon the rainfall.

Parts of the river flood-plains are used for tillage similar to that of the sea-marshes ; elsewhere are long stretches of grassland, absolutely flat with their uniformity broken only by the dykes ; here villages and even houses are rare.

Waterways and Ports.—Much of the importance of the North Sea Lowlands region is due to the rivers which direct into it-

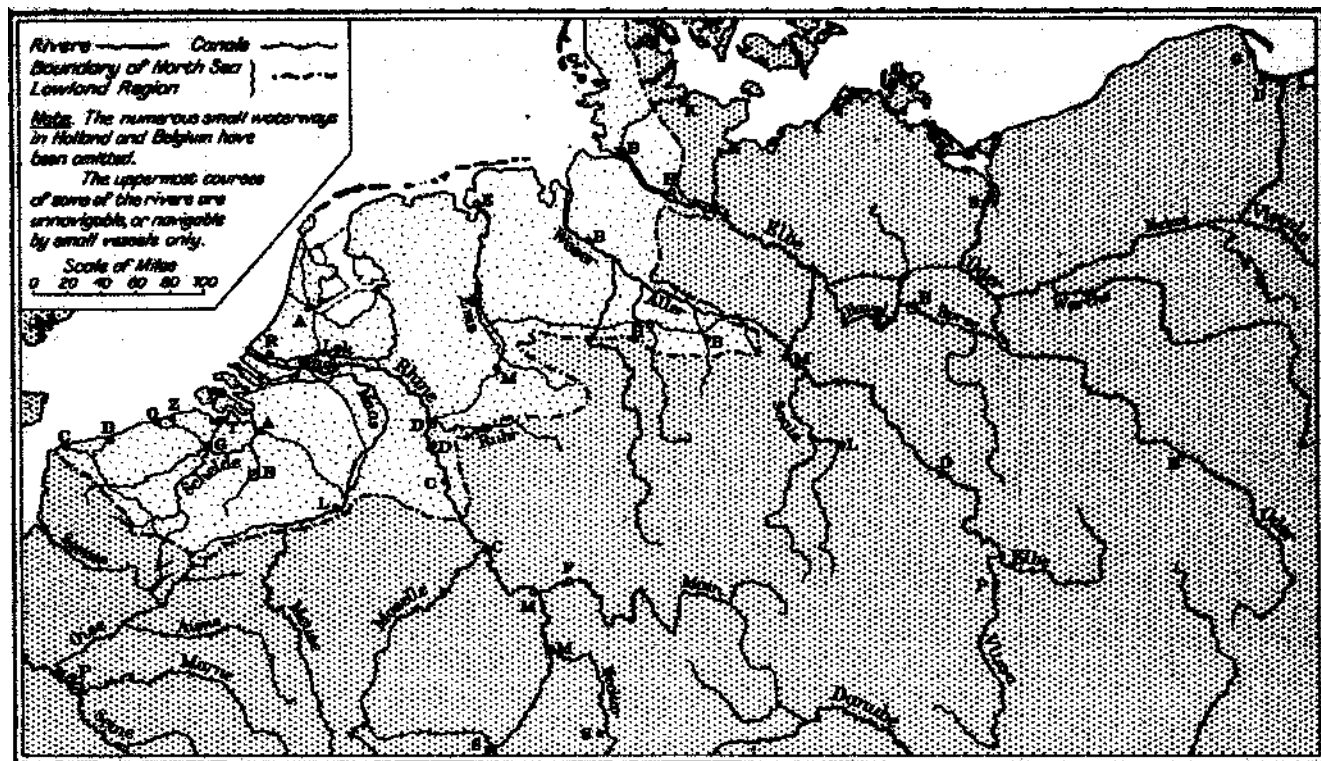


FIG. 29.—WATERWAYS LEADING TO THE NORTH SEA LOWLANDS.

communications from and to a great part of central Europe ; consequently, at or near the mouths of these rivers have grown up several great ports which make the region by far the most important commercial area of the continent of Europe (see Fig. 30). Moreover, most of these ports have been developed at points on the waterways where higher land forming suitable sites for settlement adjoins the marshes ; these sites are mainly at the inner margin of the marshes on the geest lands or the fertile plains, but at the western end of the region they are at the outer margin adjoining the dunes.

The greatest of the ports is Hamburg, on the Elbe estuary, which brings ocean liners 70 miles inland from the North Sea, Fig. 29 shows that while the main stream gives communication with the industrial areas of Saxony and of Bohemia in the Central Uplands region, the Havel tributary leads from the Spree and Berlin ; also a system of canals links the Elbe to the other great rivers of Germany and Poland in the south-west Baltic region. Moreover, a little above Hamburg the Elbe-Trave Canal leads to Liibeck on the Trave, and from Brunsbiittel, near the mouth of the Elbe, the Nord-ostsee (i.e. North-Baltic Sea) Canal leads to Kiel and carries most of the traffic between the various Baltic Sea ports and the outer world.

With such a large hinterland, Hamburg has an amount of trade which makes it rank with London and New York as one of the greatest ports of the world. Its imports consist of all kinds of commodities, while its exports are mainly of manufactured goods ; shipbuilding has developed, and also manufacturing in many forms, particularly the working up of imported materials* Consequently, the conurbation which includes Hamburg and Altona on the north bank of the river, and Harburg on the opposite side, is one of the largest in Germany, and numbers nearly one and a half millions.

Bremen, on the Weser, is nearly as far from the sea as Hamburg ; it is in the river-marsh area, and its trade is chiefly remarkable in that it is the greatest tobacco market in the world ; its population is more than a quarter of a million. At the mouth of the Ems is Emden, but this port is of comparatively little importance, although the river is joined to the Ruhr industrial area by the Dortmund-Ems Canal ; the traffic of the Ruhr region mainly goes by the Rhine to the chief markets and the sources of raw material.

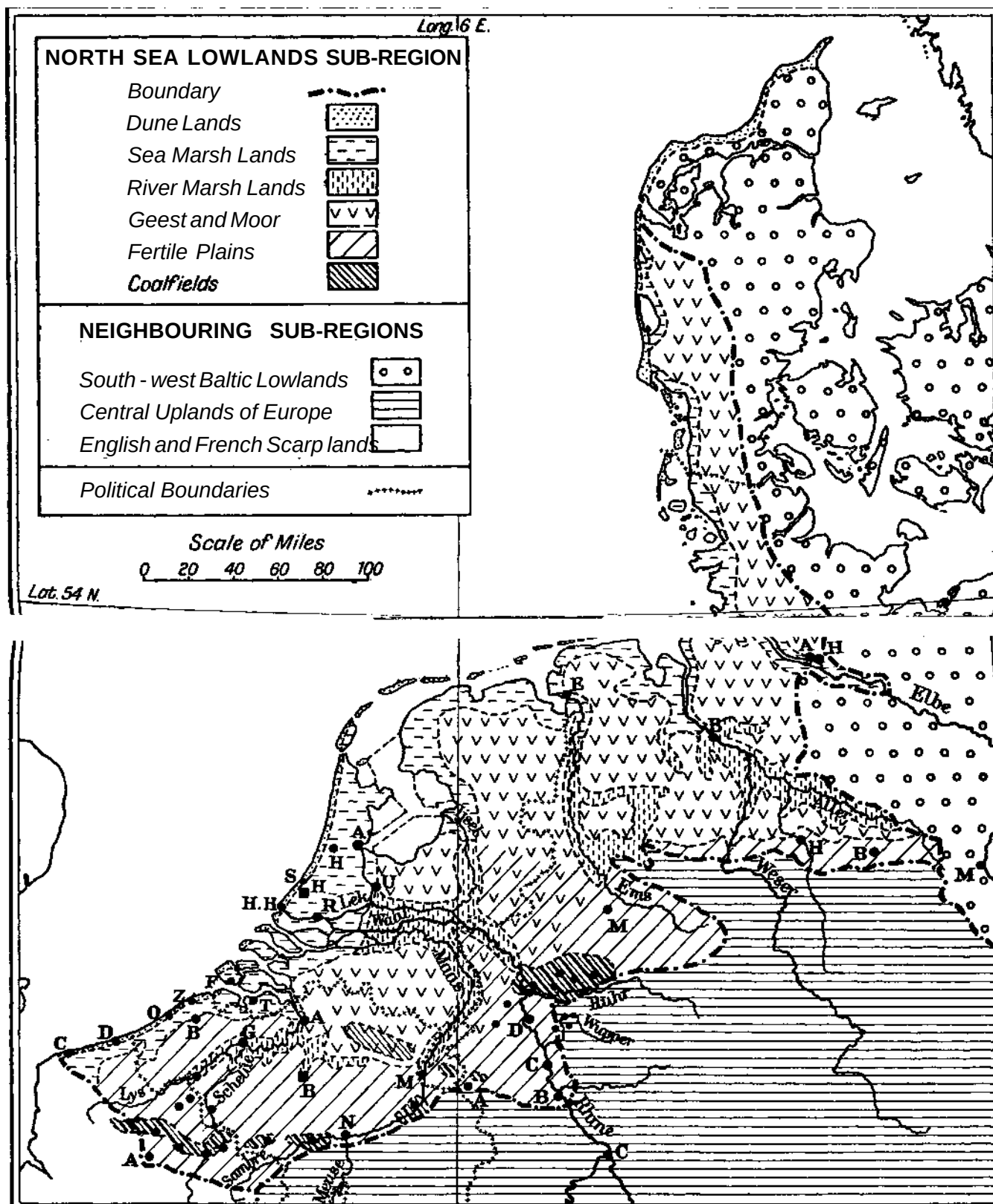


FIG. 30.—REGIONS OF THE NORTH SEA LOWLANDS.

From near the junction of the Dortmund-Ems Canal with the Ems River, another canal leads east near the margin of the North Sea Lowlands (see Fig. 29). This is the Mittelland (Midland) Canal; it crosses the Weser and its navigable sub-tributary, the Leine, on which Hanover stands, and is now continued north of Brunswick to join the Elbe at Magdeburg. By its completion a through route of inland waterways connects eastern Germany and Berlin with the Rhine-lands.

The Rhine is incomparably the most important waterway of Europe. It is navigable for small vessels from Basel downstream, but its great amount of traffic is in the North Sea Lowlands region between the Ruhr and the sea ; while there are river ports of considerable size in German territory, the chief port of transshipment between ocean and inland transport is Rotterdam. This is the one striking exception to the rule that the great ports are on the margins of the marsh-land ; unlike the others it is of recent growth, and became important only when in the latter part of the last century the increase of German trade made it necessary to improve the navigation of the Rhine estuary. Then the " New Waterway " was cut : a deep channel was made from the North Sea at the Hook of Holland, and where the waters of the Waal and Lek were led into this channel at Rotterdam, in the middle of the marsh-lands, great wharfs and basins were constructed, and the port rapidly developed. Of the goods transhipped from sea-going vessels, the greatest amount goes inland up the Rhine, and most of the remainder by the system of canals which forms a network throughout the Netherlands and is without parallel in the world. Railway transport counts for little, one reason being because the traffic consists mainly of heavy and bulky imports, such as iron and other ores and metals for the industrial regions higher up the Rhine and grain for the food-supply of the dense populations of the Netherlands and Germany. With manufactures associated with the imports, particularly for use in Holland, Rotterdam has grown till it has a population of over half a million.

Amsterdam rose to importance centuries ago when the protected waters of the Zuider Zee gave access to the interior of the polder-lands of Holland, but the increasing size of ocean-going vessels made this shallow sea useless ; first the North Holland Canal was constructed through the peninsula to the entrance of the Zuider Zee, and later the North Sea Canal gave a direct

approach available for ships of any size. Thus Amsterdam, although rather off the main lines of communication, has been able to retain a certain amount of ocean traffic, and it affords an example of geographical inertia by the fact that it still remains the chief centre of the organization of the commerce (as distinct from the actual handling of the traffic) and of the financial business of the Netherlands. It also has industries which are traceable to its pre-eminence in trade in the days when Holland was a great colonial power, e.g. cigar making and tobacco preparing, sugar refining and diamond cutting. Moreover, Amsterdam has remained a professional and residential centre, and with more than three-quarters of a million inhabitants it is the largest city in Holland.

The lower Maas is inconvenient for commerce, for being without Alpine tributaries, it is subject to very low water in summer and to floods in winter ; its middle course, however, is connected by a canal in Dutch territory from Maastricht to the Rhine estuary, and in Belgian territory by a canal from Liege to Antwerp on the Schelde (see Fig. 32).

The estuary of this latter river is the entry to a very considerable system of waterways which traverses all parts of Belgium and is joined to the rivers of north-eastern France. Where the Schelde enters the sea-marsh region Antwerp has grown up. This city has a population of more than a quarter of a million ; it is the chief port for Belgian commerce, and its transit trade, mainly for Germany and Switzerland, is of about equal importance. Like Amsterdam, Antwerp has developed industries connected with its import of " colonial " wares. At the junction of the Lys and the Schelde is Ghent, a centre of local trade and small textile manufactures ; from it one canal runs northward to Terneuzen in Dutch territory on the " West Schelde " inlet, and another leads westward to Bruges on the inner edge of the sea-marshes. Bruges was once a port, but its outlet has been silted up, and it is now joined to the sea by canals which cut through the dune belt to Zeebrugge and Ostend.

The canal which runs through French territory roughly parallel with the national boundary shows the influence of political conditions. While the natural waterways would direct traffic from the French coalfield to the Schelde and Antwerp, the desire to keep the trade within France has been an important factor in the construction of the canal which leads to Calais

and Dunkirk; the growth of these ports must therefore be ascribed in part to political causes.

The Geest and Moors.—Behind the tract-group of the Marshlands, extends another and strongly contrasted series of tracts, from near Antwerp north-eastwards to the borders of the Baltic

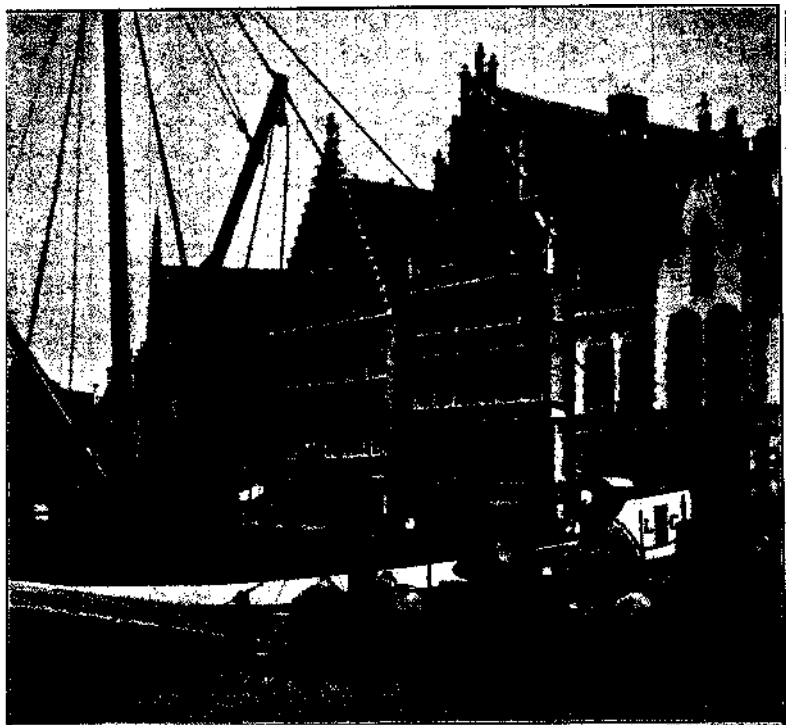


FIG. .31. --VIEW IX GHENT. [Belgian Railways & Marine.]

Note.—The steeply gabled high houses are typical of Flemish-town architecture. The view shows the "Quai aux Herbes," by one of the small waterways, carrying barge traffic, largely used in Belgium and in Holland.

Lands. These areas are in the main wide stretches of heath-land known to the Germans as geest. In the west of the region from near the mouth of the Schelde to about the lower Ems, they have developed upon masses of gravels and sands which were brought down by the Rhine and Maas until the deposits formed a great fan-like plateau. The plateau was highest near the centre of its inner margin, dipping north-westward to the sea (see Fig. 27). Later it was dissected by streams, and great valleys were cut across it. The largest of these valleys are the

two now occupied by the parallel courses of the lower Maas, Waal and Lek and by the Ijssel; consequently, the sandy plateau is divided into three masses : (1) the Campine or Kempenland, which overlaps the boundary of Belgium and Holland within the curve of the Maas ; (2) the Veluwe, between the Lek and the Ijssel; (3) the West Frisian Geest, between the Ijssel and the Ems.

The words " Veluwe " and " Geest " both mean " barren land " and, apart from some woodland on the slopes, the vegetation cover of most of the area consists of coarse grasses and shrubby growths such as heather; the surface is dry and infertile, while in parts the finest sand is blown into small dunes. In other parts iron in the sand has formed a pan of impermeable rock upon which drainage is poor, and moors have developed with marshes, peat bogs and pools of stagnant water.

Reclamation of these lands, for long almost uninhabited, is going on, and " Fen colonies " grow potatoes, beet and some rye and oats. Yet these lands remain scantily populated, and the larger settlements are generally on their margins.

East of the Ems the geest is formed mainly of sands washed away from the morainic material deposited by the ice-sheet which extended from northern Europe, as shown in Fig. 3. The greatest of the moraines are shown on the map, and it is to be observed that they mark out the eastern limit of the North Sea Lowlands region.

Streams brought sandy material from the Baltic morainic areas into the eastern part of the North Sea Lowlands region, where it is widely spread and is the basis of the geest-lands of this part; moreover, among the dry sands occasional sheets of boulder clay play a similar part to that of the iron pans in the western geest-lands and give rise to similar wet moor districts. Reclamation of this type of country has gone on in Germany, but to a less extent than in the Netherlands.

In Jutland, the strong westerly winds have blown the sand from the dune belt inland to combine with that of glacial origin and form a broad belt of dry, infertile country ; the Danes have recently begun to afforest and cultivate the sandy heath-land, but this western part of Denmark remains by far the least valuable part of their country.

In the western part of the geest-land, however, there is another resource which may be developed ; beneath the Campine are

deeply buried coal deposits : a " spur " from the belt of coal-fields of the southern margin of the North Sea Lowlands. The Campine field has a width of about 8 miles and a length of about 40 miles ; working has commenced near the Maas, but whether economic conditions will make a great extension profitable is uncertain.

The Fertile Plains.—To the south of the tract-group of the geest-lands, sedimentary soils of Tertiary and Secondary age emerge from beneath the marshy alluvium and the sandy accumulations (again see Fig. 27), and form plains of relative fertility, while in certain parts this fertility is actually great, due to a superficial deposit of loess.

Owing to the complicated way in which the older rocks of the Central Uplands were faulted, raised and depressed, they project irregularly northward into the lowlands ; consequently, the fertile plains of the latter are in some parts narrow, but in other parts form wide embayments between the upland masses. Thus in the North Sea Lowlands region, four main tracts of generally fertile plains or low plateaus may be observed.

(i) In the easternmost tip of the region is a strip in which the towns of Brunswick and Hanover are situated and which narrows westward where it is crossed by the Weser. This *Loess belt of Hanover and Brunswick* is noted especially for its production of sugar-beet and other industrial crops as well as cereals. Along it run ancient roads and modern railways which skirt the uplands and connect Berlin with the cities of the Netherlands and of northern France.

(ii) *The Westphalian Embayment*, which may be called the Plain of Munster from the town which is its natural centre, is of mixed soils and varied production. On its north-eastern and southern boundaries it is well defined by the edge of the uplands • on its north-western side it passes into an area which gradually becomes more like the geest; in the map of Fig. 30 this area is shown as transitional in its character, by the overlapping markings of both types of country. On the south-west of the Westphalian embayment the agricultural land of the plain is being invaded by the mining of the coalfield of the Ruhr region.

(iii) *The Cologne Embayment* is well defined on its southern and eastern sides, but on the north-west passes into transitional-geest country. The population of the Cologne embayment is great, for its agriculture is intensive, particularly upon a loess

covering in the south, while on the west side of the Rhine near Cologne there are deposits of lignite, or brown coal, a mineral which has been greatly developed in Germany in recent years (see Fig. 32). The Rhine, however, gives the region its greatest significance, for as a waterway it enables sea-going ships to reach Cologne, while its valley provides the most important route between southern and northern Germany and, indeed, between the Mediterranean and northern Europe.

Bonn marks the entry of the Rhine into the lowlands, but Cologne, a Roman "colonia," is a far more important focus of trade, for here the great traffic route which skirts the Central Uplands crosses the river. With industries utilizing both the lignite from the neighbouring deposits and the coal from the Ruhr, Cologne has grown into a city of about three-quarters of a million inhabitants. Farther downstream is Diisseldorf, the river port for the industrial area of Wuppertal immediately to the east in the adjoining upland ; at and about Diisseldorf a population of nearly half a million has congregated. Other centres of industry have developed west of the Rhine, e.g. Munchen-Gladbach and Crefeld, famous for textile production.

(iv) West of the Cologne embayment the fertile belt narrows between the Ardennes area of the uplands and the Campine, and here, near Maastricht, it includes the small southern prolongation of Dutch territory. Beyond the Maas the fertile belt widens to form the *Plains of the Schelde*, a region drained mainly by that river. In central Belgium this forms a low undulating plateau. In this area, again, sedimentary strata have a covering of loess, and there is intensive agriculture yielding wheat and oats, industrial crops, and roots grown as fodder for considerable numbers of cattle. This type of country extends into France.

Farther north, between the Lys and the sea marsh-lands, the plains of Flanders are less productive by nature ; here sandy soils predominate, and arduous toil, involving thorough cultivation and the use of manures, has been necessary to obtain fertility. Cereals are not so widely grown ; moreover, rye is in parts more important than wheat. The predominance of rye over wheat is fairly common on the poorer sandy soils of this section of central Europe, for climatic conditions make both crops possible and the determining factors are the dryness and relative infertility of the soil.

On both the Belgian and the French sides of the political

boundary south of the Lys, a rather scattered form of industrial development has persisted from the days when wool was produced, spun and woven in this region. Other forms of textile manufacture have grown up by "transferred inertia," the traditional skill being adapted first to the working of linen and then to that of cotton. Domestic manufacture still continues, sometimes as a necessary supplement to the scanty earnings of agriculture when winter gives spare time, but most of the work is carried on in a number of towns of moderate size situated to the north of the coalfield: in Belgium are Courtrai and Tournai, and in France are Roubaix and Lille; at these last two towns textile and other machinery is made.

By far the greatest city is Brussels, the capital of Belgium, conveniently situated in the centre of the lowland part of the State. It is at the end of the marsh-land of the Senne, a tributary of the Schelde, and grew up at the head of navigation; now it is connected by canals to the coalfields area to the south, and it has become also a centre of railway communication. As the capital of the country, the seat of much financial business, and the site of manufactures of many kinds, it has grown until its conurbation includes a population of nearly a million persons.

The Coalfields.—Fig. 27 shows in a very simplified manner how Coal Measures, formed in the upper part of the Palaeozoic rocks, have been worn away from the uplands region but outcrop at the surface where this descends to the lowlands, and are buried at increasing depths under the plains. The coal was mined, therefore, first on the inner margin of the lowlands, and the pits were later extended northwards till the deep working became too costly.

The section might suggest that there is a continuous belt of coal-mining all along the edge of the plains, but the geological structure is actually more complicated and the Coal Measures have not been preserved throughout the border of the lowlands; in consequence the coalfields form a series of disconnected patches. The actual mining areas are shown on the maps on Figs. 30 and 32. The most important of the coalfields is in the neighbourhood of the lower Ruhr where the river leaves the uplands to join the Rhine. Here the Ruhr district has become an intensely industrialized region. The industries, like those of the somewhat similar South Pennine coalfields of England, began in the valleys of the adjoining uplands, [where](#) water-power

from the streams was used for an early iron and steel industry which obtained ore and limestone from the uplands and fuel from the forests which clothed their slopes. In some of these valleys geographical inertia has allowed the industries to persist with the aid of the coal from the neighbouring Ruhr field ; thus in the basin of the Wupper, the tributary of the Rhine situated a few miles south of the Ruhr, the towns of Remscheid and Solingen have long been famous for fine steel products, while

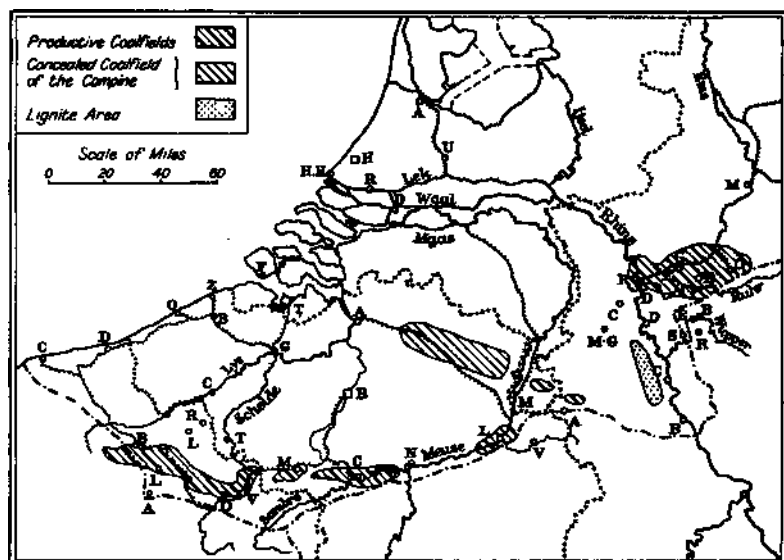


FIG. 32.—COALFIELDS OF THE NORTH SEA LOWLANDS.

a textile industry has persisted, working first wool, and later also cotton and rayon, into many fabrics, notably at Elberfeld and Barmen. These two towns became crowded together into the narrow steep-sided valley of the Wupper above Solingen, and have now been incorporated into one long municipality known as Wuppertal (i.e. Wupperdale) in which nearly half a million people are so packed that the railways have been tunnelled below the houses and elevated above the river and streets.

It is in the plain, however, that the greatest industrial development has occurred. On the Ruhr coalfield a number of towns have grown up, and have so spread that they form an almost unbroken sea of houses north of the river, stretching for about

50 miles eastwards from the Rhine. Where the Ruhr enters the Rhine it is joined by a canal connecting it with the Dortmund-Ems Canal; here a group of river-ports, including Duisburg and Ruhrort, carry on a great traffic in export of coal and import of ore and raw materials, and here are also metallurgical works.

The greatest aggregation of works is at Essen, where, within the municipal boundaries, live two-thirds of a million people, while adjoining it on the east are Gelsenkirchen and Bochum, each of which is about half the size. Several other large towns have sprawled over the coalfield, and the whole region has an unparalleled production of iron and steel goods, among which may be mentioned railway equipment, shipbuilding material, armaments, constructional steelwork, and machinery for manufacturing and agriculture. From the coal are obtained coke and by-products, including tars, dyes and other chemicals. Power stations furnish electricity for the grid system, which, fed also from other centres, distributes power to almost all parts of Germany. Textiles, leather goods and many other commodities are produced, while Dortmund is a centre from which great quantities of coal are sent inland by rail.

West of the Cologne embayment, the coal appears again: a little is mined near the German town Aachen, and also in Dutch territory, where an increasing amount is being obtained east of Maastricht.

The Belgian group of coalfields has a large production. The eastern mining area is in the Meuse valley around Liege, the greatest industrial centre of Belgium; the conurbation has a quarter of a million inhabitants and, owing to an early exploitation of ores of zinc, copper and lead, as well as of iron, metallurgical industries are very varied. In a neighbouring valley of the uplands, at and near Verviers, the manufacture of woollen goods has survived.

West of Namur, the line of the Meuse valley is continued by that of the Sambre, and here around Charleroi is another coal basin and metallurgical industry. Farther west the next outcrop of the Coal Measures occurs north of the river near Mons. Like Charleroi, Mons is itself but a small town, and it is characteristic of these western coal areas of Belgium that much of the mining and the associated work is carried on in groups of numerous small settlements set in rural surroundings.

Just across the French frontier is the last of the series of coal-

fields ; this stretches in a long and narrow belt from near Valenciennes, past Denain, Douai, Lens and Btethune, until its tip ends beneath the chalk sheet of north-eastern France. As in Belgium, there is no large city, but in and around a string of small towns and villages there is a considerable population engaged in the production of coal, coke and chemicals, steel and machinery. A great deal of coal is sent away, much of it northward to the French industrial area or the ports, and the rest southward by water or rail to Paris and elsewhere.

The belt of coalfields of the North Sea Lowlands may be regarded as a discontinuous tract; it supplies by far the greatest part of the coal-supplies of Germany, France and Belgium, and it includes some of the most densely populated areas of these countries.

Thus, with the coalfields of the inner margin and the ports of the outer margin, the North Sea Lowlands is a sub-region with an economic and political importance scarcely equalled in the world.

QUESTIONS

1. Show how the nature of the coastal areas of the North Sea Lowlands has influenced the manner of life of the inhabitants.
2. Show how the rivers of this region have influenced (*a*) the physical conditions, and (*b*) the economic development.
3. Compare and contrast the situation and the functions of three large ports of this region.
4. Write a reasoned geographical account of the Ruhr industrial area.
5. Describe and account for the differences between the farming of various parts of the North Sea Lowlands.
6. State and explain the main facts of the distribution of population in this region.
7. Briefly state how men have transformed three different types of country in the North Sea Lowlands.

SOUTH-WEST BALTIC LOWLANDS

EAST of the North Sea Lowlands is a region which, because of its position, is different as regards its climate, its surface conditions and its relations with other parts of Europe.

Climate and Vegetation.—As was explained in Chapter I I, in summer the temperatures of the lands south of the Baltic Sea are very similar to those south of the North Sea ; but in winter the conditions are more severe. Broadly speaking, the Baltic Lands have a mean January temperature below freezing-point and as one goes eastward still lower temperatures are experienced. As a consequence, the harbours of the Baltic Sea unlike those of the North Sea are normally ice-covered in winter, the period increasing eastwards, e.g. about two months at Stettin and nearly four months at Königsberg; during this period the ports have to be kept open by ice-breakers.

The gradual eastward change to a continental type of climate is also expressed, though less clearly, in the amount and character of the precipitation ; the annual total decreases, mainly due to a lessened amount in the winter half of the year (compare the figures for Brussels, Berlin and Warsaw in the table on p. 26). Moreover, at this season, with the greater cold the precipitation takes the form of snow, and this commonly remains for weeks upon the ground. Yet the sun is often bright, and clear skies are more often enjoyed in the Baltic regions than in the neighbourhood of the North Sea. Because of the above facts the South-West Baltic Lowlands region is included in the " Interior Temperate " climate region.

The natural vegetation shows changes which accord with the shorter period of vegetative growth towards the east. In the region here called the Baltic-Entry Lands the beech is dominant; from the neighbourhood of Lübeck eastward to the lower Vistula the deciduous beech and the evergreen coniferous pines form the " mixed " forest cover; from the lower Vistula to the lower Niemen pines and spruce are the most common trees, but with them are some beech and oak; beyond the

Niemen the length of the winter does not permit the growth of the beech.

The eastern limit of the beech is broadly taken as the boundary of this region, but the precise course of this boundary will be indicated later.

Surface Forms.—The surface conditions of the region are to a large extent determined by the effects of glaciation, e.g. the occurrence of great areas of boulder clay deposited as ground moraine under the ice, broken by great lines of hills formed by the terminal moraines, which have a general east and west direction and are composed of clay, sand and gravel and boulders of all sizes (see Fig. 33).

Beyond the successive margins of the ice-sheet, the water resulting from the melting formed large rivers, which occupied valleys probably existing in some form before the Ice Age ; they are known to German and Polish geologists as "primitive valleys." Along these valleys the great ice-water rivers drained westward, deepening and broadening them, and depositing in them masses of sand and gravel. Now that the ice has gone, the valleys are occupied only by smaller rivers coming from the south, and at a number of places these break through the morainic accumulations northward to reach the Baltic Sea, or in the case of the Elbe to reach the North Sea. Hence the primitive valleys have wide expanses of deposit in which there are either relatively small streams or none at all.

Consequently, in the northern part of the region there are three main types of country : (i) In the *Baltic Entry-lands* behind the line of terminal moraine which almost bisects the Jutish Peninsula is a ground-moraine area in which boulder clay predominates. These lands form the region marked (I) in Fig. 33. (ii) Farther east are the *Baltic Plateaus* (marked II), on which varied morainic material is thickly heaped, (iii) South of this belt is that of the *River Lowlands* (III), where the terminal and ground moraines of the earlier stages of the Ice Age were cut by the waters from the ice in the later stages ; here the primitive valleys are important elements in the geography.

Finally, in the south, beyond the limits of all but the earliest extension of the ice, and therefore where glaciation has had relatively little effect, the underlying rock formations have a greater influence on the geography ; here are the relatively fertile *Interior Plains and Plateaus* (IV). These areas in some

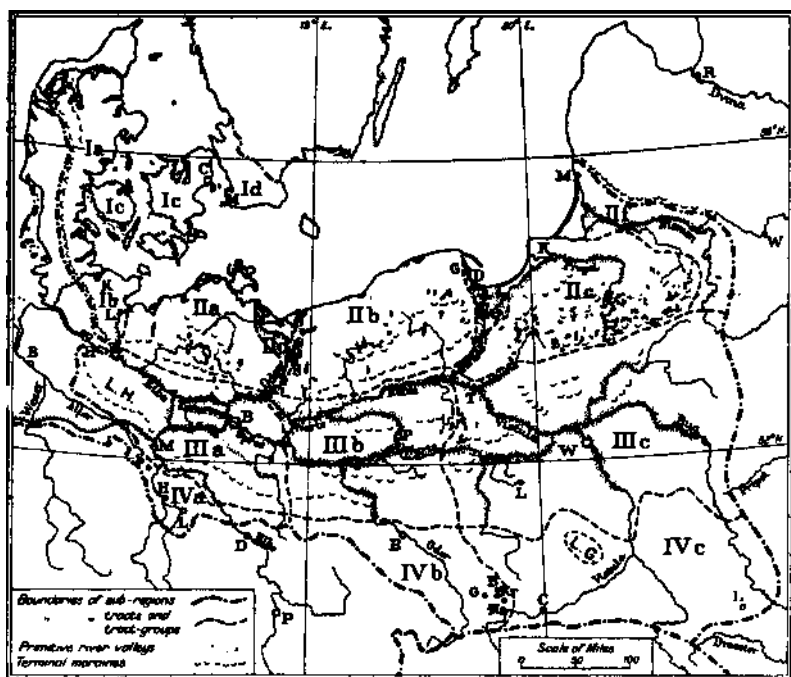


FIG. 33.—REGIONS OF THE SOUTH-WEST BALTIC LOWLANDS.

ways resemble the fertile plains in the south of the North Sea Lowlands. Moreover, adjoining the Central Uplands which form the southern limit of the South-West Baltic Lowlands are some coal deposits, though of less extent than those of the North Sea Lowlands.

The eastern limits of the South-West Baltic Lowlands have been drawn in Fig. 33 as follows : the northern belt of Baltic Plateaus ends where, on the north-eastern side of the lower Niemen valley, a line of terminal moraine (the " Baltic Border-moraine " of Lithuania) marks the beginning of a rather different type of country in the East Baltic area; the River Lowlands belt ends with the basin of the Vistula, beyond which are the great Pripet Marshes of East Poland and Russia ; the Interior Plains and Plateaus end at the water-parting between the Vistula and the Dniester, which drains to the Black Sea. Together these boundaries approximate to the eastern limit of the beech, and so correspond with the change to the Sub-boreal climate region.

The Baltic Entry-lands.—The terminal moraine which almost bisects the Jutish Peninsula forms a narrow belt of hilly country, a few hundred feet above sea-level, mainly covered with beech and oak trees. Behind this, on the eastern side, the boulder-clay country is low, sloping down to inlets of the Baltic Sea, which represent former glacial lakes, now "drowned" by a slight sinking of the whole area, or by an equivalent rising of the sea-level.

This change of level has also changed earlier river valleys into the three Baltic entries which now separate what was previously one area of almost uniform character; hence the present similarity of all these Baltic Entry-lands, marked I in Fig. 33, including Scania, the extreme southern tip of Scandinavia. Throughout the region beech woods alternate with the fields and meadows. The main aim of the farming is the keeping of cattle, pigs and poultry, and the consequent production and export of butter, bacon and eggs. The land is therefore utilized mainly for obtaining grain, roots, clover, grass and hay for the animals and to a much smaller extent for growing crops for human use, especially barley, oats and beet; closely associated with the agricultural production and keeping of animals are small industries of making sugar, brewing beer and dressing leather.

Along the north coast of Jutland the sand-dunes have been drifted as far as the point Skagens Horn, and the northern part of the peninsula is in parts sandy rather than clayey, but apart from this there is much similarity throughout the Baltic Entry-lands. Scania (Id) differs very markedly from the rest of Scandinavia, fundamentally because along its north-eastern boundary are a series of faults which have let down and preserved sedimentary rocks on the south-western side, while crystalline rocks of the Baltic Shield form most of the country on the north-eastern side. How this has influenced the farming is shown by the fact that on the south-western side 80 per cent, of the land is cultivated, while the proportion on the north-eastern side is less than 30 per cent. ; a population map shows a correspondingly sharp contrast. Climatic factors, too, play some part in bringing about the difference, for southern Scandinavia as a whole has the Sub-boreal type of climate, but in Scania the beech can thrive.

In addition to relatively favourable conditions of climate and soil, the Baltic Entry-lands, as the name implies, have a favour-

able commercial situation. This was more important in the past before railways, good roads, and canals diverted traffic from the seas, but there are still several ports at the eastern end of the Baltic. In the German part of the region (marked lb), Ltibeck is an " old-world " town, once the chief seat of the Hanseatic League dominating the trade of the Baltic lands ; it is now eclipsed by Kiel, a naval fortress at the end of the North-Baltic Sea Canal. On the Danish portion of the Jutish



FIG. 34.—VIEW ON THE ISLAND OF FUNEN.

[Danish Tourist Bureau.]

Note.—The ground-moraine landscapes of Eastern Jutland and the Danish Islands have numerous low rises and small hollows, many of the latter being occupied by lakes or ponds ; by the coasts the " drowning " has converted these into small inlets. As in this view, the farms are commonly set among pastures and beech-woods ; in the foreground the foliage of a beech tree can be recognized.

Peninsula (marked la), there are only smaller ports, but on Zealand, the largest of the islands (marked le), is Copenhagen. It is situated on the Sound, the shortest route between the Kattegat and the Baltic, though its growth to a great city of more than three-quarters of a million inhabitants is due largely to the fact that it is the capital of Denmark. In Scania, Malmo is connected by train-ferry with Copenhagen ; it is the chief port of this part of Sweden, and in size is the third town of that State.

The Baltic Plateaus.—East of Lubeck, the Baltic coastlands become on the whole higher and form a series of plateaus

sometimes known by the name of the Baltic Heights, which alternate with low and broad river valleys. The Mecklenburg plateau (IIa) is followed by the Oder Valley, the Pomeranian plateau (IIb) by the Vistula valley, and the East Prussian plateau (Iie) by the Niemen valley. The highest parts of each plateau are covered by terminal moraines, rising to several hundreds of feet. These are to a considerable degree wooded, but as a legacy of the ice the drainage is in general poor, marshy areas abound and there are so many lakes that the regions are often referred to as the "lake plateaus." On the northern slopes, boulder-clay areas provide better soils, and agriculture yields crops of rye and potatoes, but the productivity is never high and decreases towards the east. On the southern slopes, outwash sands from the ice form but poor soils, and woods and pastures give a living to a scanty population. The low river valleys are naturally marshy and liable to flood, but where the alluvial plains are protected by dykes there is fertile ground, on which cereals, sugar-beet and other crops are grown, and animals are pastured.

The coasts vary in conformity with the lands behind them. Projecting from the Mecklenburg plateau are islands with low cliffs, as on Riigen, and parts of the coasts of the other plateaus are also cliff-edged. The valleys end in funnel-shaped estuaries in which the rivers have built deltas; sand drifted from the west has formed spits which almost shut in lagoons and, where the coast faces west, there are high sand-dunes.

These river and sea deposits hamper navigation, which also suffers from the formation of ice in winter, but ports have grown up at the mouths of the largest rivers. By the Oder is Stettin, which has some importance from the trade of Berlin, with which it is connected by canals.

At the end of the Vistula valley are two ports: Danzig is a German settlement which, situated by an old mouth of the river, has for centuries been the outlet for the trade of the Vistula basin; Gdynia, away from the river itself, is a new creation of Poland constructed to give that country an independent port at the end of the "Polish Corridor" which runs between East Prussia and the rest of Germany.

At the mouth of the smaller River Pregel is Konigsberg, a large German city; its development was in part due to trade from Russia, which came here in preference to the more easterly

ports because of the shorter time during which ice prevented navigation.

At the far east of the region is Kaunas (Kovno), the capital of Lithuania, where the Niemen, or Memel, River turns westward, and the port Memel is situated where the river leaves its lagoon.

The River Lowlands.—Not all this region marked **III** is low, for there are lines of terminal moraine forming belts of hilly country ; these are, however, neither so high nor so wooded as those farther north, and frequently form heath-land, e.g. the Liineberg Heath west of the Elbe (marked L.H. in Fig. 33). More extensive are the areas of ground moraine, generally covered by a relatively fertile loamy soil, on which corn, especially rye, sugar-beet and potatoes are grown.

The characteristic areas of the region, however, are the broad, primitive valleys. One series is just within the northern boundary of the region ; with the aid of canals it connects the Vistula above Thorn with the Netze and Warthe tributaries of the Oder, and a short reach of that river with the lower Elbe. The second important line of valleys runs along the middle of the region ; it joins the Bug tributary of the Vistula to the upper Warthe, and this river by the Spree to the Elbe. The Elbe above Magdeburg flows in another glacial valley, but below the town the river breaks off to the north ; its earlier valley is continued westward towards the Aller and is occupied by the new Mittelland Canal.

These and other glacial valleys have facilitated water communication, but they did not easily lend themselves to other use, for they are partly marshy and the natural vegetation-cover is commonly heath on the drier sands and dense thicket in the damper parts. But now considerable areas have been drained and dyked and transformed into fields and meadows.

Of the three areas comprising this River Lowlands region, that drained by the Elbe (marked **IIia**) is particularly important because Berlin has grown up within it. The rulers of the district around Berlin, the " Mark," during several centuries increased their power until they became Kings of Prussia and, at last, Emperors of Germany ; Berlin was the seat of their Government and is now the capital of the German State. Its position in the centre of the waterways is shown on the map, and when railways were constructed they were made to centre upon the city. Its development as an administrative and com-

mercial metropolis aided the establishment of many forms of industry, until it is now the largest manufacturing city of Germany. It is also the chief German centre of education and of many professions. As a consequence it has spread until it occupies an area of over 300 square miles and the city itself has a population of about 4½ million persons; it is thus the greatest city on the continent of Europe. Magdeburg is a large town which owes its growth mainly to its position on the Elbe.

The Oder Lowland (IIlb), has been less developed than the Elbe Lowland; it is a rather sparsely populated rural region, and has smaller towns. The most considerable of these is Poznan, formerly known by its German name, Posen.

In the Vistula Lowland (IIlc), with which part of the upper basin of the Warte is here included, the terminal moraines are less developed, and in addition to the wet river valleys, even the areas of ground moraine have large marshy spaces. There are other districts of woods and heaths, and in general the amount of cultivated land is less than in the more westerly lowlands. In the centre and on the Vistula is Warsaw, the capital of Poland, with about 1½ million inhabitants. The Polish Government, and before that the Russians, aided manufacturing in this region by customs barriers. Consequently, industries which here lack any special natural advantages are carried on in several towns, including Warsaw and the large manufacturing city of Lodz, which has more than half a million inhabitants; metal goods and machinery are made, but the greatest development has been in connexion with textiles, and especially cotton goods.

The Interior Plains and Plateaus.—It has already been suggested that this most southerly belt of the South-West Baltic Lowlands, with its less-marked glaciation and its greater fertility, may be compared with the "Fertile Plains" belt of the North Sea Lowlands.

This is certainly true of the area which is drained to the Elbe, and may be called the *Leipzig or Saxon embayment* (IVa), for it resembles the Cologne embayment in several respects. The sedimentary rocks are covered with loess in the southern part, and the region as a whole has intensive agriculture, in which the growing of industrial crops is important. Moreover, there are great deposits of lignite, extending from near Magdeburg southwards past Stassfurt, Halle and Leipzig, which supply power for local industries. These industries are aided, too, by

the occurrence of common and potassium salts in the districts adjoining Stassfurt and Halle, where there are great chemical works. At Leipzig there are varied manufactures which have grouped themselves around an older commercial settlement; this grew up because here an ancient east-west route avoiding the Saxon Uplands found a convenient crossing-place in the otherwise marshy valley of the River Elster, by which Leipzig stands. The city is also noted as a centre of printing and publishing. It has become one of the most important railway junctions of central Europe, and its population is now about three-quarters of a million people.

Farther east, the broad upper valley of the Oder forms the *Silesian Embayment* (IVb). While the south-eastern part of this hollow is covered with sandy and rather infertile glacial deposits, the lower north-western part has more clay and loess or loamy soils on which industrial and other crops are grown. On the Oder is the large city of Breslau, with over half a million inhabitants—another of the commercial centres which have arisen where land routes which skirt the uplands cross riverways leading to the lowlands and the seas.

At the south-eastern end is the Upper Silesian coal basin, of which part is in the Oder valley, and part drains to the Vistula. Coal is not actually mined in all parts of the basin, but iron, zinc and lead deposits are worked in the area ; as a consequence there are considerable metallurgical industries. The Upper Silesian coalfields are shared by three States, as shown in Figs. 78 and 80. In Germany there is a large industrial population in and around the towns of Beuthen, Hindenburg and Gleiwitz ; in Poland there are three smaller manufacturing areas, one at Krolewska Huta and Katowice, a second at Rybnik, and a third between Teschen (Cieszyn) and Moravska Ostrava ; in Czechoslovakia there is a much smaller district in and adjoining Moravska Ostrava.

The South Polish Plateaus.—This region (IVc), mainly drained by the Vistula, rises from the River Lowlands southward to the Carpathian Mountains. As a whole, it consists of a number of plateau-like areas, but the upper courses of the Vistula and its tributary, the San, flow through lower country, while north of this upper Vistula valley the land rises in the Lysa Gora (marked L.G.) to a height of almost 2,000 feet. This variety in the relief corresponds to a variety in structure, for the greater part of

the region is formed of limestones and other sedimentary strata of Secondary or Tertiary Age, much dissected by the rivers, but faulting of the earth's crust has resulted in the emergence of blocks of more ancient and more resistant rock in the Lysa Gora area. Surface conditions, too, vary considerably, for in parts glacial deposits cover the sedimentary strata, while in some areas, especially in the southern part, there is a thick mantle of loess in which streams have cut canon-like valleys.

With the variation in relief and soils, the fertility and the utilization of the land vary, but in general it is an agricultural region suited to the growth of grains and industrial crops, and noteworthy, as compared with the more northerly Baltic lands, for a relative importance of wheat production. The southern portion of this region forms part of Galicia, which extends also into the Carpathian Mountain region, and the famous salt-mines of Galicia are at Wieliczka, near Cracow (Krakow).

Cracow is situated where the Vistula was crossed by an old route following the northern side of the Carpathians, and another old commercial centre with a somewhat similar position is Lwow, or Lemberg. This latter city, however, is unusual in being situated on no large river; it is on the water-parting between the streams draining to the Baltic on the one hand and to the Black Sea on the other. Its significance is due to the fact that it is near the meeting-point of several natural regions, and therefore at the focus of routes by which products of different character are interchanged.

In this neighbourhood, we reach the limit of Temperate Europe, and therefore return to deal with the lands situated on the Atlantic side of the North Sea Lowlands.

QUESTIONS

1. Compare and contrast the south-west coasts of the Baltic Sea with the south-east coasts of the North Sea.
2. Show how the glaciation of the South-West Baltic Lowlands has influenced land-utilization in that region.
3. Give an account of the inland navigation system of North Germany, with reference to physical conditions and economic developments.
4. Write a systematic account of the geography of Denmark, relating the facts as closely as possible.
5. Make a comparative study of the situation and development of the three capitals : Berlin, Copenhagen, Warsaw.

NORTHERN FRANCE

The North French Lowland.—West of the North Sea Lowlands rises a belt of chalk country which reaches the Strait of Dover in Cap Blanc Nez, the counterpart of the cliffs of Dover. From this cape southward to the Central Plateau of France, and extending from the Central Uplands of Europe in the east to the Breton Peninsula in the west, is the North French Lowland (see Fig. 35). In its build this sub-region resembles the English Lowland: it is formed in the main of low plateaus, which are cut by river valleys, are sometimes edged by escarpments and sink in parts to low basins or marshy plains.

From the geological point of view, the North French Lowland occupies a great hollow known to geologists as the Paris Basin. Within the hollow the land is composed of strata lying one above another upon a platform of ancient rock which rises in the east to form the Ardenne and other parts of the Central Uplands of Europe, and in the west to form the Breton Peninsula, while on the southern side it is upthrust in the Central Plateau (see the section in Fig. 08, and note that the succession of the strata is set out in Appendix I). Broadly speaking, the lower sedimentary layers outcrop near the margins of the basin, while the uppermost ones appear in the central part.

The strata of the North French Lowland, like those of the English Lowland, differ markedly from one another in their composition, and thus give rise to differences in the relief, in the soils and in the utilization of the land; hence the structure largely determines the varying conditions within the region.

The North French Lowland has a more southerly and a more continental position than the English Lowland, and consequently its summers are warmer and its-winters rather colder, as may be seen by comparing the temperature figures for Paris and London in the table on p. 26. There is not much difference in this respect between the districts near the two sides of the Channel, but in the more southerly part of the French region the greater heat in summer becomes more marked and makes pos-

sible the growth of plants, particularly the vine, which cannot ripen their fruit under normal conditions in England. Such differences, allied to traditional differences between the English and French people in the modes of cultivation, lead to considerable contrasts in the appearance of the landscapes and the mode of life of the population in the two countries.

The Ile de France.—The central part of the North French Lowland (marked I in Fig. 35) lies around the capital, Paris, towards which the streams draining the area converge. Here, in past centuries, was the heart of what was then the Kingdom of France, its eastern side being protected by a cliff-like line of escarpments¹ which raised it, island-like, above the surrounding lowland ; hence this central region became known as the " Ile de France."

It is a group of tracts consisting of gently inclined table-lands, rising in the eastern escarpments to about 800 feet above sea-level, and in parts deeply cut by the valleys of the Seine and its tributaries.

The strata of which the lie de France is formed differ in composition, and as they are slightly tilted, they outcrop in various parts of the region and hence lead to differences which mark out the respective tracts. For example, south-west of the Seine is Beauce, which has characteristic features due to the subsoil being a layer of permeable limestone ; the country is a flat, monotonous and rather dry plateau, though a thin, loamy soil allows cultivation of great quantities of wheat. Usually water can be obtained only by boring deep wells ; these are therefore costly and not numerous, and around them the farm-houses are grouped in large villages, whence the treeless fields of the whole community spread out to considerable distances.

Between the Seine and the Marne is situated another wide and generally level tract, Brie, where the subsoil consists of a lower sheet of limestone of a siliceous, " millstone " type and includes clay, which prevents downward drainage. Consequently the surface is often wet, there are groups of trees, and the characteristic occupation is the keeping: of cattle and the production of milk and cheese ; with no difficulty in obtaining water, the farms are conveniently situated within their fields and the population is of the dispersed type.

¹ These escarpments, and also geological faults in other parts of France, are shown in Fig. 86 by symbols which are explained on the map in Fig. 44.

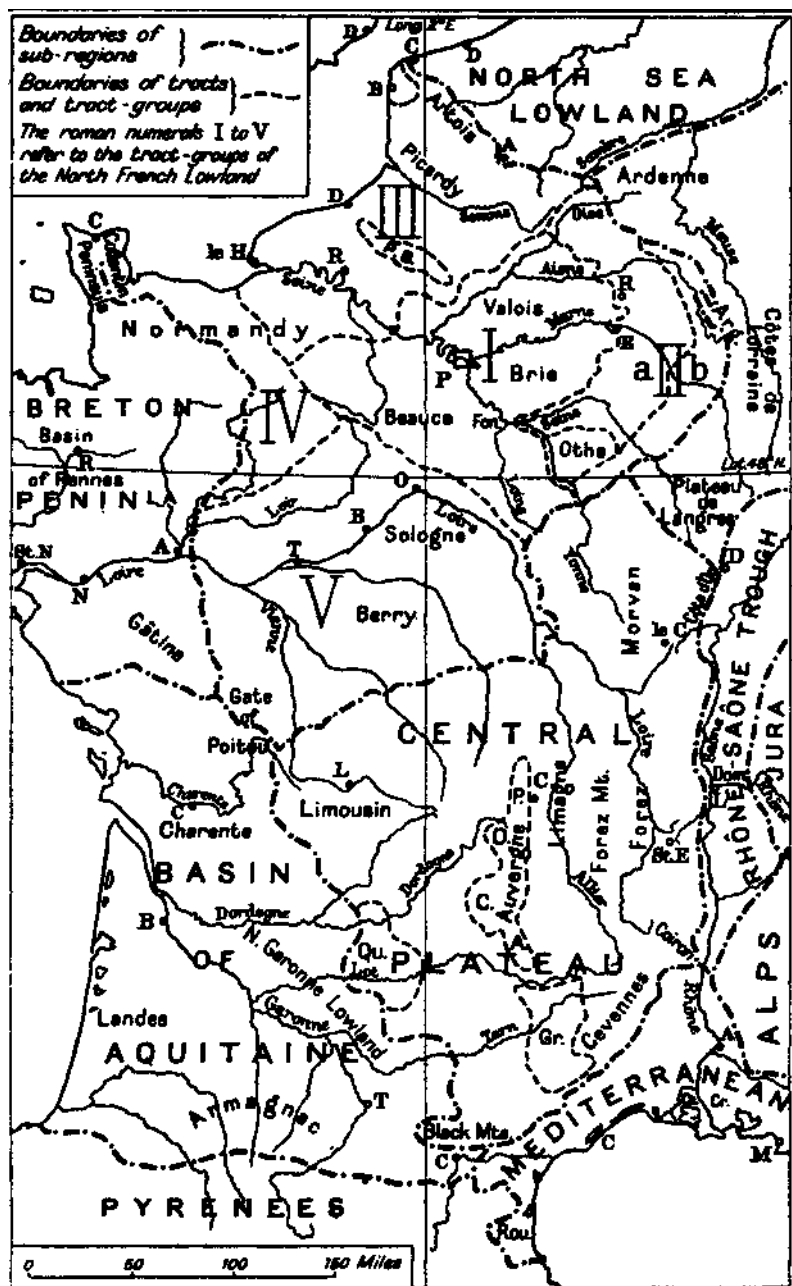


FIG. 35.—REGIONS OF CENTRAL FRANCE.

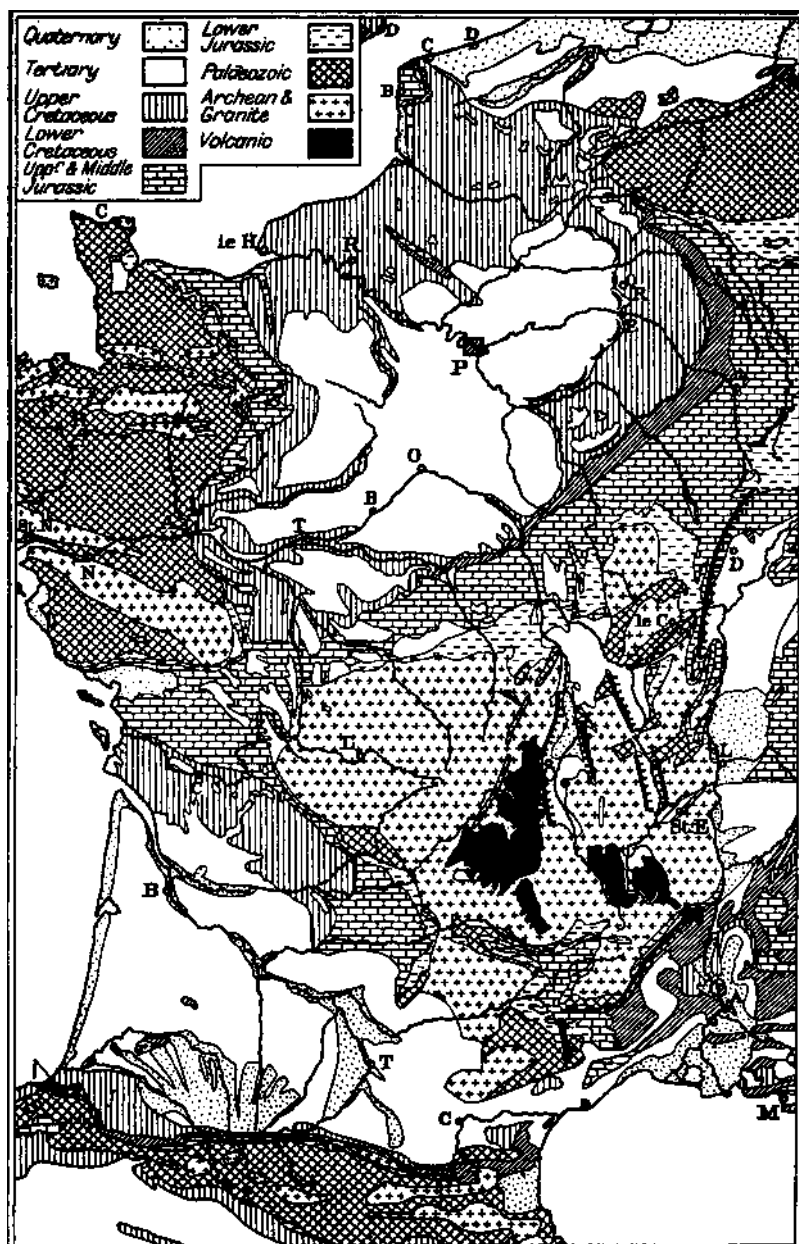


FIG. 36.—STRUCTURE OF CENTRAL FRANCE.

Between the Marne and the Oise is another tract, Valois, distinguished by the occurrence of a still lower stratum of limestone, generally covered with a fertile loam, but there are also patches of sand on which are woods. Elsewhere, too, in the lie de France wooded, sandy or clayey layers outcrop ; e.g. the forest of Fontainebleau (Fon.) is on a sandy stratum situated between the limestones of Beauce and Brie.

The plateaus are separated by broad and often marshy

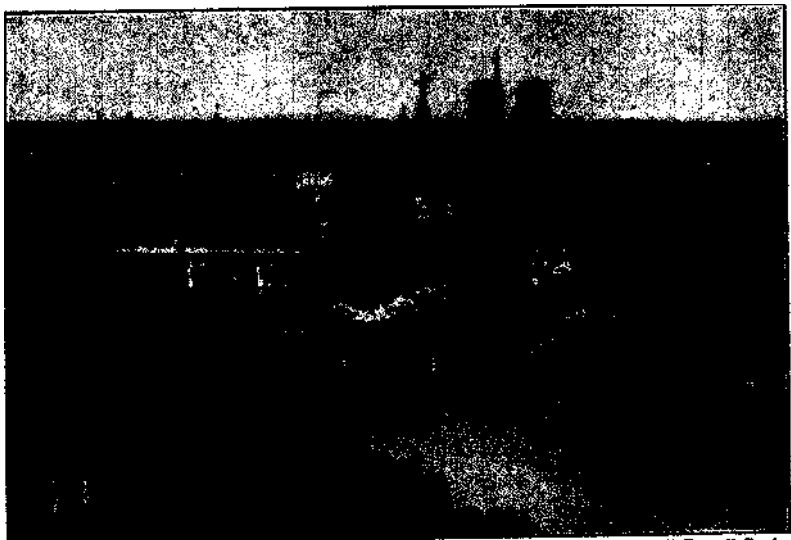


FIG. 37.—VIEW IN PARIS.

"Yoon," Paris.

Note.—The photograph was taken looking up-stream to the island in the Seine, the "He de la Cite," the nucleus of Paris; on the island are to be seen the towers of Notre-Dame. The view shows the shorter bridges spanning the Seine on either side of the island as compared with that across the undivided river; below this bridge are a few of the many barges which load and onload on the quays of Paris.

valleys, and in that of the Seine Paris grew up at a site where an island facilitated the bridging of the river. The position of Paris ensured its future importance : a north—south route here crossed another leading from east to west down the Marne and the lower Seine ; further, its central situation in the He de France early made it the natural seat of the kings of France, and with the development of the French territory it became the capital of the modern State.

As the seat of the Government and at a meeting-place of routes, it became a trading and residential centre, to which new roads were made and railways were built from all parts of France,

and indeed from all western Europe. Also, the River Seine is now navigable between the sea and the capital, and from the neighbourhood of Paris canals complete the natural communications of its tributaries : the Oise is joined to the North Sea Lowlands, the Marne to the Rhine valley, the Yonne to the Saône valley, and the Loing to the Loire valley. With this increase in its commercial significance and with the accompanying growth of its population, Paris was in a most favourable position for manufacturing and for the production of goods of almost all kinds; it is famous for articles of clothing or adornment for which skill and artistic taste are required. Paris is the artistic and intellectual, as well as the political, capital of France, and its great treasury of art, the Louvre, draws visitors from all parts of the world.

Paris now has a population of nearly three million persons, while the whole conurbation of which it is the centre has spread along the neighbouring valleys and on the adjoining plateau areas, absorbing many outlying towns, until the total population exceeds four millions.

The east-facing escarpment of the *He de France* has a peculiar importance, for on its lower slopes limestones with a covering of vegetable humus provide a suitable soil for the vine, and where there is a favourable exposure are the famous vineyards from which champagne wine is obtained. Also the Marne has here cut through the escarpment and formed a wide valley, into the opening of which the champagne vineyards extend. At this opening is the town of Epernay, and some miles to the north, at the foot of the escarpment, is Reims (Rheims); these two towns are the great wine centres of the district. At the base of the escarpment of Tertiary rocks, the chalk of the Upper Cretaceous comes to the surface, and at and near Epernay and Reims it has been hollowed out into great labyrinths of caverns ; here, where the underground temperatures remain even, the wine is matured.

The " Dry " and " Wet " Champagne Regions.—The term champagne as applied to wine comes from the name of the old French province, which included this vine-growing area. The province, however, extended far to the east, where it comprised the greater part of two markedly contrasted geographical regions; these have long borne the names *Champagne pouilleuse* and *Champagne humide*, indicating the beggarly and dry nature of the one **and** the wet condition of the other.

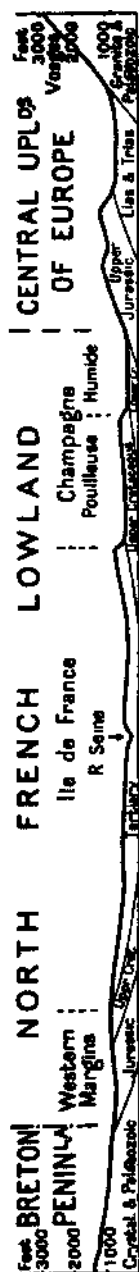


FIG. 38.—SECTION THROUGH NORTHERN FRANCE.

The contrast is due directly to the Secondary strata which rise from below the Tertiary escarpment of the He de France (see the section in Fig. 88). Immediately to the east the Upper Cretaceous chalk comes to the surface, forming at first a low belt of country, but then rising to the bare plateau of the "Dry" Champagne (IIa in Fig. 85); here there is little cultivation, and poor pasture lands on which sheep feed are the chief resource of a small and scattered population. At the northern and southern ends of this chalk plateau, coverings of Tertiary deposits give rise to more wooded landscapes; the southern area, that within the great westerly bend of the Seine, is the Forest of Othe.

Eastwards the chalk forms an escarpment, beneath which outcrop the Lower Cretaceous clays to which the character of the "Wet" Champagne (lib) is due. Although naturally forested and marshy, when drained its soils are capable of producing crops and rich pastures, and now it is a tract of agriculture and cattle rearing. This low Champagne region is bounded eastward by the wooded heights of the Argonne (Arg.) and by the more gradually rising uplands of the C6tes de Lorraine; these may be regarded as the beginning of the Central Uplands of Europe.

The Channel Plateaus.—From beneath the Tertiary layers of the He de France, the chalk emerges northward to form a series of plateaus (III in Fig. 85); these extend to the coast of the Channel, largely in the form of low cliffs, though where the coast faces westward between Dieppe and Boulogne the westerly winds have built up sand-dunes.

At the north-eastern end the chalk is bent up into the "swell" of Artois, which is a lower continuation of the Wealden Uplift of south-eastern England. Adjoining the channel the anticline is sufficiently great for the chalk top to be worn off,

as it has been in the Weald; the underlying strata, among which is a good deal of clay, have been exposed and worn down into a lower area around Boulogne known as the Bas Boulonnais. This low country is a relatively wet, cattle-rearing district, while the surrounding chalk regions of the Haut Boulonnais and the hilly Artois are drier.

This Artois plateau is not, however, poor country like the Champagne pouilleuse, for the chalk is largely covered by deposits of loam or loess with a fertile soil producing much wheat, fodder crops such as clover, colza, from which oil is obtained, and beetroot; after the harvests sheep are turned out to graze on the fields. Continuing the Artois tract to the south-west is Picardy, essentially similar in character; here the folds of the chalk, almost parallel to that of the Wealden-Artois anticline, give rise to an undulating country with the trends running south-east to north-west, and in the same direction the rivers drain to the Channel, the largest being the Somme. On the south-western border of Picardy, one of the anticlines is so marked that the chalk top has been worn away, and the resultant long and narrow Pays de Bray ("P.B." on the map) is a relatively low tract much like the Bas Boulonnais.

South-west of the Pays de Bray the chalk appears again in the low plateaus of Normandy; much of it is covered with "clay with flints," or, south of the lower Seine, with Tertiary deposits, often loamy in composition. While the plateau areas show much open cultivated country, the valleys have more trees and pasture; as a whole, Normandy is a province of varied productions and varied relief. The most marked features of the relief are seen in the valley of the Seine; here the river has been incised deeply into the plateau.

Near the head of the tide on the Seine is Rouen, and here is much interchange of goods from sea-going vessels to inland barges; here, too, was the lowest bridge-place on the river. Now Rouen has a greater amount of traffic than any other port of France. In and around the city are many factories in which cotton and other textiles are manufactured, while there are also other industries in the neighbourhood; Rouen is consequently one of the larger cities of France.

The coasts of the North French Lowland are on the whole not such as to facilitate maritime activities, but the easy crossing to England has given rise to the ferry ports of Boulogne, which

is also an important landing-place for fish, Dieppe and le Havre. The foreign trade of le Havre is very considerable ; it is the outport of Paris and Rouen, specially constructed to accommodate the large vessels which cannot proceed up the Seine ; it imports the cotton for Rouen and the other manufacturing towns of North France, and through it passes much of the foreign produce needed for Paris and for the North French Lowland in general.

In the *Western Margins* of the North French Lowland (marked IV), there is a gradual change to a more diversified region. Here the Cretaceous and Jurassic strata which rise to the surface are not so thick nor have they the same clearly contrasting characteristics as in the east, though limestones, sandstones and clay still bring variety to the country; the strata, however, rise in parts to greater elevations than are found elsewhere in the North French Lowland. Near the coast is the dry limestone plateau of Caen ; elsewhere fields alternate with heaths and woods, and the general appearance of the landscape suggests a transition to the adjoining Breton Peninsula.

The Middle Loire Basin.—The River Loire, between its exit from the Central Plateau and its lower course across the region of the Breton Peninsula, traverses and drains a broad and generally low area which continues the structure of the North French Lowland. This Middle Loire Basin is marked V on the regional map.

Here are all the strata found elsewhere in the North French Lowland region, but they are generally thinner and have narrower outcrops, and also they have been less upraised than in the more northern parts of France ; consequently they do not form wide plateaus, nor have they been etched out into such marked escarpments. Moreover, the Middle Loire Basin includes in the south a part of the belt of Jurassic limestones which, farther east, have been raised to form part of the north-eastern projection of the Central Plateau and also the C&tes de Lorraine (compare the regional and geological maps). Here in the Middle Loire Basin, on the western side of the Loire, the belt is lower and the limestones form the dry plains of Berry.

Although there are not marked differences in the relief of the Middle Loire Basin, its varied structure expresses itself in a diversity of scenery and productions, so that it is difficult to give a short summary of the characteristics of the region from

these points of view. But the generally low altitude and the more southerly situation of this part of the North French Lowland result in relatively high summer temperatures, and of these the people have taken advantage to grow great quantities of vines in the valley of the Loire and its southern tributaries.

Agriculture is the predominant occupation of the region, which as a whole is of moderate fertility. Cereals, especially wheat, are the main product; in addition, fodder for animals is grown, for on the better watered areas cattle are largely kept and sheep in drier parts, such as the open lands of Berry and also in the Soioigne, once marshy but now drained.

In past centuries the basin of the Loire was relatively a more important part of France than it is at present; Orleans at the nearest point to Paris served as a link between the metropolitan region and the centre of France, and from Orleans down the valley there is still to be seen a succession of finely built castles, e.g. at Blois, Tours, Saumur and Angers.

At its south-western end the basin of the Middle Loire narrows to the Gate of Poitou, which leads to south-western France.

The Breton Peninsula.—By comparison with the broad open fields of the North French Lowland, the Breton Peninsula is shady country, with small fields enclosed by hedges and with a good deal of tree growth. The distinction is largely due to the irregular relief of the land and to the abundant surface water, and these characters are themselves the result of the occurrence of older and impermeable rock and the heavier rainfall of the region. Hence the boundary between the North French Lowland and the Breton Peninsula is drawn where the impermeable rocks of Palaeozoic and Archaean age emerge from beneath the sedimentary strata already described, and project westward between the Channel to the north and the Bay of Biscay to the south. Since the greater part of this area formed the old province of Brittany, the name Breton Peninsula is here used, although the region includes the western part of others of the old provinces, notably Normandy and Maine. The peninsular position of the region gives it the equable and rainy climate which marks it out as part of the Atlantic Margins minor region of Temperate Europe. The contrast between the conditions at Brest and at Paris are shown by the figures on p. 26.

Moreover, the structure of the Breton Peninsula, one of the " Hercynian " uplands, distinguishes it from the neighbouring

regions of France and, together with the climate, makes it resemble the Devonian Peninsula of England in many respects.

The plateau was raised a relatively little distance above sea-level, and rivers have etched out the less resistant rocks, leaving the more resistant ones as ridges or bosses of moderate height. The direction of these elevations corresponds with that of the old mountain systems : in the north from west to east, and in the south a tendency to the south-east; consequently the present triangular-shaped region shows, at the Atlantic corner, parallel ranges near the north and south coasts with a narrow low belt between them, while on the continental side of the triangle there is a broader northern upland area forming the heights of Normandy and Maine, then a wide lowland through which the Loire enters the sea, and in the south the Gatine upland trending south-eastward before it disappears under the Gate of Poitou.

Uplands versus Lowlands.—The structure is the main cause of the differences between the uplands and the lowlands of the Breton Peninsula—one of the three great contrasts which the region offers to the observer.

The uplands, both those near the western extremity and those near the eastern margin, reach 1,000 feet and more above sea-level ; frequently they are in the form of long ridges composed of Archaean crystalline rocks, such as gneiss or quartzites, or of resistant sandstones ; in other cases they are broader and more rounded in form and composed of granite. On these rocks poor stony soils have developed, and the wind-swept, rainy uplands generally bear a heath-land type of vegetation ; in parts water collects in the hollows of the impermeable rocks and forms pools, while marsh plants grow in a peaty soil.

Between the uplands the lowlands have been worn down in the less-resistant slates or shales ; here clayey soils have been formed, and though naturally ill-drained and wet and once densely forested with oaks, they have proved capable of utilization. There are meadows on which many cattle are reared, largely for the production of milk and butter ; there are fields in which cereals and vegetables, especially potatoes, are grown ; there are orchards from which large amounts of apples are obtained, and in this part of France cider made from the apples takes the place of wine. The most extensive lowland area is the "Basin of Rennes," in the centre of the region, situated between

the generally higher elevations of the western extremity and the eastern margins.

The mineral resources of the region are very small, and apart from some iron in the north-east margin in Normandy, the chief products are granites and slates, quarried where they can be transported easily by water.

East versus West.—Because of the triangular shape of the Breton Peninsula, the narrow and projecting west is much more exposed to the influence of the sea than the broader east which adjoins the North French Lowland ; the former is wetter and more wind-swept, although more equable, while the latter has warmer and drier summers. Moreover, there is a greater extent of the clayey areas in the centre and east, and consequently the more valuable crops of wheat and oats are obtained in these parts, while buckwheat and rye are grown in the west.

Because of its remoteness from the rest of France, the people of the west have been more isolated, and this feature of their lives is increased by the method of farming: the peasants mostly live in scattered houses, surrounded by their patches of arable land, pasture, and vegetable and fruit garden, enclosed by hedges and trees, and connected with the outer world only by a muddy cart-track. Old ways and old ideas tend to persist, and Breton is still widely spoken.

Coast versus Interior.—The Celtic word " Armor " meant the -coastal belt, in opposition to " Archoat," the wooded country of the interior, and the life of the region has been greatly affected by the character of the coast itself.

The breaking up of the old massif led to the broad outlines of the present peninsula, but the numerous bays of moderate size are due to more recent changes of sea-level, involving the " drowning " of the earlier valleys ; in the far west the hollow between the northern and southern ridges has been deeply invaded by the sea, and the great bays of Brest and Douarnenez are the result. This irregularity of the coast has been accentuated by the wearing action of the stormy seas, which have fretted the shores, wearing them back into cliffs and detaching the outstanding parts of headlands to form rocky islets.

Such a coast, although at times dangerous to shipping, gives abundant harbourage, and fishing and trading have been encouraged. From the north coast fishermen go as far away as the Newfoundland and Iceland cod fisheries, and on the south

side tunny fishing and more especially sardine fishing is important ; everywhere there are fishing villages, and in the larger centres preserving and canning are important industries.

No other region of France has such a coast, and from the people of the Breton Peninsula a large part of the personnel of the French fleet is recruited ; moreover, Brest, with its position at the entrance to the Channel and its situation in a land-locked harbour with deep water, is a naval station of great importance.

The far west, however, is so remote from the rest of France that it has not an advantageous position for import and export. The north-east and the south-east parts of the coast on the other hand, have more commercial significance. At the end of the Cotentin Peninsula is Cherbourg, which is a port of call for liners from Southampton and the North Sea on their trans-Atlantic passages, as well as a naval station. More important is the trade from the Loire estuary : Nantes is the old-established port of the Loire Basin, situated where roads from either side converged at the lowest bridge-place on the river. When larger vessels were built, Nantes could not be reached by them, and St. Nazaire became its deep-water outpost; still more recently, engineering works have forced the waters of the Loire to scour the channel, and once again Nantes can receive liner traffic. Now both ports share the trade and subsidiary industries, including shipbuilding.

The coastal belt of the Breton Peninsula has another advantage over the interior in that its mild winter climate and its facilities for rapid export have enabled it to develop a great production of early potatoes, cauliflowers, artichokes and peas. Agriculture is helped in yet another way by proximity to the coast, for the soils have been greatly enriched by manures obtained from seaweed gathered at low water, and also from banks of sand formed of shells, which give valuable material for plant food.

With this variety of natural opportunities of getting a living, the population along the Breton coasts is much greater than that in the interior, and indeed is greater than that of most of France, with the exception of the manufacturing areas of the north-east and the districts near the great cities.

(Questions are given at the end of the next chapter.)

SOUTHERN AND CENTRAL FRANCE

The Aquitaine Basin.—The latitude of south-western France accounts for its higher temperatures both in summer and in winter, as compared with those of the Paris region (see the figures for Bordeaux on p. 26), and the direct exposure to the Atlantic winds accounts for heavier rainfall. These conditions make possible a widespread cultivation of maize, which becomes more important than wheat as a cereal crop in the south, and there is a wider extension of vine-growing in the Aquitaine Basin even than in the Middle Loire Basin. On the adjoining Central Plateau and the Pyrenees fall heavy rains, and from these the rivers bring down great quantities of water, particularly to the Garonne, which is in consequence subject to great floods. Moreover, the bottom of the great trough between the two highland areas has been largely filled in with material brought down in the past, and alluvium is still being deposited in the valley of the Garonne and is rapidly filling up the Gironde, the common estuary of the Garonne and the Dordogne. The Garonne is not navigable above Bordeaux, except for small boats, and large liners have to use outports near the mouth of the Gironde if they serve this region at all.

Indeed, in spite of the long coast-line, the natural conditions do not favour maritime activities, for in this angle of the Bay of Biscay the currents sweeping southward have accumulated sand, which has been heaped up by the prevailing westerly winds into an almost continuous belt of high dunes. These are known as the *Great Dunes of Gascony* and are shown on the geological map as among the Quaternary deposits. The belt of sand has enclosed a number of lagoons, all except one now being completely shut off from the sea.

Moreover, behind these coastal barriers is the tract of the *Landes*, consisting of great flat plains of wind-blown sand, below the surface of which iron has cemented the sand into an impermeable pan. The region was therefore a marshy heath-land with innumerable pools ; in these, mosquitoes bred and carried

malaria among the few people who kept sheep on poor pastures.

Now, however, the inland drift of the sand has been checked by planting grasses and trees on the dunes, and the drainage has been improved by breaking through the pan and by cutting dykes ; then, some thousands of square miles were planted with

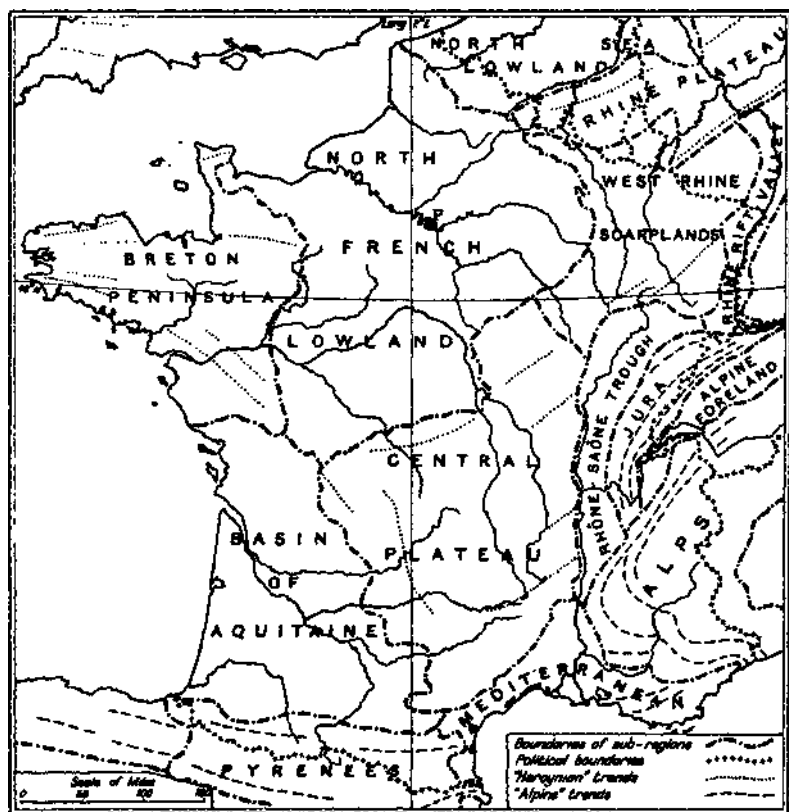


FIG. 39.—REGIONS AND STRUCTURAL TRENDS OF FRANCE.

the maritime pine, which yields timber, resin and turpentine,, while improvements in pasturing have allowed many more sheep and also cattle to be reared on the Landes.

The other tracts of the Aquitaine Basin are much more productive. The country which adjoins the Gate of Poitou is called the *Charente Region*, for it is drained by the River Charente to the Bay of Biscay. The soils are fertile, producing

wheat and maize, and along the whole course of the middle and lower Charente there are vineyards; from the wine a great deal of brandy is obtained—a famous kind is that known as Cognac, from the town in the centre of the district.

The *Garonne Valley* is another important vine-growing region. " Bordeaux wines " is the general name given to the wines made in the lower part of the area, but far up the courses of the river and its tributaries there are also extensive vineyards ; some of the more choice wines are exported, but by far the greatest amount is consumed in the country. In general, the Garonne valley is the most productive and the most populated part of Aquitaine. Wheat and fruit trees are grown throughout the area, and on the wide plains of Toulouse, below that city, maize and early vegetables are important productions ; tobacco is also grown in some parts of the Garonne valley.

Bordeaux is the port of the whole Basin, with about a quarter of a million inhabitants. Toulouse is not quite as large ; it is the trading centre of the upper part of the region, and is a focus of routes up the valleys of the Pyrenees and through the Gate of Carcassonne to the Mediterranean region of France.

Between the Garonne valley and the Central Plateau is a region which may be called the *North Garonne Lowland*. Its characteristic features are due to the subsoil being largely formed by Tertiary deposits known as " mollasse "—sandy and clayey accumulations worn down from the Pyrenees during and after the upraising of those mountains ; it was spread out over almost all the Basin, although now covered by later deposits on the Pyrenean side of the main valley. The region has a rather monotonous appearance, for on the mollasse have developed gently undulating plains, remarkably uniform except for the river valleys that have been cut into them. Wheat and fruit, especially plums, and fodder for cattle, characterize the agriculture.

Between the great curve of the Garonne valley and the Landes is an almost semicircular region rising gradually to the Pyrenees ; the name of the central district, *Armagnac*, may be adopted as a convenient label for the whole region. Here an immense alluvial fan has been formed of material brought down from the mountains : first the mollasse, then later Tertiary gravels, sands and clays, and on top of all Quaternary sediments.

Into this broad " cone " the rivers have cut valleys spreading out fan-like and draining either to the Garonne or to the angle

of the Bay of Biscay. In their upper parts these valleys are deeply cut into the plateau of the higher country where heathlands pasture sheep during their annual passage between wintering on the lowlands and spending the summer in the mountains. In the lower parts the valleys are wider and the climate is warmer and drier; here maize is widely grown, fruit trees and the vine become increasingly important as the region becomes lower, and Armagnac brandy is one of the well-known exports of the district.

Thus the Basin of Aquitaine, taken as a whole, is a sub-region of predominantly agricultural character and of a markedly southerly type; with a lack of mineral wealth and almost shut in by mountains and a difficult coast, it has had very little industrial or commercial development, and in consequence its population is not great and is mainly scattered in isolated farms or in villages and small towns.

Between the Pyrenees and the Central Plateau is the broad Gate of Carcassonne, whose fortified walls and castle still bear witness to its strategic importance in past centuries.

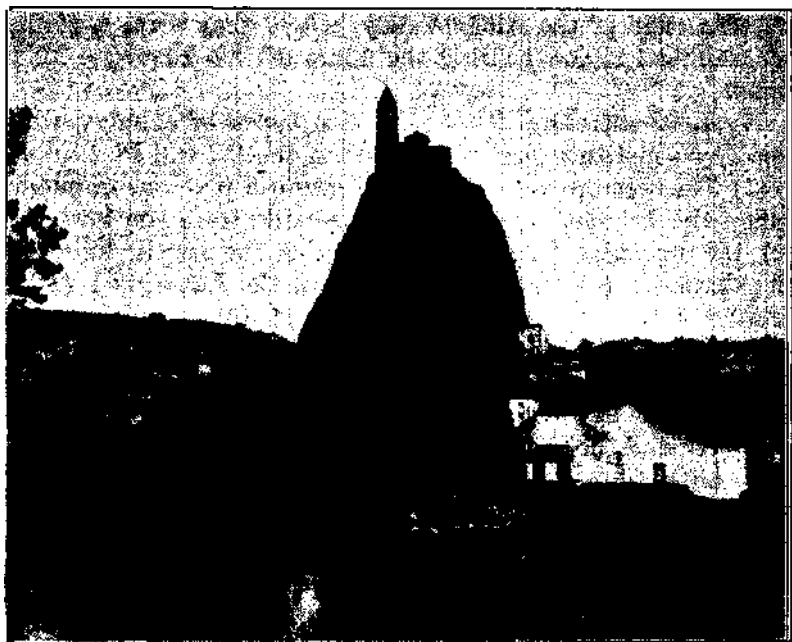
The adjoining region of the Pyrenees has a greater extension in Spain than in France, and will be dealt with in the chapter on the Iberian Peninsula.

The Central Plateau.—Although this region, frequently called the Massif Central by French geographers, appears on a relief map as an upland with few breaks in its continuity, it includes areas of extraordinarily contrasting character. Even where the surface shows little change in altitude, the appearance of the country and the mode of life of the people may change suddenly with the occurrence of a different bed-rock; hence, the geological structure is the key to the geography.

In this Hercynian Upland, the structure is complicated, for the "Armorican" foldings, with a north-west to south-east direction, approach the "Variscan" foldings, which run from south-west to north-east.

Moreover, in the upraised massif of the Central Plateau, marginal areas of Secondary sedimentary strata were incorporated. These areas can be seen by comparing the limits of the region as shown in Fig. 85 with the occurrence of the various strata as shown in Fig. 86; of special interest are the masses of Jurassic limestone in the regions of the south and south-west marked "Gr." and "Qu." on the regional map.

Another most significant feature of the Central Plateau is the existence of many great faults. Of these, one series forms the steep eastern margin of the region where it overlooks the Rhone-Saone trough.¹ Consequently, while in general the Central Plateau rises gradually from the west, its eastern boundary is almost mountain-like, and its high south-eastern edge, reaching about 4,000 or 5,000 feet, is known as the Cevennes.



(French Railways—National Tourist Office.)

FIG. 40.—VIEW AT LE PUY.

Note.—"Puy" is a common name for a summit in the Central Plateau, and it has been adopted as the name of the town "Le Puy" in the volcanic region west of the Upper Loire. North of the town rises the volcanic rock named "Rocher d'Aiguille," shown in the view; it is nearly 300 feet high, and on the top is a chapel built in the tenth century.

Another series of faults has produced two marked valleys in which flow the upper Loire and its tributary the Allier. That of the Allier is called the Limagne; it is a rift valley between faults running in a general north-to-south direction, and in it have been preserved Tertiary deposits and material worn down from the surrounding upland. The corresponding valley of the Loire takes the form of two down-faulted basins, also filled in

¹ In the geological map in Fig. 86 all these faults could not be shown without obscuring other features.

by Tertiary deposits ; the southern is known as the Forez Basin. The narrow upland left between these valleys of the Allier and the Loire is called the Forez Mountains.

Still another important element in the structure of the Central Plateau is associated with these dislocations, for through such cracks volcanic material was forced out and accumulated on the other rocks. In this region such recent volcanic rocks are found in great amount near the head-stream of the Loire, and on the western edge of the Allier Valley, where they form a distinct geographical region bearing the name of the Auvergne Mountains.

We may therefore distinguish five types of country which together constitute the greater part of the Central Plateau.

(1) The western crystalline and granitic plateau, frequently called the Limousin, which rises gradually from the lowlands ; (2) the upraised limestone plateaus of the south, known as the Causses ; (3) the volcanic region of the Auvergne ; (4) the faulted valleys of the Allier and Loire ; (5) the high eastern margin of complicated structure, including the Cevennes in the southern part and certain coalfields in the northern part. To these may be added two projecting spurs, the broad Morvan in the north and the Black Mountain in the south. These regional units differ from one another considerably in structure, altitude and position, and consequently in climate and utilization.

Limousin.—Where this plateau rises from the North French and Aquitaine Lowlands it is about 1,000 feet above sea-level, and it slopes gradually upwards towards a higher eastern part, frequently known as the Plateau de Millevaches, which gains an elevation of nearly 8,000 feet.

The lower western area has an equable, and on the whole warm, climate with a moderate rainfall, and its crystalline rocks have weathered to soils which have been improved by long manuring and by bringing chalk up from the neighbouring lowlands. There are arable lands, on which wheat and buckwheat are grown, but most characteristic are meadows, generally irrigated and cut for hay twice in the year, and plantations of edible chestnut trees. The farming is concerned mainly with cattle-rearing, and the chestnut trees yield both timber and also the nuts which form an important part of the people's food.

On the higher eastern part of the plateau the climate is colder and more cloudy; there are heavy rains and in the winter

frequent snowfalls. On the rounded heights are granitic tors, also hollows filled with waterlogged sands ; heaths abound, and there are woods of oak and beech. There is little cultivation, though some rye is grown, and cattle are bred to be sent to lower areas for fattening and sale.

The settlements in the Limousin are generally small; Limoges, on a tributary of the Loire, is the natural centre and market town of the lower plateau, and at this town are pottery and porcelain works having the advantage of kaolin from granite quarried in the neighbourhood.

The Auvergne.—This region, named after an old French province, consists of four main tracts, all volcanic, but of different origin, appearance and use.

In the north, overlooking the Limagne, is a relatively narrow belt marked P. on the regional map. This is formed of a considerable number of relatively recent cones, known as " Puy " ; the best known is the Puy de Dôme. Though the volcanoes are extinct, their forms are still fairly well preserved, and on some of the lava fertile soils have developed. At their general elevation of nearly 3,000 to 5,000 feet, however, these lands have a comparatively severe climate and the heavy precipitation commonly takes the form of snow. Hence only such hardy crops as potatoes and rye can be produced, and, as on the neighbouring plateau, pastoral work is the main resource of the scanty population.

Farther south the belt widens to the mass of Mont Dore (D.), formed by the eruption of material from many neighbouring vents ; here the volcanic accumulation reaches its greatest elevation, over 6,000 feet. Farther south again is the widest area, the Cantal (C), once a volcano of still greater elevation than the Mont Dore mass, but of older date and now worn down to a rather less height. On these mountains the snow may lie for half the year, but their sides are deeply eroded, and in the lower parts of the valleys there are good soils and abundant water, and here fields, fruit trees and villages are found.

The " tail " of the Auvergne is the Aubrac (A.), an enormous stretch of bleak lava flows, of little value except as a summer pasture for cattle from farther south.

The Allier and Loire Valleys.—The two great head-streams of the Loire system derive their waters from a region where the melting of the winter snows frequently coincides with heavy

rains ; hence they are both subject to enormous floods in spring, in striking contrast with very low water in the usually dry summer. Moreover, at all seasons they are liable to great rises, for upon the surrounding highlands rain-water is not absorbed by the impermeable rocks, but rushes rapidly down the steep slopes into the two great valleys.

In Tertiary times these depressions were occupied by lakes, now drained, and upon the deposits of that period much alluvium has since been spread. The low altitude of the resulting plains, only about 1,000 feet above sea-level, gives them a relatively warm climate which at midsummer may indeed be hot, and the bordering uplands give them shelter. Consequently, where the soils are favourable, they are extremely productive and have attracted relatively dense populations into the heart of the Central Plateau. The Limagne is exceptionally fertile, for the proximity of the volcanic region long ago caused ash to descend upon it, and since then debris of mixed composition has provided material for the development of rich soils. Upon these soils wheat, various fodder crops and sugar-beet are grown, and the numerous villages are almost hidden by great orchards of pear trees, walnut trees and even apricot and peach trees, while vines are grown on the lower slopes of the valley sides.

Towns have grown up, the largest being Clermont-Ferrand on the edge of the valley almost underneath the Puy de Dome ; here have developed manufactures, aided to some extent by a small local coal-supply, but depending almost entirely upon imported material. The central position in France of Clermont-Ferrand would seem largely offset by its situation within highland barriers, but it has risen to considerable importance in connexion with the motor-car industry and there are great rubber factories and also engineering works of various kinds.

The valley of the Loire is less productive, for the crystalline rocks above it have furnished sandy material which renders the Forez and other basins less productive than the Limagne; wheat and potatoes are the chief crops. There is a cotton-spinning industry in the Roanne basin below the Forez, but no industrial development comparable with that of the Allier valley.

The Causses.—The name is derived from an old south French word for limestone, and the permeability of the rocks is the

fundamental factor in the characteristics of the regions. There are two main areas, the Grandes Causses (Gr. on the regional map), situated chiefly in the upper basin of the Tarn, and the Causses of Quercy (Qu.), cut by the middle courses of the Lot and Dordogne.

The Grandes Causses are limestone plateaus at elevations of between 2,500 and 3,500 feet above sea-level; they are separated



[E.N.A.]

FIG. 41.—VIEW ON THE RIVER TARN.

Note.—This shows part of the gorge cut into the limestone of the Grandes Causses. At one place the river-level is more than 1,500 feet below that of the neighbouring plateau. The limestone walls sometimes overhang the stream, where they represent the subterranean tunnels and caverns of an earlier stage of development.

from each other by the deep valleys of the Tarn, its tributaries, and other rivers draining either to the Atlantic or to the Mediterranean. Although the rainfall on these heights is great, the surface is usually dry and rocky; there is little soil except in the hollows or the valleys, and generally vegetation is very sparse and sometimes practically non-existent. The water sinks into the limestone, and collects in cracks, which are widened by solution and corrosion till underground channels

are developed, widening in parts to caverns. In course of time the tunnels become very deep and their roofs may give way; the rivers are then exposed at the bottom of narrow canons in some cases hundreds of feet in depth.

These valleys effectively separate the Causses from each other, and greatly impede communication, which, moreover, is often impossible in the valleys themselves. Surface streams upon the plateau are rare and sometimes suddenly disappear in swallow-holes, perhaps emerging in a canon-like valley far away. Landscapes like that of the Causses are said to be of the " Karst " type, the name being derived from the similar Karst upland near the head of the Adriatic Sea.

With the lack of vegetation, the only considerable resource is the grazing of sheep on the poor pastures, and from the ewes' milk " Roquefort " cheese is made. Conditions of life are hard, especially in times of drought, when water may have to be carried great distances from the larger streams. Necessarily, the population of the Grandes Causses is extremely scanty and, settlements are limited mainly to parts of the valleys where soil has accumulated and water can be obtained.

The Causses of Quercy are essentially similar, but they are of much less elevation, being little more than 1,000 feet above sea-level. Hence the valleys are less deeply cut, and the climate is less extreme ; consequently the pastures are better, life is not so difficult and the population is rather greater.

The Black Mountain and Morvan Spurs.—In the extreme south the Central Plateau almost meets the Pyrenees in the spur of the Black Mountain, a crystalline mass which derived its name from the dark forests still covering it in part.

In the extreme north is the Morvan, whose highest part is of more complicated structure, but of generally similar appearance ; from this it bears the Celtic name Morvan, which meant Dark Mountain. Around this height upraised sedimentary rocks, largely of Lias clay and Jurassic limestone, form a transition both to the North French Lowland and also to the Plateau of Langres, which continues the high ground to the C6tes de Lorraine and the Central Uplands of Europe.

The Eastern Margins.—Here is an area of great complexity which in one part or another includes all the types of country found in the Central Plateau. In the south the Cevennes, deeply scored by rivers running rapidly to the lower Rh6ne

or the Mediterranean, descend from heights of over 5,000 feet and show a zonal arrangement of vegetation as they reach lower altitudes and have higher temperatures : pastures on the heights give place to beech forest, and this yields to great plantations of chestnut trees before the mountains pass into low foothills and plains of "Mediterranean" character. On the edge of the Cevennes, faulting has let down and preserved the small coal basin of Ales, or AJais, and farther to the north-east a projecting spur of volcanic basalt, the Coiron, brings the plateau close to the Alps.

More important coal basins are found on the Central Plateau between the Loire valley and the Rh6ne-Saone Corridor. The direction of the Variscan folding is shown on the geological map by belts of Palaeozoic rock running from south-west to north-east, and in these are productive Coal Measures ; moreover, the rocks have been worn down into hollows which facilitate communications between the Loire and Rhone river basins. There are three such coalfields, and of these the central one has the advantage of neighbouring iron ore ; here are the great armament and other iron and steel works at le Creusot. The southern one is the basin of St. Etienne ; its valley of over 30 miles in length has been described as a "long and infernal street" in which metallurgical industries of all kinds, glass-making and the manufacture of silk and artificial silk goods are carried on. From this coalfield coal is sent to Lyons, where it is used in power-plants when the water-power upon which they normally depend fails during the dry seasons.

Reviewing the characteristics of the Central Plateau, it will now be realized that its geological history has welded into close proximity very different types of country ; consequently it is not a simple sub-region, like the North French Lowland, in which there is much uniformity, but a composite sub-region with little more than its elevated situation in the heart of France as a common characteristic.

The Rh6ne-Saone Trough.—This great hollow is the result of the Alpine disturbances which produced both the folded ranges of the Jura and the Alps on the eastern side and also the faultings which separate it from the Central Plateau and its continuation, the Plateau of Langres, on the western side. At the northern end of the Sa6ne trough are strata of Secondary age, but the

greater part of the hollow is floored by marls and other Tertiary deposits, and glacial material was brought down in great amount where the Rhone enters from the Alpine highlands.

The soils in the hollow are therefore varied, but where they are fertile the region is very productive, for the climate is favourable to cultivation. Because of the almost enclosed situation of this relatively low region, the temperatures approach the "continental" type, as is shown by the figures given for Lyons on p. 26: the July mean of 70° F. and the annual maximum of 95° F. are markedly high as compared with the January mean of 36° F., and the annual minimum of 10° F.; no other part of north-western Europe shows such extremes. The rain is abundant, due to the proximity of the great highlands.

The northern and central part of the broad Saône valley is a fertile country, with great stretches of wheat and maize, sugar-beet, hops and fodder crops for dairy cattle. Especially productive is the zone at the foot of the western hills, part of which goes by the name of the Cote d'Or; all along these slopes are vineyards and orchards of cherry, peach and other fruit trees. The wines are known by the general name of "Burgundy," from the old province of which this zone formed part.

The area of the Dombes (marked "Dom." on the regional map) in the angle east of the Saône and north of the Rhône is very different, for here the morainic material is spread out in broad, terrace-like formation, and on these levels there are impermeable clays. Consequently there is naturally bad drainage, and this area is the least populated of the whole region.

Farther south the trough narrows to the "Rhône corridor." Here fertility is again considerable, and vineyards stretch along its borders, while besides fields of maize there are great plantations of mulberry trees grown for the food of silk-worms; in this way the agriculture is related to the silk industry carried on in a number of small centres, in addition to the great works in and close to Lyons.

The greater part of the silk required for the industry in Lyons, however, has to be imported from abroad; moreover, though the machines are mainly driven by electricity derived from water-power from the Rhône itself and the neighbouring Alps, the chief advantage for the industry lies in the position of the

city in relation to distant sources of raw material and distant markets for the finished goods. Great quantities of silk are brought from the Mediterranean countries and the Far East through Marseilles ; for the disposal of manufactured silk and other goods, the Saône valley gives relatively easy routes in two directions : the first is north-westward to the Paris Basin and the Channel ports by way of Dijon and the railways over the Plateau of Langres, and the other is north-eastward to the Rhine Lands and the North Sea ports by way of Belfort in the Burgundian Gate between the Vosges and Jura Uplands.

With other routes, such as the St. Etienne valley westward and the Rhône valley eastward, Lyons has a most marked nodal position, and it is not surprising that it has developed into a very important commercial centre. Naturally, to the same city have been attracted a number of other industries, including the production of chemicals and machinery. With its population of over half a million, Lyons is the third city of France.

The River Rhône is practically unnavigable, for the masses of water which it receives from the heavy rains on the surrounding uplands and from the melting snows of the Alps make it liable to floods, which occur at various times in different parts of its middle and lower course, and its current is usually too swift for boats to go upstream; it is the valley, not the river, which is so important for commerce.

Mediterranean France.—The traveller proceeding southward through the Rhone corridor, after passing the narrow gap between the Coiron and the western-most Alpine chains (again see Fig. 35), observes a different landscape, for before reaching Avignon above the Rhône delta, he sees extensive olive-yards as well as vineyards and orchards of fruit trees, and as a striking contrast thorny shrubs with bare, stony soil visible between them. The south-eastern corner of France belongs to a different major natural region of Europe.

Yet as it is on the northern margin of the Mediterranean, its climatic conditions differ somewhat from those farther south (refer to the figures for Marseilles on p. 26). In particular, the winter temperatures are lower than is common for places near the sea-level, and the annual minimum is exceptionally low. This is due to the cold "Mistral" which arises when depressions pass along the Mediterranean basin and draw in,

from the chilled Central Plateau, air which descends the Rh6ne valley in bitter blasts. As a consequence, the growing of oranges and lemons is restricted to such parts as the extreme east of the French coast away from the Rh6ne valley.

The varying conditions of climate, relief, soils and opportunities for trade lead to considerable differences in the areas which together constitute the Mediterranean sub-region of France.

Constituent Areas: (i) *Bas Languedoc*.—The western part of Mediterranean France is formed mainly of the lower part of the old province of Languedoc ; it comprises three tracts : (a) Inland is a hilly area largely formed of limestones, on which there are plantations of vines, olive and mulberry trees, though large parts are poor garrigues used only for winter pasturing of sheep sent up to the Central Plateau in summer, (b) Nearer the sea are alluvial plains devoted, to an unusual extent, to vineyards yielding almost half the total amount of wine of France, though its value is not proportionally so great. Such a " one-crop " form of production has its dangers, and this region has suffered greatly from the phylloxera disease of the vines, and also from periods of low prices for wine, (c) The coast is being straightened by material washed from the Rhone delta by the counter-clockwise currents of the Mediterranean Sea ; dunes enclose brackish lagoons, from the waters of which salt is obtained by evaporation. The old port of Aigues Mortes at the edge of the delta is now inland and Cette (Sete), farther west, has an artificial harbour.

(ii) *The Rhone Valley and Delta*.—The formation of deltas is facilitated by the almost tideless nature of the Mediterranean Sea, and the delta of the Rh6ne occupies a considerable area. Near Aries, the river divides into two branches ; between these is the Camargue, the " wet delta," in which drainage is now making pasturage possible, while to the east is the Crau, the " dry delta/" formed largely of pebbly deposits brought down from the Alps by the Durance. Here irrigation is necessary, and with protection from the Mistral by wind-breaks, there are winter pastures for sheep from the Alps, and some cultivation.

The greatest significance of the lower Rh6ne valley is in affording an easy route connecting northern Europe with the Mediterranean Lands and, behind them, the Far East. This

route has been important for more than 2,000 years ; the towns of the Rh6ne valley, such as Avignon, Nîmes and Arles, still have in their buildings the evidence of Roman occupation : fortresses, arenas, temples and aqueducts, and the great commercial city Marseilles is of even earlier origin, for it began as the site of a Greek colony.

Marseilles is not actually in the Rh6ne valley, but is placed by a bay at the side of the delta which is safe from the silting action of the currents, and the harbour has the advantage of deep water. The bay is open, however, and artificial shelter has had to be provided, while to cope with the traffic a great canal has been tunnelled through the ridge north of the bay into a lagoon adjoining the delta. The Rh6ne itself is not navigable, and only a small canal leads by the side of the river to Arles.

Traffic has therefore to go northward from Marseilles by rail, and the greatest amount of the imports is destined to serve the needs of the people and the industries of the Rh6ne valley itself; most of the trade of Marseilles, indeed, is between south-eastern France and the French Colonial possessions in North Africa and southern Asia. From north-western Europe, however, there is much passenger traffic, which takes advantage of the quick railway route to the Mediterranean as compared with the long sea journey *via* the Bay of Biscay and the Strait of Gibraltar.

Round the port of Marseilles industries have developed, particularly those requiring imported material, such as the making of soap, margarine and chemicals, and the refining of sugar ; the population of Marseilles is now over three-quarters of a million, and it is therefore the second city of France.

(iii) *Basse Provence*.—The old French province, Provence, extended from the Alps down to the rocky coast, and that part which is within Mediterranean France is largely upland. In this easterly part of Mediterranean France, the Alps to the north give more protection from cold winds, and the pleasant, indented coast has proved attractive to visitors seeking warmth and sunshine ; this is the beginning of the Riviera coast, which is further dealt with in the chapter on the Italian lands. The same favourable climatic situation which has led to the growth of large and fashionable resorts such as Nice and Cannes has also favoured a large-scale cultivation of flowers for export and for the making of scent.

In an almost land-locked bay has been established the great arsenal and naval port of Toulon, by which shipbuilding yards have been constructed; its situation on the direct routes between France and her overseas possessions makes it, politically and strategically, an important feature of Mediterranean France.

QUESTIONS ON CHAPTERS VIII AND IX

1. Consider on broad lines the similarities and dissimilarities between the lowlands of South-eastern England and those of North-eastern France.

2. Discuss to what extent the geological structure, apart from other geographical factors, has determined the characteristics of the North French Lowland.

3. Give a reasoned account of the distribution of the main occupations of the people in North-eastern France (including the part in the North Sea Lowlands region).

4. Examine the situations of the larger towns of North-eastern France, and classify these situations in relation to the physical geography.

5. Examine (*a*) the common characteristics, and (*b*) the internal differences, of the Breton Peninsula.

6. "The Breton Peninsula of France resembles the Devonian Peninsula of England." How far is this true?

7. Contrast the lowlands of South-western France with those of North-eastern France, and account for the differences.

8. Write systematic notes on the wheat and wine production of France.

9. State, and briefly describe, the differences in the landscape to be observed on a journey from the Saone valley near Dijon to the Mediterranean Sea.

10. Examine the statement: "The Central Plateau has little more than its elevated position in the heart of France as a common characteristic."

11. Write an essay on the ports of France.

12. Test the truth of the dictum that river basins are not natural units, by reference to the rivers of France.

CHAPTER X

THE CENTRAL UPLANDS

THE complexity of this part of Temperate Europe is due to the "Alpine" disturbances which, north of the Alps themselves, produced (1) the long, upraised belt of the Alpine Foreland; (2) the folded ridges of the Jura; (3) the upthrust Hercynian massifs of the Harz Mountains (marked "H"), the Rhine Plateau

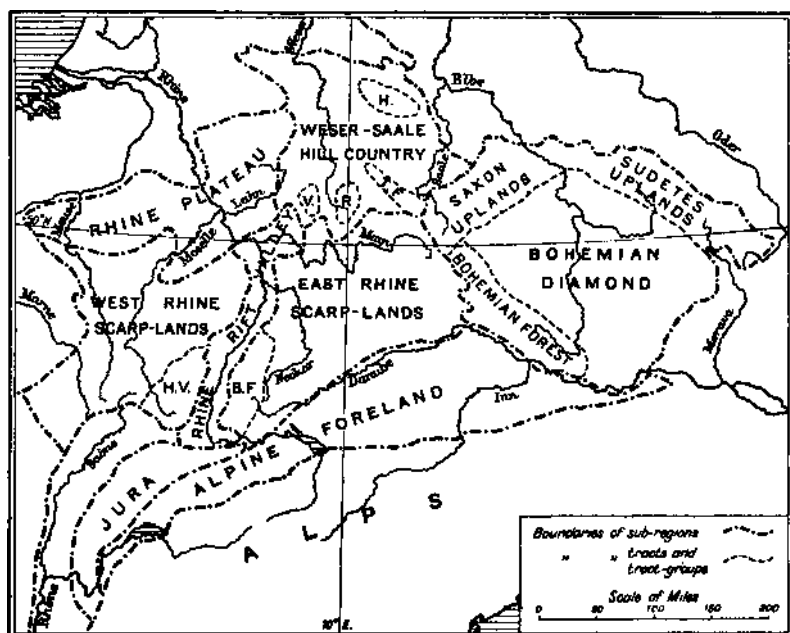


FIG. 42.—REGIONS OF THE CENTRAL UPLANDS OF EUROPE.

through which that river runs between Bingen and Bonn, the Thuringian Forest ("T.F."), the High Vosges, the Black Forest, and the Bohemian "Diamond" and its margins, the Bohemian Forest, the Saxon Uplands and the Sudetes Uplands; (4) the tilted areas of sedimentary strata between the Hercynian fragments, viz. the East Rhine Scarp-lands, the West Rhine Scarp-lands, and the Weser-Saale Hill-country; (5) the sub-

sided Rift-valley of the Rhine; (6) volcanic masses such as the Vogelsberg and the Rhon ("V" and "R").

These structural units, either singly or in a group, form the sub-regions which we will now consider in turn.

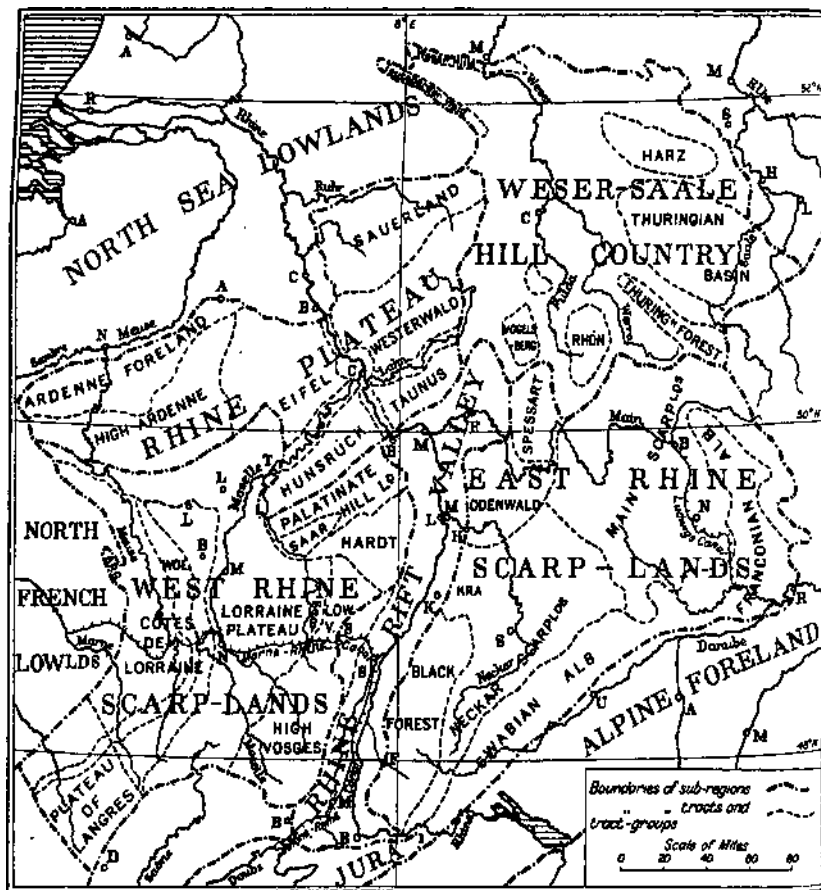


FIG. 43.—REGIONS OF THE RHINE UPLANDS.

Note.—Ludwig's canal is now replaced by the Rhine-Main-Danube canal.

The Rhine Plateau.—This massif is mainly composed of resistant slates, sandstones and quartzites, and in the north of less-resistant limestones, of Palaeozoic Age (refer to Figs. 48 and 44). It has been more or less faulted on all sides, and upraised most markedly on the south-eastern side, where its

gentle meanders, and its tributaries, the Moselle (named Mosel in Germany) on the west and the Lahn on the east, had similar courses. All these streams have continued to cut their valleys into the massif, and their meanders have become incised into the upland. Hence they have very winding courses, and the steep sides of the narrow valleys face in turn towards almost all directions as they overlook the meanders of the rivers.

North of the Moselle and Lahn valleys, the uplands are partly formed of volcanic rock in the Eifel and the Westerwald areas. In the Eifel, a mass of basalt rises to well over 2,000 feet, and there are small volcanic cones and lakes giving variety to scenery which attracts tourists.

Because of its elevation the Rhine Plateau has a markedly different climate from that of the adjoining North Sea Lowlands. The temperatures are lower, the precipitation is greater and the winds are frequently stronger; consequently the winters are severe, heavy snowstorms occur and a snow cover which is commonly some feet deep may last for weeks. The melted snows and rain cannot drain through the impermeable rock of the plateau, and the surface is often wet; many of the wide hollows are marshy or peat bogs. Large areas of the upland and the ridges bear deciduous forests or plantations of conifers, though lower parts of the plateau have been turned into cattle pastures, and some of the land has been ploughed for the hardier cereals, oats and rye, or dug for potatoes, while on the limestone areas of the northern margin even some wheat and beet are cultivated. On the whole, however, the region has not proved remunerative to farming.

In some parts of the north, industries were long ago based upon the occurrence of ores, mainly of iron, worked by fuel from the forests and water from the rapid streams near the edge of the upland. To some extent these industries have survived, importing coal from the adjoining coalfields of Germany and Belgium, but as a whole the plateau areas support few people.

In the deeply cut valleys of the Rhine, Mosel and Lahn, however, conditions are very different. The warmer and sheltered situation allows cultivated fields and rich meadows where the rivers have left fertile deposits beside their meanders, and there are orchards and vines on the slopes which face the sun. The Mosel valley is particularly renowned for the wine which is the main product of that region, and in this and in the

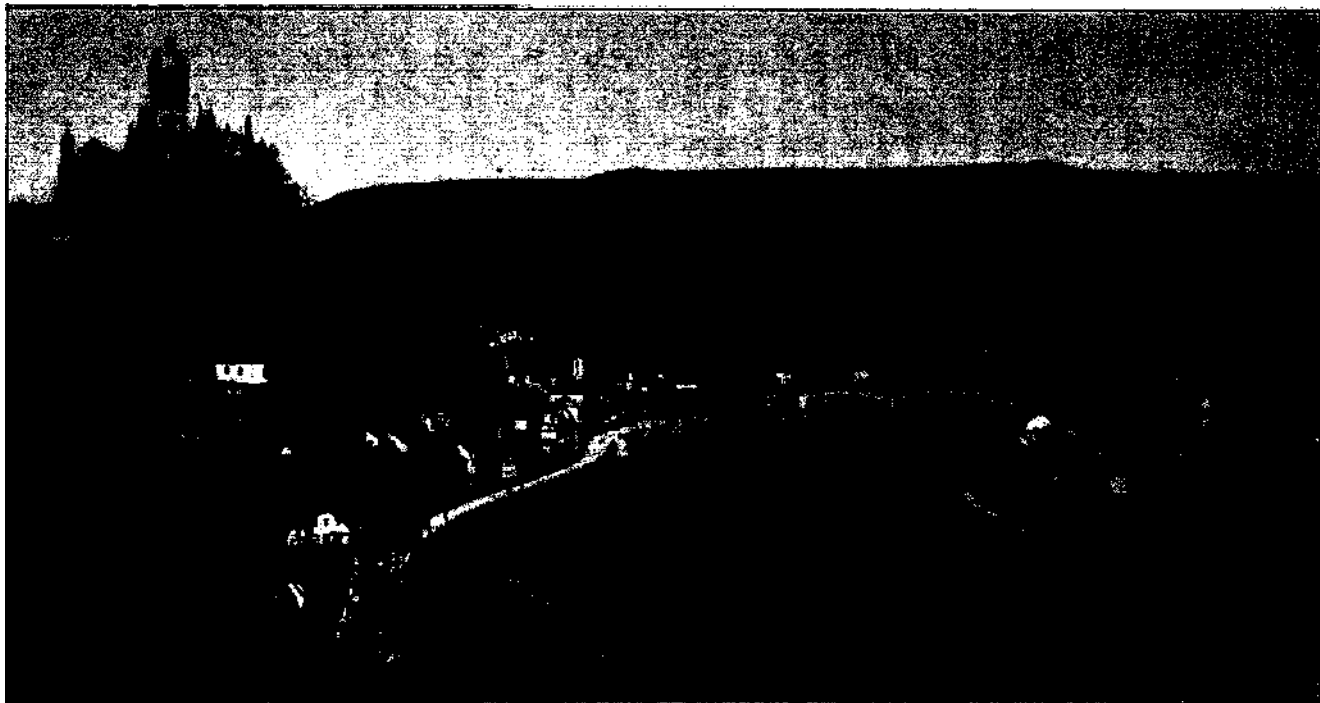


FIG. 45.—VIEW ON THE MOSEL.

German State Railway.

Note.—The flat top of the Rhine plateau is clearly shown ; on the outer side of the incised meander of the Mosel there is practically no lowland, and the road has had to be built up at the river's edge, but on the inner side a small flood-plain has been formed. The castle of Oochem crowns the height remaining between two side valleys; where the larger one (beyond the castle) enters the main valley the town of Cochem has grown up, and the Mosel has been bridged. The view is taken approximately from the south, and the warm south-facing slopes appear light where they have been cleared for vineyards; the darker patches are the woods still remaining on the upper levels, and even on the lower north-facing slopes, as shown on the extreme right. Field cultivation appears only on the small flood-plain area.

other larger valleys **are a** number of small towns depending upon the local trade which uses both the rivers and the roads along their banks.

The Rhine valley is of the greatest importance as a route for commerce, for with this exception the plateau bars the way between north and south. River steamers, railways and motor-cars carry a great deal of traffic through the valley, but there is no large river port in the region ; Coblenz, in a widening of the valley and at the confluence of the Moselle and Rhine, is an ancient town with a famous cathedral, but it has not grown into a great modern commercial city.

The Rhine Rift-valley.—An almost complete contrast to the Rhine Plateau is shown in this down-faulted trough, for it has a drier and sunnier climate, wide areas of fertile land and large cities on or near the river banks. Within the valley itself, differences are mainly due to the various strata which have been relatively recently deposited in the great hollow or on its margins, and we may note four types of constituent areas, working back in our description from those most recently formed to those of earlier origin.

The Flood-plain of the Rhine.—This is shown in the map in Fig. 46 and the section in Fig. 47. It is situated immediately by the river, and would still be subject to inundation were it not for the embanking which, together with the straightening of the stream, has been carried out during the past century.

(i) Above Basel (Bale) the river is too rapid for navigation (though improvements are projected), and has cut a relatively deep and narrow valley. Basel is at the head of navigation on the Rhine and has some trade on that account, but its greatest importance is due to its position at a gap between the upland areas where routes from the north lead towards passes across the Alps. Because of its nodal position it has become one of the main entries to Switzerland, and with a population of about 200,000 people it is the second city of that country.

(ii) Below Basel the river enters the broad valley, and as far as the neighbourhood of Karlsruhe the stream deposits more material than it removes. Enormous amounts of gravels and sands are brought down from the Alps, particularly during great summer floods, and near the stream the water-level is always near the surface, which is therefore frequently wet; even after improvements there remain extensive "moors" and alder-

woods, and the chief use of the flood-plain is for pasture. Strasbourg, a few miles up the 111 tributary, is a centre of inland waterways, for most of the lower Rhine traffic stops here, and between the 111 and the Rhine the Rh6ne-Rhine Canal goes up the valley to cross the watershed west of Basel to southern France ; another waterway, the Marne-Rhine Canal, leaves the 111 at Strasbourg to cross the West Rhine Scarp-lands into northern France.

(iii) North of Karlsruhe the Rhine meanders through a flood-plain which is drier and more capable of utilization than farther up-stream. Moreover, the more regular regime and the greater depth of the river allow navigation of larger boats, traffic is greater and there are busier river-ports. The greatest of these is Mannheim, at the head of navigation for large barges, and here and at Ludwigshaven, its twin-port across the river, are considerable industries; together these cities have a population of nearly 400,000 people.

Where the Rhine turns under the edge of the Taunus, it receives its tributary the Main, and at the junction is Mainz, another river-port and industrial centre.

The Rhine Terrace-lands.—On either side of the flood-plain rise the terrace-lands, formed of older deposits of sands and gravels now situated above 20 feet above the river. They are dry and generally infertile, and in parts there are still great pine-woods. At some points, however, cities have grown up: Mulhouse, in the extreme south where the 111 and the Rh6ne-Rhine Canal enter this region, has important textile industries, and so has Colmar, close to the 111 farther down its course ; between the two towns mines are driven through the surface to reach potash and other salts in the deeper strata of the valley, and the chemicals obtained from these salts aid chemical and dye works connected with the textile industries of the towns.

On the right-bank terrace is Karlsruhe, where a mediaeval castle, guarding routes along and across the valley, aided the growth of a town which has now become a modern commercial and industrial city.

The Foothills and Marginal Plateaus.—Behind these past and present river deposits rise areas formed of sedimentary rock of Tertiary or even older date. The faulting which produced the rift was complicated, and there are large areas which have been let down half-way, as it were, and lie between the lowest parts

EUROPE: THE REGIONS

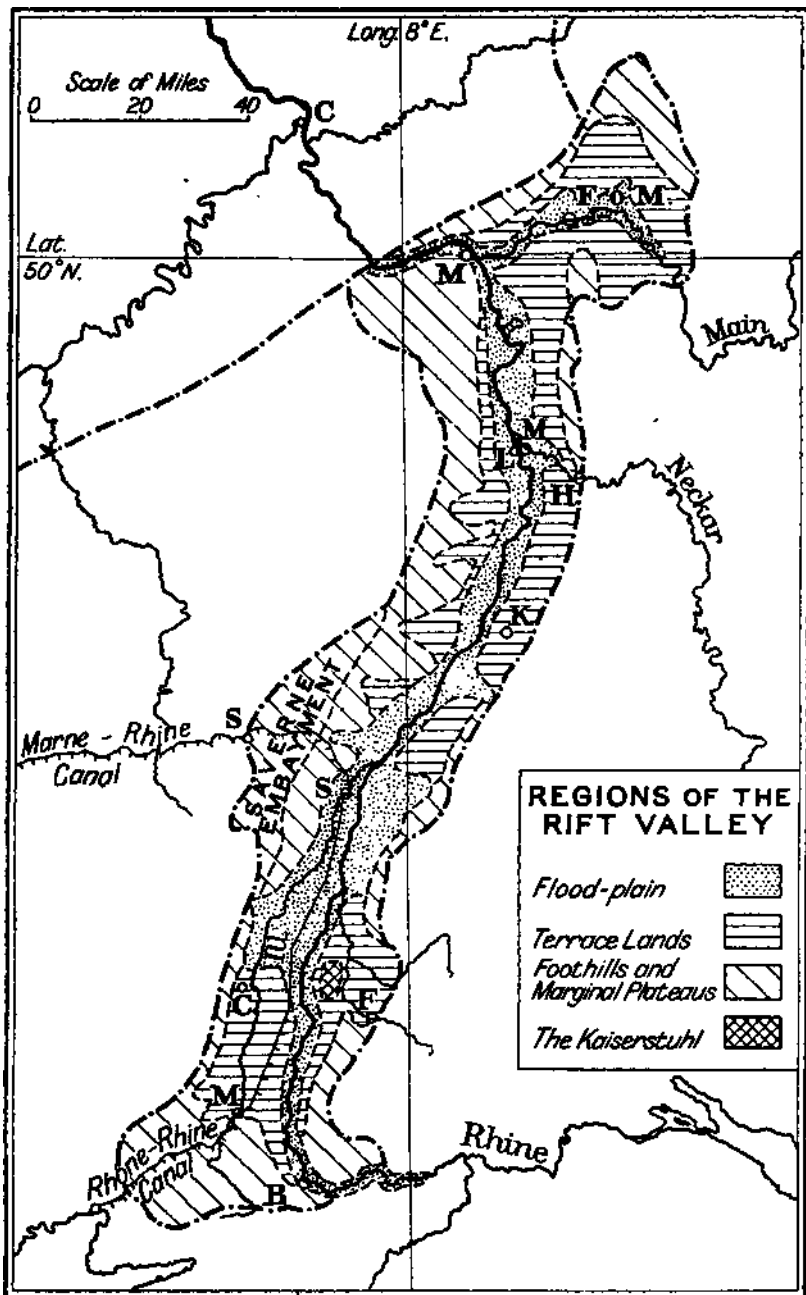


FIG. 46.—REGIONS OF THE RHINE RIFT-VALLEY.

of the valley and the scarp-lands beyond it. Such an area is the Saverne embayment, west of Strasbourg ; it is named after a small town in a side valley through which passes the Marne-Rhine Canal, as well as railway and road.

The Rift-valley in general has a relatively low rainfall and much sunshine, and because of its southerly latitude as well as its low and sheltered position it is the warmest part of central Europe ; its summers may indeed be called hot. Moreover, almost all the foothills and marginal plateau areas were covered with a mantle of loess in the post-glacial period.

Consequently these marginal areas of the Rift-valley are exceptionally fertile. They yield wheat and maize ; fruits, including peaches, apricots and even almonds ; industrial crops of chicory, beet and tobacco ; in addition, there are vineyards

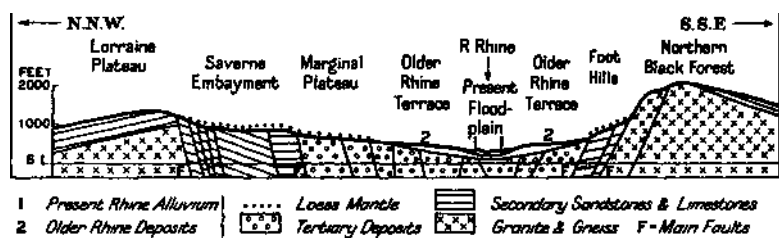


FIG. 47.—SECTION THROUGH THE RHINE RIFT-VALLEY.

which make this the most important wine-producing region of central Europe.

Hence there is a considerable population even in the rural districts, and there are also a number of important cities, particularly where routes enter the valley, e.g. Freiburg and Heidelberg; Frankfurt-on-Main is at an important nodal position at the north-eastern corner of the Rift-valley where traffic from north to south crosses the Main ; it is the chief commercial, financial and industrial centre in the south-west part of Germany.

The Kaiserstuhl.—Overlooking the Rhine near Freiburg stands a small, fairly flat-topped plateau rising about 1,000 feet; it is the remains of a great volcanic mass of Tertiary date, called the Kaiserstuhl—the Emperor's Chair. The lava has weathered to fertile soil, and even the steep slopes are terraced for vines.

Thus the Rhine Rift-valley, as shown in Fig. 21, is a lowland sub-region within the Central Uplands.

East Rhine Scarp-lands.—It appears that as a result of the Alpine thrust towards the north-west the whole area now comprising the Rhine Rift-valley and its bordering East and West Scarp-lands was bent up into a dome-like form, the highest part being over the present site of the Rift, and the strata dipping down on either side.

The central strip of the dome foundered and formed the great valley, but the bordering uplands remained ; their tilted strata on either side are therefore of similar structure and dip away from the Rift in each case. The section in Fig. 48 shows this arrangement, and the broken lines suggest how the layers once continued to join over the central area. As the dome-like uplift was highest over the southern part of the Rift-valley, the bordering scarp-lands are here highest, and here all the sedimentary strata have been worn away, leaving granites and gneiss to form the uplands of the Black Forest and the Vosges Mountains. Farther to the east and west respectively the sandstones and limestones remain, but have been worn into scarp-lands whose steeper sides look inward while the more gentle slopes dip outwards.

The two wings of this formation differ, however, in several respects, and we will first describe the East Rhine Scarp-lands.

The Black Forest—In addition to the main eastward tilt of the strata of the scarp-lands, there has been a downward warping north of the Black Forest, and consequently the granites and gneiss of the highest part of that area dip down beneath a cover of Bunter sandstone which forms the surface of the lower and northern part of the Black Forest.

The granitic masses in the south have weathered into rounded heights, such as the Feldberg, which reaches nearly five thousand feet. The rainfall is, of course, considerable, and as the tree-line is at about 4,000 feet, the highest parts tend to be moors, heaths or rough grazing-grounds ; cattle are sent up to them when the snow melts in May and remain till about October, and the chief product from these summer pastures is cheese.

Lower than these highest parts in the south-west, and covering much of the sandstone area of the rest of the region, are great forests of spruce and fir, to the distant appearance of which the name Black Forest is due. Although in the valleys there

is some cultivation of oats, rye and potatoes, and there has been some plantation of cherry and edible chestnut trees, the main resource of the Black Forest is the timber, either exported as such or used as the material for the carved products of domestic industry or as fuel for glass-making. In summer many tourists visit the region, but on the whole it is very scantily populated.

Odenwald and Spessart—North of the Black Forest, the Bunter sandstone dips down below the limestones and marls which form the surface of the scarp-lands east of Karlsruhe, but it rises again still farther north and north-east; here, because of its relatively greater resistance and granitic outcrops, it forms the uplands of the Odenwald and Spessart. These are rather like the Black Forest on a small scale, but they do not rise above the tree-line, the forest-cover consists mainly of oak and beech and there are wider areas of cultivation, although most of the

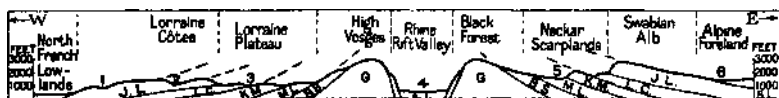


FIG. 48.—SECTION THROUGH RHINE SCARP-LANDS.

Note.—The section is drawn from west to east, south of the latitude of Strasbourg, to Tülm on the Danube. The figures 1, 2, 3, 4, 5 and 6, indicate the valleys of the Marne, Meuse, Mosel, Rhine, Neckar and Danube. The strata are indicated by the following initials: A.T. = Alluvium and Tertiary deposits in the Rhine valley; J.L. = Jurassic Limestone with interbedded Clays; L.O. = Lias Olays with some Limestones, etc.; K.M. = Keuper Marls and Sands; M.L. = Muschelkalk Limestone; B.S. = Bunter Sandstones; G. = Granite, Gneiss, etc., of the Vosges and Black Forest.

country is mainly dependent upon forestry. They are essentially one region, though separated by the valley of the Main, which cuts right across the upland, while the Neckar similarly cuts through the southern part of the Odenwald,

The Neckar-Main Scarp-lands.—The upper courses of these rivers drain country which they have etched out of the layers of Muschelkalk limestone, Keuper sandstones and marls, and Lias clays, marls and weak limestones. In general, the marls and limestones have been worn down to plateaus at an elevation of about 1,000 feet, above which the more resistant sandstones stand with scarps rising another 500 or 700 feet. The climate varies according to altitude, and the lower lands grow wheat and fruit, even the vine in the valleys; in the inner part of the Main basin the best hops in the world are claimed to grow. The higher sandstone scarp-lands, however, are less fertile; they bear extensive woodlands with both deciduous and coniferous trees.

The Swabian and Franconian Alb.—The easternmost part of the scarp-lands is formed by the massive strata of resistant Jurassic limestone which overlook the Neckar-Main area from heights reaching over 8,000 feet above sea-level in the western or Swabian part and rather less in the eastern or Franconian part. The word "Alb" has the same meaning as "Alp," i.e. summer pasture, and the higher parts of this region, bare and bleak, still deserve the name, though where the region is lower towards the Danube farming is more remunerative. Yet as a whole this region is relatively unproductive, and the population is scanty.

In the north, the Franconian Alb is faulted down eastward, and between it and the Bohemian Massif is an extension of the Main region.

Routes and Cities.—The lower parts of the Neckar-Main Scarp-lands have a considerable population dependent upon agriculture, and there are several large cities on routes which lead through the region. One such line of communication cuts across the south-west portion from Karlsruhe in the Rift-valley, through the Kraichgau ("Kra." in Fig. 43), the hollow between the Black Forest and Odenwald, crosses the Neckar by Stuttgart and continues towards Ulm, the head of navigation on the Danube; Stuttgart is now a city of over 400,000 inhabitants.

The other important route is in the east of the region: it comes from northern Germany by the head-streams of the Weser to the upper course of the Main, which it crosses at Bamberg. Then it proceeds southwards underneath the heights of the Franconian Alb as far as Nurnberg (Nuremberg), and thence three routes diverge. One goes south-east by a small valley through the escarpment to the Danube above Regensburg, and by this route the small "Ludwig's Canal" joined the Main system to the Danubian system of waterways; its course is now followed by the new and important Rhine-Main-Danube Canal, which allows through traffic by water across the whole of Germany from the north-west to the south-east.

Two other routes lead more directly southward from Nuremberg through valleys of the Alb, to cross the Danube to Munich and Augsburg respectively; thence they enter the Alpine region, make use of the Brenner Pass, and so reach Venice and the Mediterranean. From the time when traffic used these routes

to bring spices, silks and precious stones and metals from the East, the cities on these roads have been famous ; in Nuremberg is found some of the finest architecture of the Middle Ages, together with modern business houses and factories, for it is now an industrial centre with 400,000 people.

The West Rhine Scarp-lands.—This sub-region differs from its eastern counterpart in two important respects. In the first place, it is farther from the Alps, and consequently the Jurassic limestone strata have not been uplifted to any great height; indeed, they dip westward into the great structural basin centred upon Paris.

In the second place, the build is complicated where the region impinges upon the southern tip of the Rhine Plateau ; here, overlooked by the Hunsrück, is an area which makes a transition between the plateau and the scarp-lands. Like the plateau, it is formed by a mass of ancient and relatively resistant rock, but it has not been uplifted to the same extent, and its dissection has resulted in a hilly rather than a high plateau type of country ; it may be called the *Palatinate Hill-land and the Saar Basin*. This region is economically important because in its south-western part, the Saar Basin, are preserved Coal Measures which have given rise to the Saar coalfield. With the aid of this coal, iron ores from the Lorraine deposits farther west are worked and an iron and steel industry has developed.

The remaining parts of the West Rhine Scarp-lands show a broad resemblance to those east of the Rift-valley.

The Vosges Mountains are similar to the Black Forest, particularly in the higher portions, but the east-facing slopes, in Alsace, are relatively dry and sunny and have more cultivation ; also in the lower parts of the valleys, both on this eastern Alsatian side and also on the western, or Lorraine side, are villages and small towns where a small, old-established woollen and linen industry has persisted and led to a more important cotton industry, aided by the water-power of the rapid streams.

North of the mountainous *High Vosges* is the hollow of the *Low Vosges*, still partly forested, while farther north and north-east rises the *Hardt Upland* corresponding to the Odenwald, though without granitic outcrops.

The *Lorraine Plateau* is situated west of the Vosges, the Hardt and the Saar Basin. Here are the same rocks as in the Neckar-Main Scarp-lands, with Muschelkalk giving good soils for

cereal growing, Keuper marls having rich pastures and Lias clays more difficult to work.

These strata in France, however, are at a generally lower elevation than those in Germany, and have not been worn into such marked relief, though the Lias clays have been cut into a rather deep valley belt by the Moselle and its tributaries, the rivers which drain nearly all the Lorraine Plateau.

This valley belt, cut into the Lias clay by the Moselle, lies under the scarp of the Jurassic limestone region which is situated immediately to the west (see Fig. 44), and at the junction of the Lias and Jurassic strata are rocks in which occur iron ore known as minette. The minette ore is mined around the town of Nancy, in and near the Moselle valley, and iron and steel works have grown up in this neighbourhood.

Farther north, on the edge of the Moselle valley, is the fortress of Metz, important because Lorraine has for long been debatable ground between France and Germany.

The Jurassic limestone region which is situated to the west is perhaps most conveniently termed the *Cotes de Lorraine*, for in the east where it is highest the edges of its scarp overlooking the Moselle are known as the *Cotes de Moselle*, and farther west it is again deeply cut by the Meuse, and the resultant hill-slopes are called the *Cotes de Meuse*; overlooking this Meuse valley is the fortress of Verdun. In the south part of the limestone belt the drainage is not to the Rhine, but to the Seine, whose tributaries, especially the Marne, have also cut deep valleys.

The rainfall is fairly heavy on the higher parts of the limestone plateau, which, like the Ardenne, is on the side of the Central Uplands facing the Atlantic winds. The highest areas are much wooded, while the rest of the plateau is rather poor agricultural-country.

The whole region is not an unbroken plateau, for between the upper and lower limestones are clays which outcrop in a belt running longitudinally; this clay-belt has been worn to a relative hollow, and part of it, known as the Woevre (Woe. in Fig. 43), is naturally marshy and even yet has small lakes.

The minette iron ore which is situated at the base of the Jurassic strata is reached in two districts by mining through the rocks which form the edge of the escarpment; one is in the "Briey basin," north-west of Metz, whence the ore is sent

in part to Germany for working, and the other is in the " Longwy basin " at the northern part of the scarp. Here the Jurassic escarpment faces north and almost coincides with the boundary between France on the one side and Luxembourg and Belgium on the other. The iron ore is utilized in all three countries (see Fig. 79 in Chapter XIX); it is of most value to France and Luxembourg and forms an important part of the basis of the economic life of the latter small State.

The western margin of the limestone belt rises fairly definitely from the clays of the North French Lowland which succeeds it to the west, but in one part there is, as it were, a bastion of uplands projecting from the main area. This is the Argonne Forest region, where an admixture of sand with the clay has enabled the stratum to resist erosion, and wooded heights of about 1,000 feet mark the sharpest contrast between the Central Uplands and the North French Lowland.

South of the Marne the limestone belt rises to an area whose escarpment forms the high Plateau of Langres ; this links the Central Uplands of Europe to the Central Plateau of France.

The Weser-Saale Hill Country.—Most of this area is drained by the upper Weser and its tributaries, and much of the rest by the Saale tributary of the Elbe ; for this reason, and because it is very uneven in its relief, a convenient name is the Weser-Saale Hill Country.

The Harz.—One of the most striking features as seen on a relief map is the upstanding mass of the Harz Mountains. This is a typical horst, markedly fault-edged on the north-west, south-west and north-east sides, though its surface descends more gradually towards the south-east. The " Upper Harz " in the north-west reaches over 3,500 feet and is almost completely covered with dark masses of spruce forest, but the " Lower Harz " in the south-east has deciduous woods and also many clearings for agriculture and small settlements. A little mining of copper is almost the only survival of past varied and important mineral industries.

In the *Harz Foreland*, to the north-east and south-east of the massif, potash salts are obtained, which aid chemical works such as those at Stassfurt situated in the neighbouring lowlands near the Elbe ; also, just within the upland region south of Brunswick, there are deposits of high-grade iron ore which have recently been utilized.

The Thuringian Forest.—Very similar to the Harz is the Thuringian Forest; here the main faults which bound it run in a north-west to south-east direction and give it a long and relatively narrow shape with a fairly flat top, reaching over **3,000** feet.

The Weser Hills and Teutoburger Wald.—Almost the same general direction is shown by the two lines of hill country which project north-westward far into the North Sea Lowlands. They are formed of sedimentary rocks of Secondary Age, folded and faulted, but only to a moderate elevation, and the "Wald" or "Forest" has mostly given place to farming.

The Rhon and Vogelsberg.—In the south of the Weser Hill Country rise two great volcanic masses, the Rhon and the Vogelsberg; since they reach elevations of about 3,000 feet, their higher parts are moorland or forest. Other wooded volcanic heights lie on either side of the Fulda tributary of the Weser.

The Fulda Valley offers a useful means of communication from the Rhine Rift-valley to the North German Plain, and this relatively low and fertile country is rather like that of the valleys of the Main and Neckar.

The Thuringian Basin.—Farther east, between the Harz and the Thuringian Forest, is an important area, drained by the Saale. It is formed of the same strata as the Rhine Scarp-lands, bent downward into a syncline forming an oval-shaped basin between the surrounding heights. The outcropping strata have been etched out by the tributaries of the Saale to form a series of low scarps, and the basin as a whole resembles the Neckar-Main Scarp-lands on a smaller scale; it is a well-developed region of productive agriculture.

The Bohemian Massif.—The area drained mainly by the upper Elbe river system may be thought of as largely formed of ancient rock, including granite, gneiss and schists, faulted in two main directions: south-east to north-west, and south-west to north-east (see Fig. 50). Along the faults, blocks have been raised or lowered to produce four main regions:

(i) A central area, sometimes known as the "Bohemian Diamond," of moderate elevation on its south-east side, but lowered towards the north; here it is bounded by the uplifted edges of (ii) the Sudetes Uplands on the north-east, and (iii) the Saxon Uplands on the north-west, while another faulted and

raised area, (iv) the Bohemian and Bavarian Forest Uplands, is the boundary on the south-west.¹

The Bohemian Diamond.—The southern part of this central region is a plateau of resistant rock ; undulating country rises to rounded heights, where it forms the water-parting (shown by a dotted line on the regional map) between the Elbe (known in Czechoslovakia as the Labe), which drains Bohemia, and the Morava, which flows southward to the Danube and drains Moravia.

Most of this Bohemian-Moravian Plateau area is drained by the Vltava tributary of the Labe ; it has generally rather poor soils and its agriculture is not very productive. The main development is in the neighbourhood of the River Berounka, which enters the Vltava just above Prague (Praha), the capital of Czechoslovakia. Here the folding of the carboniferous strata has preserved Coal Measures which are mined in several places from near Pilsen (Plzen) to near Prague, and iron and graphite are also obtained in the neighbourhood. Aided by these mineral resources, industries have grown up : at Pilsen iron and steel goods, glass and pottery are produced, and beer is brewed, and at Prague the range of productions includes these commodities, besides chemicals and various textiles.

Prague is also an important trading and financial city ; situated at the head of navigation on the Elbe-Vltava river system, it was the chief market and the seat of Government of the old Kingdom of Bohemia, and it has become the capital of the modern State of Czechoslovakia, and now has nearly a million inhabitants.

Although Prague is almost in the centre of Bohemia, it is (like many cities) at the meeting of two types of country, for here the Vltava descends from the plateau to the North Bohemian Trough. In this northern corner of the Diamond, the ancient rocks dip down and are covered by sedimentary or alluvial deposits, save where there have been out-pourings of volcanic material under the edges of the great faults which separate the Trough from the Saxon and Sudetes Uplands.

Consequently, apart from such volcanic heights, the North

¹ In Germany, the term " Sudetenlander," i.e. Sudetes-lands, has been applied to a much wider area than the Sudetes Uplands ; indeed, the whole of Bohemia, Moravia and Silesia has been included in the term, and the German-speaking people who now live in Bohemia and Moravia are still commonly referred to as Sudetendeutsch, i.e. Sudeten Germans.

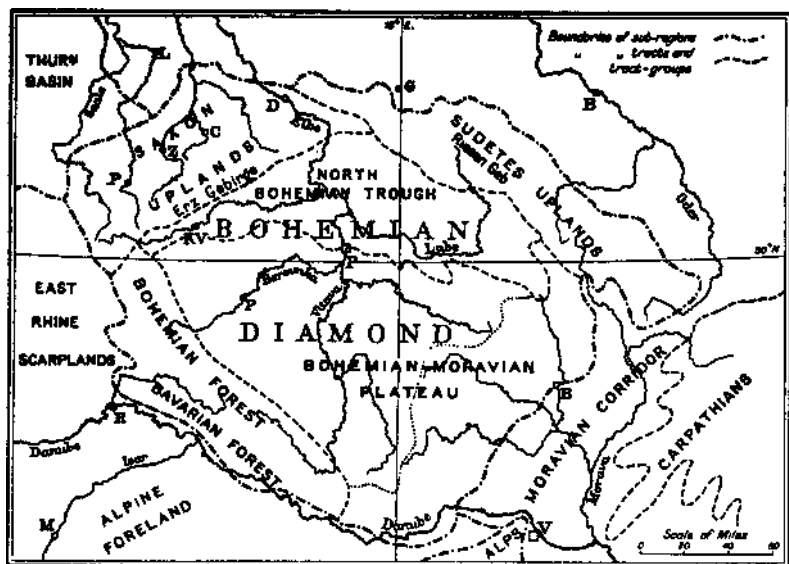


FIG. 49.—REGIONS OF THE BOHEMIAN MASSIF.

Bohemian Trough is lower and warmer than the Bohemian Plateau, its rocks have weathered to fertile soils, and the valleys of the Labe and Eger (or Ohre), which drain it on east and west respectively, are fertile and well populated; beet production and sugar refining are considerable in the Labe area, and fruit and vine growing noteworthy in the Eger valley.

The faulting of the north-western edge has resulted in mineral springs around which have grown up health resorts, such as Karlsbad. Deposits of brown coal or lignite are worked in the Eger valley, and these have aided the carrying on of varied forms of industry, while at the base of the Sudetes Uplands there is cotton manufacturing. Hence there are a number of towns, and because of its agriculture, mining, industries and trade, the North Bohemian Trough is a densely populated region.

The Bohemian and Bavarian Forest Uplands.—The mass of gneiss, granite and schist which forms the south-western part of the Massif has been dislocated along faults, running generally from south-east to north-west. In its south-eastern part, however, it is warped rather than broken, and rises more gradually from the Bohemian Plateau, forming rounded heights of about 4,500 feet above sea-level. The higher parts are almost completely clothed with firs and other coniferous trees, but

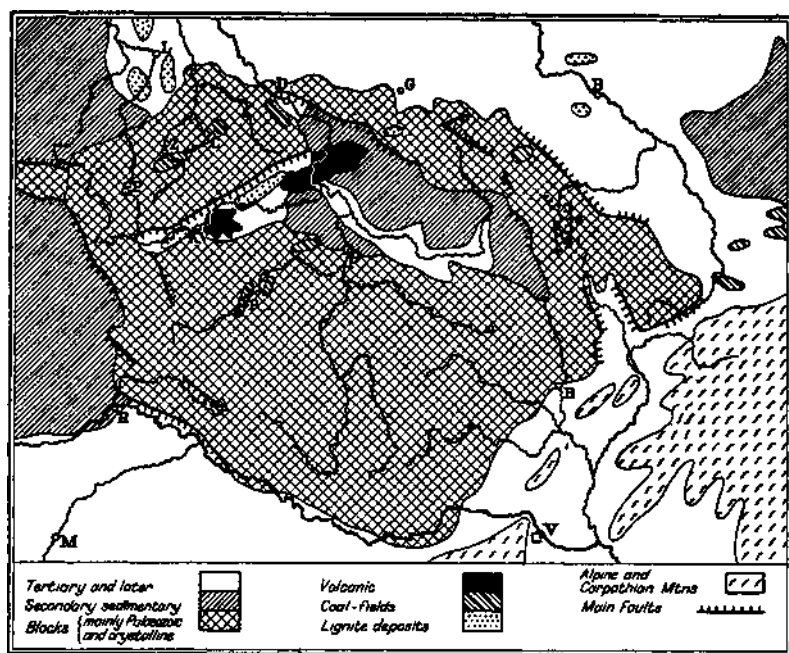


FIG. 50.—STRUCTURE OF THE BOHEMIAN MASSIF.

there are great moors and peat bogs in the broad hollows. A rift-valley separates the smaller Bavarian Forest from the greater Bohemian Forest, and there is thus a double, and almost uninhabited, barrier to communication between the Alpine Foreland and the Bohemian Diamond. In the north-west, the Bohemian Forest is less high, contains small areas of sedimentary rock, which offer more opportunity of settlement, and is more easily crossed.

The Sudetes Uplands.—These have broadly similar structure, relief and vegetation, but have been still more dislocated; consequently, in addition to high areas of crystalline rock, such as the Riesen Gebirge (Giant Mountains) which rise above the tree-line to over 5,000 feet, there are a number of rift-valleys and basins of lower elevation in which sedimentary strata have been preserved. These are farming areas, and also there are two districts which have fuel deposits: one is at the northern edge, south-west of Gorlitz, where lignite is found and utilized to produce power transmitted to the manufacturing districts of Saxony and to the northern plains; the other is the small



FIG. 51.—VIEW IN PRAGUE.

[Czechoslovak Legation,

Note.—The central building is the " Powder Tower," once part of the fortifications enclosing the city; with the growth of Prague, the tower has been surrounded by the modern buildings which form such a striking contrast.

Lower Silesian coalfield south-west of Breslau. In earlier times mineral ores were obtained in the Sudetes Uplands, and there are still small manufacturing districts in which textiles are now the chief products.

At its south-eastern end this upland region forms the most easterly bastion of the Central Uplands ; beyond this the ancient rocks dip below younger deposits in the Moravian corridor.

The Saxon Uplands.—At its north-western end the block of the Sudetes Uplands is separated from that of the Saxon Uplands by an area in which faulting has let down and preserved a mass of sandstone which projects north-westward from the North Bohemian Trough towards Dresden. This sandstone is easily eroded and has been cut into a series of cañon-like valleys by the Elbe and its tributaries. Communication between the Bohemian lands and Germany is carried on by the Elbe, and at the northern end of the gorge of the river has grown up Dresden, a great city of nearly three-quarters of a million people. It has also advantages in developing industries because of the mineral resources of the adjoining Saxon Uplands.

From the northern plain this massif rises gradually southward to the faulted edge which is called the Erz Gebirge (Ore Mountains) because of the occurrence of ores of silver, lead, copper and other minerals (refer back to the section in Fig. 4). These were once mined and led to a relatively close settlement of what was then a forested upland. Now the ores are in large part exhausted (though in a valley of the southern slope a recent development has been the working of radium-producing ores) and the forests which supplied timber for raw material and fuel have been destroyed. Other resources, however, have been utilized : the streams were harnessed first for direct power and later for obtaining electrical energy, and Coal Measures were found in basins extending along a belt of " Variscan " graining some distance up the slope ; consequently in the neighbourhood of this belt several large towns arose, including Plauen, Zwickau and Chemnitz. Little coal now remains in this Saxony coalfield, and the greater part of the electric power on which the industries mainly depend is derived from coal, lignite and water-power outside the area. Clearly, geographical inertia has played an important rôle here and enabled the early metal, wood and textile working to continue, and also transferred inertia has greatly widened the range of production. Moreover, beside

the large-scale manufacturing of the towns, smaller-scale industry has survived in villages and even in the houses of the workers. Consequently, except on the highest parts, the Saxon Uplands region is one of the most densely populated areas of Germany, and indeed of all Europe.

The Jura.—The southern end of the Rhine rift-valley is almost closed by the Jura Upland ; between this and the Black Forest is only the narrow valley of the Rhine above Basel, but between it and the Vosges Mountains is the wider Burgundian Gate, or Gap of Belfort, as it is called from the fortress-town which guards this entry between the Rhine-lands and the Rh6ne-Sa6ne basin.

It is from the Jura Upland that geologists gave to strata appearing here the name of "Jurassic," and geologists frequently illustrate their terms "anticline" and "syncline" from the marked foldings which the limestones have here experienced on

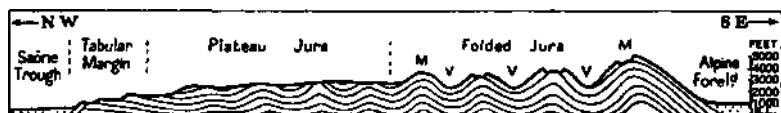


FIG. 52.—DIAGRAMMATIC SECTION THROUGH THE JURA UPLANDS.

the side nearer the Alps, and right across the region in the south (see Figs. 52 and 53). In this region of the "Folded Jura" the structural anticlines correspond with the mountain ridges and the synclines with the longitudinal valleys between them. In Fig. 52 a typical ridge, or "mont," is indicated by M, and a typical longitudinal valley or "val," by V.

The central part of the uplands, however, is of plateau form and is known as the "Plateau Jura." Here the foldings are less marked, and in the past the higher parts of the anticlines were worn down in a process of peneplanation. In the extreme north and north-west are the "Tabular Margins," where the strata have remained little disturbed except when they break down into the valleys of the Rhine and the Sa6ne. The map in Fig. 53 therefore shows three distinct constituent areas of the Jura sub-region.

The Folded Jura.—Considerable parts of the mountain ranges are over 8,000 feet above sea-level, the highest reaching more than 5,000 feet. With heavy precipitation, much of the region

is covered with forests of spruce and silver fir, though above 4,000 feet there are only summer pastures. Forestry and the keeping of cattle are therefore the most widely spread occupations, and Gruyere cheese is a well-known product. In the deep, longitudinal valleys are farming settlements, and for centuries domestic industries have been carried on during the winter. A development of these is the making of watches and clocks; the manufacture is now aided by electricity obtained from the water-power of the streams and is in part organized in large factories; consequently some of the villages have grown into towns, the largest of which is la Chaux-de-Fonds.

Beside these long and fairly wide valleys there are others, the "cluses," which have been worn transversely across the ridges. The cluses are typical narrow limestone cuttings, sometimes with almost vertical sides, and are important as giving a means by which communications are carried on across the great barrier of the Jura Mountains.

The Plateau Jura.—With a general elevation of 2,000-3,000 feet and a dry and infertile soil, this region resembles the Franconian and Swabian Alb; it is mainly a rather bleak pasture-land. In parts, however, glacial deposits from the Alpine ice-sheet give a welcome admixture to the limestone, and woods and the cultivation of barley and oats affords variety to an otherwise monotonous landscape and some additional resources to a scantily populated country.

The Tabular Margins.—This lower area is much more productive and relatively well populated. Indeed, the central part of the north-western margin is such a vine-growing district that it is known as the "Vignoble," while the northern area bordering on the Burgundian Gate and the Rhine valley has industrial development, especially of watch and clock making and of silk manufactures. Besançon, near the exit of the Doubs from this region, is the chief centre of the French horological industry.

The Alpine Foreland.—The Alpine Foreland extends as a unity for about 500 miles in front of the whole northern margin of the Alps, most of it at an elevation of between 1,000 and 2,500 feet above sea-level. Here, between the upraised limestone strata on the north-west, the block of the Bohemian Massif on the north-east and the Alps on the south is a relative hollow,

filled in to a great depth by Tertiary deposits, the "Mollasse," largely sandstones with marls and shales, formed of material worn away from the Alpine strata.

The surface deposits too are mainly of Alpine origin, but of much more recent date, for during the earlier part of the Ice Age, all except the extreme northern angle of the Foreland was covered by the ice and its deposits; the last advance of the ice-sheet, however, with its greater influence on present-day geography, affected only a relatively narrow area nearer to the Alpine margin (see the map in Fig. 53). In post-glacial times the Tertiary sediments of the unglaciated northern angle were largely covered with fertile loess.

The relatively high altitude of the Alpine Foreland is an unfavourable factor, and only the south-western half can be compared with the warmer parts of central Europe. At Geneva, temperatures are very similar to those in the Rhine rift-valley, but at Munich they are almost the same as those of the extreme north-east of Germany (see the table on p. 26). Rainfall is everywhere relatively heavy, reaching about 60 inches on the Alpine margin.

Taking into account climate, relief and surface conditions, we may observe the following constituent regions of the Alpine Foreland: (i) the warmer, south-western portion, which may be termed the *Rhine-Rhone Plateau*, since it is drained by those two rivers; (ii) the *Bavarian Foothills*, the area which was glaciated in the last advance of the ice and now drains to the Danube; (iii) the *Bavarian Plateau*, farther north and earlier glaciated; (iv) the *Northern Danubian Plains* in the angle of that river, and largely loess-covered.

The Rhine-Rhone Plateau is in French territory south-west of Lake Geneva, and is German north-east of Lake Constance, but its greater part constitutes the "Swiss Midland," as the Swiss geographers call this most populated and productive section of their country. Most of the area shows the characteristic morainic scenery with low hills, and its valleys have been fairly deeply cut by post-glacial streams. The hollows once occupied by the terminal tongues of glaciers which emerged from the valleys of the Rhine and Rhone are now filled with the waters of Lakes Constance and Geneva. In the long, narrow trough under the edge of the Jura an earlier glacial extension became filled partly by lakes, e.g. Lake Neuchatel, and partly by the

marshes of the River Aar, now largely reclaimed for farming. The variety in the land-forms and in the soil conditions gives rise to an alternation of fields, meadows and woods, all carefully utilized and supporting a considerable population ; the irrigated meadows give predominance to pastoral work, and on this Foreland Plateau (not in the Alpine valleys) is the main production of the Swiss dairying industry. In favourable situations, e.g. on the south-facing shores of Lakes Geneva and Neuchatel and in the river valleys, wheat and fruit, including the vine, are cultivated.

Moreover, commerce and a considerable amount of industrial work are carried on at nodal points where two sets of routes intersect. In one set are the transverse lines of communication which skirt or cross the Jura to reach the passes through the Alps ; across these run routes along the plateau from southern France to the Rhine and Danubian countries. Geneva is situated at an obvious " gateway " into Switzerland, and in this favourable position it has become the centre of the Swiss manufacture and trade in watches and clocks ; moreover, it has international importance as the seat of the League of Nations, with its many activities in which representatives of most of the nations of the world co-operate. Bern (Berne) in the centre of the Swiss Midland is conveniently placed as the capital; it is situated by the River Aar and on the direct railway route northward from the Simplon Pass. Zurich is at the end of Lake Zurich, which half-blocks the plateau, and through this city passes the route from the St. Gotthard Pass to the Rhine rift-valley; it is regarded as the " intellectual capital " of Switzerland, and has a technical college specially famous for its electrical engineering, for the Swiss have done much to advance science in connexion with the development of the water-power of their country. Both in Zurich and in the smaller towns and villages in the district, water-power is greatly used to carry on the manufacture of silk and other fabrics, chocolate and other foods-tuffs, as well as many forms of metal goods, including machinery.

The Bavarian Foothills.—The irregular relief of this region is due to its covering by the last extension of the Alpine ice-cap,

lakes in the sites of past glaciers, though moors and peat-bogs are common. There are rather poor growths of pine over considerable expanses of the region, the fairly heavy rainfall aids pastoral work rather than cultivation, and on the scanty resources only a small population can obtain a living. At its eastern extremity the region extends into Austria ; here Salzburg, the " salt burgh," situated where the Salzach leaves the Alps, is famous as the birthplace of Mozart, and its concerts attract visitors from many countries.

The Bavarian Plateau.—Not much better favoured than the foothills region is this plateau, which though mainly in the province of Bavaria extends into Wurttemberg on the west and Austria on the east. Here the older morainic material is largely covered by the out-wash gravels and sands from the last ice-sheet. The surface has been cut by glacial and post-glacial streams into a series of terraces, and in the valleys the Alpine-fed rivers bring summer floods and prevent the utilization of the land. On the higher parts there are wide beech forests, and others of pines, spruce and firs. Moors are now being reclaimed for pasture or crops for cattle, but there is little cereal cultivation, mainly of barley for brewing or of rye. Most of the settlements are small and widely scattered, except for two great cities on important routes referred to earlier in this chapter. Augsburg was a Roman settlement on the Lech ; it became great by the trade with Italy, and has still fine buildings dating from that time. Munich is situated where the route crossed the Isar between marsh to the north and forest to the south, and intersected an old " salt road " from Salzburg to Augsburg. Munich has been called the capital of south Germany, for in past centuries it was the seat of the rulers of Bavaria and is still the possessor of museums, picture galleries, opera houses and a great university. In recent times it has developed into the chief commercial city of this part of Europe, and with imported coal and with water-power from the Alps and the Isar numerous industries have grown up, brewing being particularly noted ; it has a population of about three-quarters of a million.

The Northern Danubian Plains.—Here on the almost horizontal, loess-covered sediments of sands and marls, good soils have developed, and the region is favoured by the warmer climate, due to its lower altitude. Cereals, particularly wheat, are an important production, and hops are largely grown ; everywhere

there is cattle-rearing, and the farming supports a moderately dense population.

It may be pointed out that the River Danube, which runs near the northern margin of this region, established its course before the present surface of the country had been developed, and consequently in some parts the river flows through the sediments of this plains region and has a wide and often marshy valley, while in other parts the river is in the adjoining regions of more resistant rocks and has cut a valley which is always narrower and is sometimes almost a gorge ; here, as so often, a river flows athwart the natural regions of the present stage of the earth's evolution.

QUESTIONS

1. Contrast, in as much detail as possible, the upland areas with the river valleys of the Rhine Plateau.

2. " The Rift-Valley of the Rhine is a geographical unit area." How can this statement be reconciled with the differing characteristics of the country comprised within this valley ?

3. Write an essay on the Rhine as an artery of economic life.

4. Describe the country traversed by the Marne-Rhine canal, and assess the value of this canal.

5. Estimate the economic importance of the areas comprising the " Bohemian Diamond " within the Bohemian Forest, Saxon and Sudetes Uplands.

6. Account for the fact that Saxony is one of the most densely populated areas of Europe.

7. Make a regional study of the Jura Uplands.

8. Write comparative notes on the situation and development of any three cities in Southern Germany.

9. Describe and account for the economic development of the Swiss portion of the Alpine Foreland.

CHAPTER XI

THE ALPINE LANDS

General Characteristics.—With a length of some 700 miles, the great curve of the Alpine region extends from the Mediterranean Sea across the southern part of all central Europe, and it adjoins regions which are of different physical character and inhabited by people of varying types. Hence its valleys have been penetrated and occupied by men of several nationalities, and the Alpine Lands are now shared by several States : France, Switzerland, Germany, Italy and Yugoslavia.

Structure.—As was explained in Chapter I, the Alps constitute the highest and most extensive system of folded mountains of Europe. Here the strata were thrust north-westward and northward against the massifs of the Central Plateau of France and the uplands of central Europe until nappes were piled on one another to a height of miles above the present mountains ; strata which had their roots in the southern part of the Alpine region were even pushed across to the northern side (refer back to Fig. 5).

The lower rocks were metamorphosed into crystalline form, and where the upheavals were greatest, that is, along the middle part of the great curve, the overlying sedimentary strata were worn away. Consequently the rocks of the central zone of the " High Alps " (compare Figs. 5 and 53) are mainly of crystalline structure, while the lower margins, or " Pre-Alps," are formed largely either of limestone of Secondary Age, or of the Tertiary sands, marls and clays known as Flysch. The southern zone of sedimentary rocks is missing, however, in part of the western Alps where the crystalline rocks descend steeply to the western side of the North Italian Plain.

In the central zone, besides the metamorphosed and crystalline nappes are areas of older rocks, including masses which are like those of central Europe and show the earlier Hercynian folding. Also in the disturbances in the Alpine region igneous rocks such as porphyry were produced, though recent volcanic outpourings have no important part in the build of this region. These

contrasted elements in the structure considerably influence the present-day geography.

Relief.—In the Alps, however, altitudes are so great that differences of relief are even more important than those of the rock material, and perhaps the best way to appreciate the form of the relief is to study the pattern of the river valleys. Near the outer, i.e. the western and northern, margin of the great curve of the region is a series of almost continuous longitudinal valleys, which accompany the junction between the High Alps and the Pre-Alps along much of its extent (see Fig. 53). This line is well marked in the case of the valley of the River Isère, above Grenoble, and of its tributary the Drac, which meets it at that town ; to the north-east, after a break, it is again clearly seen in the back-to-back valleys of the upper Rhone and the Vorder Rhine ; after another break it is continued by the longitudinal section of the Inn above and below Innsbruck, and by the longitudinal courses of the Salzach and the Enns. Most of these rivers have their origin in the High Alps, and all of them turn from a longitudinal course outward and cut the North-western and North-eastern Pre-Alps into sections which have their own local names. Some of the valleys, too, have such marked individuality and importance that they have long been regarded as regional units and given special names ; e.g. the longitudinal part of the Isère valley is known as the Gresivaudan, and that of the Salzach as the Pinzgau.

Near the inner margin of the Alps which overlooks the North Italian Plain, marked longitudinal valleys are found only in the eastern part. Here are two series, each of less extent than those of the outer margin. One set forms the northern part of the Italian lake region, where, in the Val Tellina, the River Adda flows westward to join Lake Como, whilst farther east are the shorter longitudinal valleys of the Brenta and Piave. The other set lies farther north-east and is within the Eastern High Alps ; it is formed of the Val Pusteria, which is drained both westward by the Isarco to the Adige river system, and eastward by the Drava ; where the Drava leaves the High Alps to cross the Eastern Marginal Pre-Alps, it flows through a broad and deep depression known as the Klagenfurt basin.

While all these series of longitudinal valleys aid movement between different parts of the Alpine region, several transverse valleys are of great importance as permitting communication

across the mountain barrier. In the west, from the Italian plain near Turin, the valley of the Dora Riparia leads to the Mont Cenis Pass, and thence to the Arc tributary of the Isère, while the valley of the Dora Baltea leads by the Little St. Bernard Pass to the Upper Isere and by the Great St. Bernard Pass to the Rh6ne. From Lake Maggiore there is access by the Toce valley to the Simplon Pass, and thence to the Rh6ne, and by the Ticino valley to the St. Gotthard Pass, and thence to the Reuss. From Lake Como a northward route leads over the Splugen Pass to the Hinter Rhine. In the Eastern Alps beyond the Splugen, the most marked transverse route is up the Adige valley as far as Bolzano, thence continuing northward up the Isarco tributary to the Brenner Pass, and across this to a tributary of the Inn, which meets the main river at Innsbruck.

In the broad mass of the Eastern Alps there are also several large oblique valley-lines, with a general south-west to north-east direction—for example, the upper Inn flows through the Engadine valley. In the Eastern Margins part of the Pre-Alps the upper Mur flows from south-west to north-east till it turns at Bruck, while beyond this town the same line is followed, though in the reverse direction, by its tributary the Murz; beyond the Murz the line continues across the Semmering Pass to the Leitha tributary of the Danube.

The reasons for the courses of the Alpine valleys can be explained only in part by the present differences of the rock composition; especially in the High Alps their origin may lie too far back in the geological history for its discovery. The form of the valleys, however, and much of their human significance are due to relatively recent glaciation, of which some account will be given later.

Climate and Vegetation.—It is evident that the deeply cut valleys must have climatic conditions very different from those of the intervening highland masses, and these again differ from one another because of their relative elevations; the greater part of the marginal Pre-Alps, for example, is clothed with forests or pastures, while in the central High Alps wide areas rise above the tree line and even to the levels of perpetual snow.

There is, indeed, in the Alpine region a zonal arrangement of climates. The culminating heights which rise above about 10,000 feet form the *snow zone*, and bear no vegetation. The mountain slopes which are below this level, but above 5,000 or

6,000 feet, are in the *alp zone*, snow covered for more than half the year, and with such a short period when vegetable growth is possible that trees cannot exist; low herbaceous plants grow in great abundance, however, flowering brightly in the earlier part of the summer and constituting the valuable alpine pastures.

Below this level the higher valleys and the upper slopes of the lower ones are in the *forest zone*, which extends downwards to about 2,500 or 3,000 feet; in the higher parts of the forest zone only conifers are found, the spruce and larch being common, but at the lower levels there are mixed growths of coniferous and deciduous trees, the beech often giving a lighter colour to the woods in the west, and the oak being more plentiful in the east. Deforestation has, however, taken place over considerable areas, and the trees have given place to pastures.

The lowest valleys which have been cut below about 2,500 feet are in the *cultivation zone*; here fruit trees have been planted and cereals and vegetables are grown. At these lower levels account must be taken of another factor than altitude, for the Alpine Lands have such a wide extent that the different parts adjoin regions with markedly different climates; hence from these contrasting regions, winds of different character penetrate into the valleys and modify their climatic conditions.

With these differences of climate and vegetation necessarily correspond differences in the ways of life of the inhabitants.

Regional Divisions.—Thus, determining the general character of the various parts of the Alpine region are five main factors: the altitude; the composition of the rocks; the situation; the climate; and the utilization by man of the natural resources. Taking all these into account, the constituent sub-regions have been demarcated as shown in Fig. 53, and will now be briefly described in turn.

The High Alps.—By contrast with the marginal Pre-Alps, all this medial belt is "high," but the culminating area is the Central Alpine sub-region between the Splügen Pass marking off the Eastern High Alps and the valley of the Dora Riparia beyond which are the Southern High Alps.

The Central High Alps.—The two factors of great elevation and generally crystalline structure determine much of the character of this region, yet here, as throughout the Alpine Lands, it is the valleys, often floored with recent deposits, that count for most in the human geography* The forms and the

resources of these valleys, and also the scenery of the mountains, owe much to the glaciation of the Ice Age. Deep corries, or cirques, with steep walls, were worn out of the uppermost parts of the pre-existing valleys, and by the development of these cirques mountain masses were cut back into irregular sharp-edged



[French Railways—National Tourist Office.]

FIG. 54.—VIEW OF THE MER DE GLACE.

Sote.—The Mer de Glace is the name given to the lowest part of the glacier which descends north-eastward from the extensive massif of Mt. Blanc ; in this part the tongue of ice occupies a valley to a width of half a mile, and a length of four miles. Above the part shown in the picture the icefield is much wider, and covers the slopes of the massif which rises to the peak of Mt. Blanc, about six miles to the right of the view here shown.

ridges, and the ridges were reduced to jagged pyramids, " horns " or even " needles." The valleys were scoured into troughs of U-shaped section, and in parts were deepened to basins separated by rock-bars or by morainic deposits ; main valleys were worn more deeply than were the side valleys, which were left " hanging " after the ice had disappeared and the form of the valley bottoms had become visible. Much of the magnificent

scenery of the mountains and of the varied charm of the valleys, enhanced by small lakes in many of the basins, is due to past glaciation.

On the greatest heights the Ice Age has remained into the present: on vast snowfields the ice still forms and works its way as glaciers downward into many of the higher valleys. Thus the culminating point of the whole Alpine Highland, the peak of Mont Blanc, towers to over 15,700 feet, and from the icefield of the north-east side of its huge massif the "Mer de Glace" works down to the upper Rhone valley (see Fig. 54).

Few climbers scale the great heights; but to see these, and to enjoy the beauties of the whole region, many thousands of tourists annually visit the High Alps. They are accommodated in hotels built in the upper parts of the valleys, and in the lower parts small towns have arisen which directly or indirectly depend upon the "tourist industry."

Because the Central High Alps are situated between the Mediterranean Lands and north-western Europe, and because here the highland barrier is narrowest, great trade-routes have for many centuries taken advantage of the passes deepened and smoothed by the ice. The modern railways, however, though they use the same valleys, have avoided the steepest climbs by tunnelling beneath the water-partings near the passes.

Thus the most direct railway route is that which goes northward up the Toce valley, but instead of crossing the Simplon Pass, over which the road has to climb to 6,600 feet, tunnels beneath the adjoining ridge for $12\frac{1}{4}$ miles, and rises only to 2,300 feet; this route, after descending into the Rhone valley, further shortens the distance by traversing the Bernese Alps through the Lotschberg tunnel, 9 miles long, to Berne (refer back to Fig. 20). Almost rivalling this crossing in importance, the St. Gotthard route has a shorter tunnel of nearly 10 miles long, but climbs to about 3,800 feet, the road over the pass being nearly 7,000 feet above sea-level. The third of the railways over the Central High Alps has less traffic, for it leads only from the Italian Plain to the middle Rhone valley; it is the Mt. Cenis route and has the additional handicap of a greater climb: the tunnel summit is about 4,400 feet, and the pass, some miles away, is at 6,800 feet.

The railways now use the water-power which is abundantly afforded by the streams fed by the heavy precipitation and melt-

ing snows. Where glaciation has caused a break in the normal smoothed valley profile, as at the exit of the hanging valleys or at the rock-bars in the course of the larger streams, power plants have been erected for the production of electricity; cables transmit the current for use within the Alpine region and, to an even greater extent, for transmission to the neighbouring regions of France, Switzerland, Germany and Italy.

While the transverse Alpine valleys leading to the passes are of great importance as lines of communication, the broader longitudinal valleys are the more suited to human occupation. In the Central High Alps, however, only those of the upper Rhone and the Vorder Rhine have any considerable amount of cultivation or settlement of any size ; most of the valleys are of the higher kind, in which the people live in small villages and are mainly dependent upon pastoral work.

The mode of life of the people is influenced to an extraordinary degree by the altitude of their environment. Their houses are necessarily built in the lower parts of the valleys, where alone the cold of winter can be supported, and where small patches of ground can yield crops, mainly of quickly ripening barley and vegetables, such as potatoes and beans. These village settlements are generally on the " sunny side " of the valleys, for little light and heat fall upon the " shadow side."

The main resource of the people is their herds of cattle, and smaller numbers of sheep and goats. These animals must be fed upon the higher pastures, and consequently systems of transhumance, i.e. seasonal migrations of animals and man, have developed, the particular times and methods varying according to local conditions. A common practice is that in early summer almost the whole population, with the beasts, leave the village and go up to the meadows of the summer alp, the most productive frequently being irrigated glacial terraces.

On these pastures are what appear to be other villages ; they are groups of small summer chalets, which shelter both people and animals. Here is made the cheese which is sent down the valleys for use in winter, or for export; here, too, quantities of hay are gathered for the winter feed of the cattle. As the summer advances, the animals are taken to the high pastures, where they are allowed to graze, accompanied by women or children, while the men reap the hay meadows or the cultivated fields in the lower parts of the valleys. With the coming of winter, the

return migration takes place : the alps are abandoned and the villages are repopulated ; for several months the beasts are shut in their byres and the people largely restricted to their houses.

The winter is a time of almost complete isolation, and until recently, even in summer these interior valleys were largely out of touch with the rest of the world.

Although in the Central High Alps water-power is abundant,



[Swiss Federal Railways.

FIG. 55.—VIEW OF AN ALPINE PASTURE.

Note.—The richer pastures are those, below the "alp zone," made by clearing the forest growth ; this view shows such a pasture area with trees remaining around it. It is on an exceptionally steep slope used, not for grazing, but for growing hay, which is carried down in nets and stored in barns for winter fodder.

minerals are scarce, and in the secluded valleys there has been very little industrial development. Exceptions occur in the Dora Baltea valley and in the valley of the Romanche tributary of the Drac, where there are metallurgical and chemical works based mainly upon the utilization of the local water-power, while anthracite is obtained from a short distance ; also in the relatively broad longitudinal valley of the upper Rhone there are some industrial establishments.

Taken as a whole, however, the Central High Alpine region is one where the natural resources, apart from the attraction

which the scenery has for visitors, can support very few people.

The Southern High Alps.—The structure of this region is similar to that of the Central High Alps, but the altitudes are less, there are no areas of perpetual snow, and the scenery is less attractive ; the climate is drier and the pastures and forests are poorer. Although the passes are lower, they are off the main currents for traffic, and the region is less populated.

The Eastern High Alps.—While in general the characteristic features of the Central High Alps are continued on the eastern side of the Splügen dividing-line, there are certain changes to be observed, which become more marked as the region is traced farther eastwards. There is less precipitation and the altitudes are not as great; consequently there are smaller glaciers to-day and the land-forms show less action of ice in the past.

Moreover, the Alpine barrier does not here lie so directly athwart the great trade-routes as farther west. Hence, in spite of a number of broad valleys and low passes, the Eastern High Alps are crossed only by one route of capital importance, viz. that of the Brenner Pass, which is so low (4,500 feet) that the railway crosses it without a tunnel.

Another feature of the eastern part of the High Alps is that crystalline rocks do not form so large a proportion of the region, and considerable areas are composed of limestone. In some parts, the almost vertical cliffs which frequently characterize high limestone districts provide scenery rivalling that of the glaciated mountains ; this is exemplified most strikingly in the Dolomites area, situated east of the Adige valley below Bolzano (Bozen). Here, upon a great platform of porphyritic rock, forming upland pastures, lie masses of dolomite (magnesian limestone) which reach even into the zone of perpetual snow ; what specially distinguishes them is the way in which they have weathered into the most fantastic shapes of groups of pinnacles, described even as "cathedral-like," and the brilliant colour given to parts of them by veins of minerals.

As in the more westerly parts of the High Alps, mineralization has not in general much economic significance. The deposits of most importance are in the extreme north-east; here the iron ore has given its name to the Eisenerz Alps between the Enns and the Mur. Industrial development has not proceeded so far in the east as in the west, and in the High Alps region the

water-power has been less utilized ; the greatest plants are those in the Isarco (or Eisack) valley, near Bolzano, which produce electric current for use in textile and other industries in the Adige valley, and to a greater extent for transmission to the Italian Plain. Forestry and pastoral work are the main occupations of the High Alps, and these support an even smaller population in the east than in the west.

The Pre-Alps.—Lower altitude is the one characteristic common to all the Pre-Alp sub-regions ; differences in situation, structure, climate and human occupation are the other factors which have determined their respective natures.

The North-Eastern Pre-Alps.—On its inner side this sub-region includes the series of longitudinal valleys of the Inn, Salzach and Enns, north of which rise massive limestone heights, except where slaty rocks take their place north of the Salzach. This limestone belt consists of wide plateaus, often of the karst type, broken by the broad transverse valleys of the main rivers and the narrow and sometimes gorge-like cuttings of the smaller streams. The outer marginal strip is formed of Flysch, with lesser heights and more open valleys. As the climate of the valleys is similar to that of the Alpine Foreland, to which they open, cultivation is less favoured than pastoral work ; this and forestry are the main resources of the region. Copper is mined in the neighbourhood of the Salzach, and in several parts salt is obtained and water-power is utilized, but there has not been much industrial development. Trade follows the line of the longitudinal valleys, which are connected by the Arlberg Pass with the Rhine valley ; traffic from the Brenner Pass crosses this line at Innsbruck, whence it has several outlets to central Europe.

The North-Western Pre-Alps.—Very similar as regards land-forms and structure are the North-western Pre-Alps, but their aspect gives them a milder climate, and their lower lands therefore have better possibilities of cultivation, the broad valley of the Gresivaudan producing wheat and maize, vine and fruit trees ; pastoral work, too, has become very important. Glaciation has had a considerable influence on the region, and the scenery and lakes in several of the valleys, particularly in Switzerland, have been a factor in the development of many pleasure resorts. The industrialization of the Swiss Plateau and the adjoining part of France has stimulated the utilization

of the water-power and an associated development of manufactures, the latter being greatest in the valleys of the Isère and Drac, on either side of Grenoble. This town is a centre of metallurgical and chemical industries, of cement making, and of glove manufacture ; with nearly 100,000 inhabitants, it is by far the largest town in the Alpine region. The trans-Alpine routes already described, together with the longitudinal valleys, give easy access to all parts of the North-Western Pre-Alps, and help to make it the most densely populated sub-region of the Alps.

The Mediterranean Alps.—This term fitly describes all the Pre-Alpine region drained either directly to the Mediterranean Sea, or by the Durance and smaller tributaries which flow to the lower Rhône in "Mediterranean" France, for the characteristic which distinguishes it from the other marginal Alpine areas is a normal condition of summer drought; this is due to markedly less rainfall combined with the considerable summer heat. The forest-cover is almost lacking, garrigues appear, and there are even areas practically bare of vegetation. Deep canons appear in the limestone districts, and the scenery has a savage aspect uncommon in the Alps. The human geography, too, is exceptional, for, although pastoral work is the main resource, it is concerned with the keeping of sheep instead of cattle. In particularly favoured spots are cultivated vines, almond trees and even olive trees. Relatively very little traffic passes through the region and the total productivity of the land is small; consequently the population is scanty. The site of the settlements illustrates the distinctive character of the region, for they are frequently on the shady side of the valleys to avoid the great heat of the sun in summer.

At the eastern extremity, the immediate coast of the Mediterranean Sea, commonly known as the "Riviera," may conveniently be regarded as a separate sub-region ; its characteristics resemble those of the adjoining coasts of Mediterranean France and the Northern Apennines.

The Piedmont Pre-Alps.—As in the High Alps north of the Dora Riparia, so here the more resistant rocks, in part crystalline, descend directly to the North Italian Plain and longitudinal valleys do not appear. The altitudes are not great, and the uplands have been reduced to a series of ridges separated by the deep valleys of the streams which cross the Piedmont belt to converge upon the plains south of Turin. These valleys prolong

many of the characteristics of the plain into the mountain region, and the people have worked their way into them, continuing their mode of life as far as possible. The water-power of the streams is utilized for the use of Turin and Genoa, and in general the life of the region is closely associated with that of the lower lands of North Italy.

The Italian Lake Region.—After a break from the Dora Riparia to near Lake Maggiore, the Pre-Alps are resumed in the region which may be called the Italian Lake Region from the fact that in it lie a number of large and small lakes, occupying almost a network of transverse and longitudinal valleys. Indeed, the lakes, in the formation of which glaciation has played a large part, were once both more extensive as well as more numerous than they are now, and old lake-bottoms afford valuable areas of pasture or cultivation. The structure is complicated, for crystalline and sedimentary rocks are both found, but the distinguishing character of the region is the co-existence of the valleys and of a climate which combines adequate rain with warmth due to the southerly position and aspect. The climate of the region as a whole is not "Mediterranean," in spite of the fact that the olive grows in favoured spots ; more typical are the plantations of vines in the valleys and on the lake-side terraces, and edible chestnut trees on the lower slopes of the mountains, while the higher parts are largely covered with woods of deciduous trees, especially the beech, or with alpine pastures. The care of the vine and fruit trees and the rearing of cattle are the dominant occupations over most of the region ; in the vicinity of the lakes is a considerable tourist industry ; water-power is utilized at a number of places and the manufacture of textiles has extended into several of the valleys. It should be noted, too, that the three most important routes across the High Alps have their southern entrances in this region. In the richness of its natural endowment and the relative density of its population the Italian Lake sub-region may be compared with its north-western counterpart.

The South-Eastern Pre-Alps.—Here limestone ridges and plateaus are the characteristic features, and this region forms a transition to the karst uplands of the Balkan Peninsula north-east of the Adriatic Sea. Yet though the ground is frequently dry, there is quite a heavy rainfall, and forests alternate with poor pastures. Quicksilver is obtained from Idria, but in

general the region is little developed, and its population is small

- *The Eastern Margins.*—The crystalline structures of the Eastern High Alps become lower in the Eastern Pre-Alps and are cut by the valleys of the Mur, Drava and Sava ; in parts of these valleys, and notably in the Klagenfurt basin, are sedimentary deposits of Tertiary date. The forests of the uplands give timber for the making of paper and other wood products, while pastoral work and farming of the central European type are carried on in the valleys. The iron of the Eisenerz area is used in metallurgical works in the valleys of the Murz and of the upper Mur, where in the Tertiary strata lignite is found ; lead is mined near the Klagenfurt basin, and here, too, are metal works. Communications are relatively easy, and with Vienna on the one side and Trieste on the other, there is a fair amount of through traffic ; hence, with fairly varied resources, the valleys of this sub-region are moderately well populated.

QUESTIONS

1. Give an account of the structure as related to the relief of the Alps.
2. Draw a sketch-map showing the principal Alpine valleys. Comment upon their distribution, and group them into types according to their situation and arrangement.
3. Explain how glaciation has affected (a) the scenery, and (b) the utilization, of the Alps.
4. Show where and why industrial development has penetrated the Alps.
5. Describe the railway routes crossing the High Alps.
6. What reasons may justify the name " Mediterranean " being applied to part of the south-western Alpine Lands ? How may this area be demarcated ?
7. Write an essay on " Pastoral Life in the Alps."
8. Describe the characteristics of the " Italian Lake Region " of the Alpine Lands.
9. Contrast, and account for the differences between, the North-western and South-Eastern Pre-Alps.

THE DANUBIAN LANDS

Position and Relief.—At their eastern extremities the Alpine Mountains appear to spread out towards the north-east and the south-east; the North-Eastern Pre-Alps are continued, across the Vienna Basin, into the north-western ranges of the Carpathians, while the South-Eastern Pre-Alps pass directly into the mountains of the Balkan Peninsula.

Between these diverging mountains the Central Alpine structures break down eastward first into a region of hill-country, which may be termed the East Alpine Foothills (see Fig. 56), and then into two great subsidence areas, the Upper Hungarian Basin and the Lower Hungarian Basin.

These Middle Danubian Lowlands are interrupted by higher "islands," such as the Bakony Forest and, continuing the same north-easterly direction across the Danube, the Matra and other mountains, while farther south are the Mecsek Heights ("M.H." in Fig. 56), and the uplands in the Croatian and Slavonian districts between the Drava and Sava. It is convenient to refer collectively to these areas as the Middle Danubian Uplands; they have a complicated structure and in general represent masses of older rock projecting through the relatively recent deposits laid down in the subsidence basins.

The great highlands and uplands of the Carpathian System form three sub-regions: (1) the wide mass of the North-Western Carpathians, of which the outermost ranges are known as the Western Beskides; (2) the much narrower Eastern Beskides or Forest Carpathians; (3) the almost triangular mass of the South-Eastern Carpathians comprising the Moldavian Carpathians on the eastern side, the Transylvanian Alps and Banat Mountains on the southern side, and the West Transylvanian Highlands, including the Bihor (or Bihar) Mountains, on the western side, while between these three highland masses lies the upland Basin of Transylvania.

Finally, the Hill-lands and Plains of Walachia represent a

filled-in subsidence basin between the Transylvanian Alps and the low plateau of Bulgaria south of the lower Danube.

Climate.—The statistics for Budapest given on p. 26 indicate that in this part of Temperate Europe there are hot summers and rather cold winters, while the rainfall is moderate in amount. But the climate, of course, varies within the region, and while Budapest, because of its almost central position and its situation between upland and lowland, has average figures, the highlands have much colder and wetter conditions and the lowlands are generally warmer and drier.

In the eastern part of the lowlands of the Lower Hungarian Basin there is a lack of rain, especially felt in the hot summer ; here aridity shows itself by the occurrence of steppe-like country, known as the Pussta, and even districts of sand-dunes.

To the south and east of the Transylvanian Alps is another area where the rainfall becomes less than is common in central Europe. The Walachian Hill-lands are fairly well watered and may be grouped with the eastern part of the Balkan Peninsula to form the "Drier South-eastern Lowlands" sub-region of Temperate Europe, marked "10" in Fig. 21.

The climate of the Plains of Walachia, however, as shown by the figures for Bucharest on p. 26, is definitely of the steppe-land type, and therefore this part of the Danubian Lands lies beyond the geographical region of Temperate Europe, and in several respects is an extension of eastern Europe.

The Carpathian System.—We will begin the regional description by dealing with the highlands, and will consider first the *North-Western Carpathians*. Here there is a series of curved highland zones which lie, as it were, one within the other, and are separated by valleys or high basins, in which recent deposits have been laid down. Thus there are the outer and almost concentric curved chains of the Beskides, continued south-westwards by the White Carpathians ; south of the Beskides there is the highland mass of the High Tatra, which, at an altitude of about 8,700 feet, includes the culminating point of the whole Carpathian System ; separated from this highland by the upper valley of the Vah is the Low Tatra, which, in spite of its name, reaches about 6,700 feet ; separated from the Low Tatra by the upper valley of the Hron are lower masses, known as the Slovakian (also known as Hungarian) Ore Mountains. The Vah and Hron flow first westward and then

southward to join the Danube, while back-to-back with their upper courses are the Hornad (Hernad) and Sajo (Slana) which flow first eastward and then southward to join the Tisza (Tisa).

As regards structure, the outer zone of the White Carpathians and the Beskides are composed of the Flysch strata of shales, sandstones, etc., while the High and Low Tatra, the Little Carpathians, which extend south-westward to the Danube at Bratislava (Pressburg), and part of the Ore Mountains are



[Czechoslovak Legation.

FIG. 57.—VIEW OF A CARPATHIAN PASTURE.

Note.—This is a view in the High Tatra region ; in the foreground is a flock of sheep—on the level ground of an old lake-basin.

formed mainly of crystalline rock ; the remaining parts of the Ore Mountains are of volcanic origin (see Fig. 58).

The Beskides, modelled from the Flysch rocks of relatively weak resistance, have rather smooth forms ; they are forested with beech and firs, and almost the only resource they offer is their timber.

The crystalline areas have bolder outlines ; the High Tatra in particular has wild scenery, for here, and to a less extent on the Low Tatra, glaciation has produced the same striking land-forms as those of the High Alps. Forests of firs clothe nearly all the slopes as far as the tree-line at about 5,000 feet, above

which rise almost bare crests and summits ; alpine pastures **are** rare. On the Tatra Mountains a forest economy is again predominant, and only in the valleys and the high basins is there any considerable population. In these valleys and basins most of the people get their living by cattle- and sheep-rearing and subsidiary agriculture, with small domestic industries, such as spinning and weaving, the manufacture of glass and metal-working. The last occupation is due to the occurrence of silver ores in the volcanic area of the Ore Mountains, while more ancient rocks yield iron, manganese and copper.

The Forest Carpathians are much narrower, for it appears that the great subsidence which has occurred in this part of the Tisza basin has left little of the highland but the Flysch chains of the Eastern Beskides, except that on the edge of the depression, i.e. on the inner side of the mountains, are certain volcanic masses. The parallel ranges are well named the Forest Carpathians, for woods almost completely cover them, and forestry is almost the only occupation ; but on the slopes and in the valleys of the volcanic areas there is more cultivation, and even some vine-growing. In the upper valleys of the Tisza and its tributaries live the greater part of the people of Ruthenia, the easternmost part of Czechoslovakia.

The South-Eastern Carpathians,—The Flysch belt of the Beskides is continued first in the mountains of the Bukovina, i.e. Beech-land ; farther south the Flysch continues in the outer part of the Moldavian Carpathians, and even just around the great westerly bend of the system where it borders the Walachian Hill-lands. Behind the Flysch chains there are crystalline and volcanic areas, and an important characteristic of the region is the existence of basins of considerable altitude and wide extent in the uppermost courses of the Mures (Maros) and Olt (Aluta).

While the mountain areas have but a scanty population, which depends mainly on the beech and fir forests, the basins have a very considerable number of inhabitants who cultivate meadows and grow forage crops for their cattle, and in the lower basin of Brasov the town of that name is surrounded by a fertile district in which corn and sugar-beet are obtained.

On the outer margin of the Moldavian Carpathians is one of the Rumanian oilfields (see Fig. 56).

The Transylvanian Basin.—In this great hollow Tertiary deposits of clays and sands, with layers of gypsum and salt,

were formed. The whole region has been cut up into a land of very irregular relief by the Mures and other tributaries of the Tisza, and by the Olt, which cuts through the Transylvanian Alps to the lower Danube.

The higher lands, frequently formed of sandstone, bear woods of beech and other deciduous trees. The lower areas, however, are usually treeless, and consist of arable lands or pastures, on which large numbers of cattle, sheep, swine and horses are reared. The valleys are the most productive areas; some of them have terraces mantled by loess, and on such lands great harvests of wheat and of maize are gathered, while on sunny slopes fruit trees and the vine are cultivated. There are a considerable number of small towns, and the largest, Cluj, has about 100,000 inhabitants.

The Transylvanian Alps.—On the southern side the upland basin is shut in by the broad highland mass of the Transylvanian Alps. Although involved in the "alpine" folds, its structure is in the main that of a great massif of crystalline rock, whose higher parts are in the form of plateaus.

On the southern side of the Transylvanian Alps is the depression now occupied by the Walachian Hill-lands and Plains, and at one period in the geological history rivers from basins in the highland descended so steeply to this depression that they rapidly eroded their valleys and formed great gorges, including those of the Jiu and Olt. The Olt, indeed, cut back its valley till it captured that part of the course which is within the Transylvanian Basin. By such valleys through the highland barrier, railways join Transylvania with the lower south-western lands of Rumania.

Only the greatest elevations of the Transylvanian Alps show jagged outlines due to glaciation, and lower are broad, undulating plateaus which bear alpine pastures; to these large numbers of sheep migrate in summer from Walachia. Below the alpine pastures is the zone of forests of pines and beech, and in the lower and wider parts of the valleys, near the margins of the highland, chestnut trees and the vine are grown.

Near the western end of the Transylvanian Alps is the upper valley of the Jiu and the basin of Petrosani, floored by Tertiary deposits from which lignite is obtained.

A rift-valley separates the Transylvanian Alps from the Banat Mountains, and through this valley, north of Orsova, runs the

railway which connects central Europe with the lower Danubian lands (refer back to Fig. 20).

The Banat Mountains contain a variety of structures : there are ores of iron, copper and other valuable metals and deposits of anthracite. Hence, metallurgical industries have developed at Resita, and here are the greatest iron and steel works of Rumania, where armaments and railway equipment are made.

South of the Banat Mountains there is no real break between these highlands and their southward continuation across the Danube to the Balkan Mountains. The mountain barrier is cut by the Danube only by a series of gorges, which stretch downstream for about 60 miles till Orsova is reached ; below that town are the rocks and rapids of the Iron Gate, where a side-canal has had to be cut to allow the passage of the small number of river craft which pass from the middle to the lower courses of the river.

The West Transylvanian Highlands.—North-west of the Transylvanian Alps is the valley of the Mures (Maros), a rather wide corridor, fertile and well populated. On the farther side of this valley rises the confused area of highlands and uplands, to which the only convenient general name seems to be the West Transylvanian Highlands. Here the rounded granitic Bihor Mountains reach about 6,000 feet. Igneous rocks and volcanic activity are associated with mineral deposits in two or three places, and small industries have developed at Zlatna. For the rest, the scattered population depends on forestry and farming.

East Alpine Foothills and Middle Danubian Uplands.—*The East Alpine Foothills.*—The crystalline rocks of the Alps sink down eastwards and are covered by limestones, sands and clays, in which rivers have carved their valleys and formed a very irregular relief. The forests which cover the ridges consist mainly of beech, and on the lower slopes chestnuts have been planted. The valleys are utilized for agriculture ; and fruit and vines are grown. Where the Mur enters this region is the town of Graz, a market for the exchange of the products of the Alps and the lower lands, and a centre of manufacturing which, with the trade, supports a population of 200,000 persons in and around the town.

On the southern margin the Sava issues from the Alps, and here is the town of Lyublyana ; at this point the route of the Sava valley is crossed by that from the head of the Adriatic Sea.

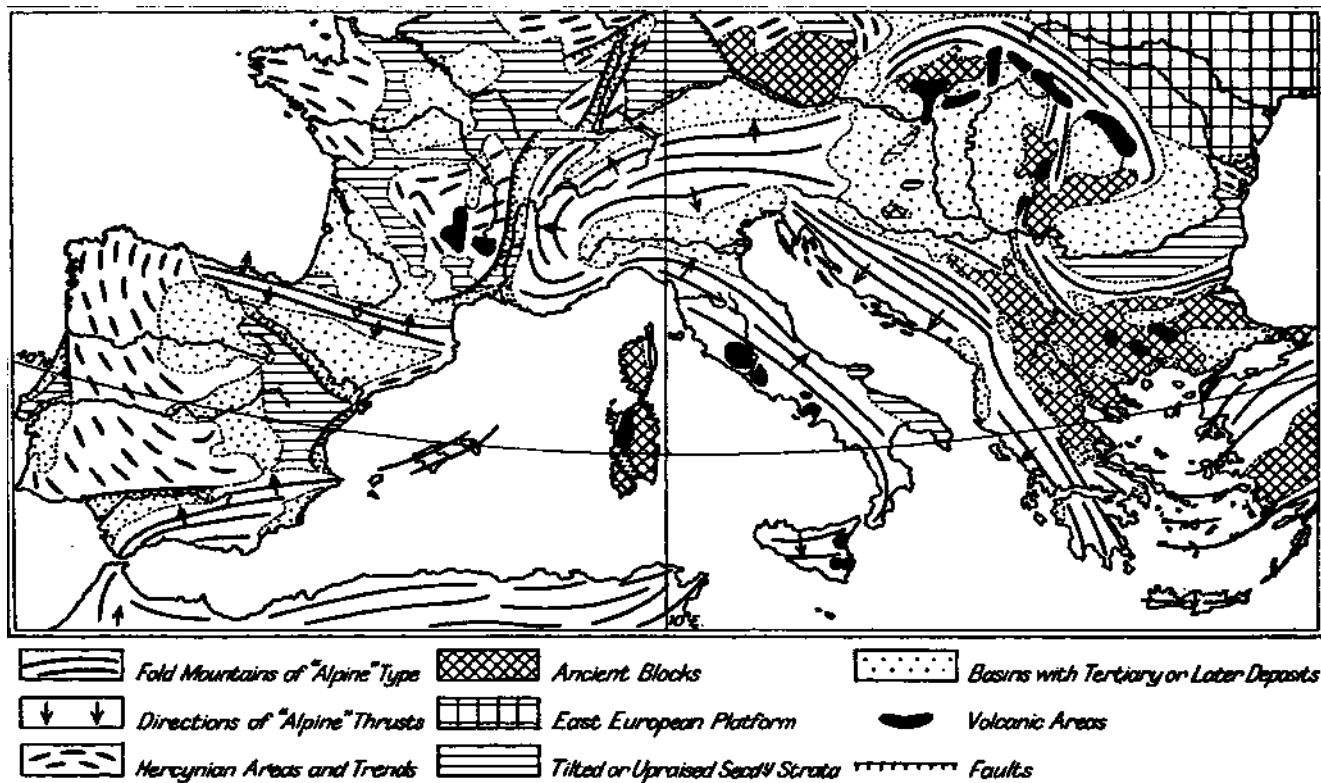


FIG. 58.—STRUCTURE OF SOUTHERN EUROPE.

The Middle Danubian Uplands.—Between the Drava and Sava the Croatian-Slavonian Upland from the Alpine margin stretches south-east; its highest parts are formed of upthrust masses of crystalline rock and are mainly wooded; the lower slopes have orchards and vineyards. From the lowlands north of the Drava rises a small massif, the Mecsek Heights, which also bears woods and vineyards, but the relatively old rock of which it is composed has some deposits of coal; these are of particular value to the State of Hungary, in which there is a lack of minerals, and under the faulted edge of the upland has grown up Pecs, one of the few industrial towns of Hungary.

The Bakony Forest is a somewhat similar upland, whose long, faulted south-eastern edge descends steeply to the depression in which waters of the shallow Lake Balaton have accumulated. Other smaller hill-areas continue the line of the Bakony Forest to the north-east, until there rises a volcanic mass, through which the Danube has cut a picturesque gorge just before the river turns from its easterly to its southerly course above Budapest.

Beyond the Danube gorge the upland continues gaining in width and elevation, and in the volcanic mass of the Matra Mountains it reaches about 3,500 feet. On the northern side of these uplands lignite is found. Farther to the north-east, where the River Sajó breaks through the volcanic belt, more lignite is found, and also some iron-ore deposits, by which are situated large ironworks. The Matra Mountains and the volcanic belt shut in, on the north-west, a long fertile basin between them and the North-western Carpathians; this hollow is drained by the Rivers Ipel and Sajó to the Danube and Tisza respectively. Its north-eastern end affords a route up the valley of the Hernád, a tributary of the Sajó; in this valley is the industrial centre Kassa (Kosice).

The Middle Danubian Lowlands.—*The Moravian Corridor.*—The name Moravian Gate is applied to the narrow hollow between the Sudetes Upland and the Western Beskides, while to the south-west, between the Bohemian Massif in general and the broken line of ridges which link the Alps with the Carpathians, extends a longer and broader lowland area; this is drained to the Danube by the Morava and its tributaries, and it may conveniently be called the Moravian Corridor. An

extension of the corridor across the Danube is known as the Vienna Basin, since that city is situated on its edge.

Much of the broad corridor is floored by deposits of Tertiary age, on part of which loess has been laid down, and in general it is a fertile region with a wide variety of products. It is not by any means a uniform country, for from the lowland rise lines of wooded, sandstone hills, while as other exceptional features there are the marshy valleys of the Danube below Vienna and of the lower Morava.

The break between the Alpine and Carpathian Highlands is of the greatest commercial significance, for it gives an easy route for traffic to accompany the Danube from its upper to its middle course, and to link central to south-eastern Europe. Where the river skirts the north-eastern extremity of the great Alpine barrier is Vienna, situated at the meeting-place of this north-west to south-east route with another at right angles, viz. from the Adriatic Sea and northern Italy through the Moravian Gate to the Baltic lands and north-eastern Europe.

Vienna was the capital, and was situated almost in the centre, of the great Austrian Empire ; when the Empire broke up in the War of 1914-18 Vienna remained the capital, though almost on the frontier, of the much smaller State of Austria, until in 1938 this was incorporated into the German Reich.

When it was the residence of powerful rulers, Vienna became a centre of science and the arts, particularly of music ; as a seat of Government and a meeting-place of routes it attracted commerce and industry. Thus before the War of 1914-18 its population was over 2 million persons. The small new State of Austria, however, did not require, nor could it support, such a large capital as the old Empire, and now the city is only the administrative centre of the Austrian province of Germany ; the population has declined and is now less than 2 millions.

In the Moravian part of the Corridor there are several large towns, notably along the north-western margin, where there are trading centres on the routes into Bohemia and through the Moravian Gate. The largest of these towns is Brno, with about a quarter of a million inhabitants. Here, as well as in other towns along this border of the Bohemian Massif, are industries aided by coal both from the Upper Silesian coal basins and also from those of the Massif.

The Upper Hungarian Basin.—This region almost corre-

sponds to the lowland drained to the Danube between two gorges; the upper is that where the river cuts through the south-western extremity of the Little Carpathians above Bratislava, and the lower is that where it breaks through the barrier of the volcanic uplands above Budapest. In this broad subsidence basin have been laid down from Tertiary times onwards varied deposits, mainly of sands and clays, and including loess ; on these are grown wheat, maize, sugar-beet and fodder crops. Where the side-streams meet the Danube, however, there is a great accumulation of sand and mud, which is liable to flooding, and of which only a part has been utilized. The Danube itself divides into three main channels, enclosing a great " island " which has gradually been reclaimed, mainly for keeping cattle and horses and to some extent for cultivation of grain and vegetables.

The Lower Hungarian Basin.—Apart from the emergent uplands already dealt with, tracts of three main types are found in the great basin drained by the Danube between the gorge above Budapest and the narrows which end in the Iron Gate : (i) the West Danubian Plateau, of moderate relief and with a climate of central European type ; (ii) the wide East Danubian Plains, in general of less-marked relief and of more arid character ; (iii) between and interrupting these regions, the broad and naturally swampy valleys of the Danube and of the lower courses of the Drava, Sava, Tisza, Mures and other smaller rivers.

Just below the gorge where the Danube enters the Lower Hungarian Basin is Budapest, the capital of Hungary. It consists of two parts : Buda is on the high, right bank of the Danube, where the heights come to the river's bank and give a favourable site for an old fortress ; Pest is on the low, left bank, and was a market-place for the products of the Danubian Plains. Budapest has spread out widely, having grown particularly with the reclamation and improvement of the plains and the construction of railways which collect much of their produce at this centre ; the whole conurbation numbers about 1½ millions of inhabitants, in spite of the check due to the partition of Hungary.

The West Danubian Plateau is mainly undulating country, rather similar in its build, soils, climate and productions to the Upper Hungarian Basin on the other side of the Bakony Forest. In the southern portion, however, the summers become hotter,

and in some parts growing of maize and melons becomes characteristic, while in other areas drought may be frequently experienced. Where the Sava enters the Lower Hungarian Basin from the East Alpine Foothills is Zagreb; it is on the route which connects the Danubian lands with the Adriatic ports of Fiume and Susak.

The East Danubian Plains.—This is the region of which the greater part is sometimes known as the Alföld, while the southeastern area adjoining the Banat Mountains is called the Banat Lowland. In climate, scenery and the type of land-utilization the East Danubian Plains are transitional to the steppes of southern Russia.

The temperatures tend to extremes, particularly felt when violent winds, blowing without hindrance across the great plains, bring snowstorms in winter and burning heat in summer.

Only on the margins of the region where there is more rain, and in those districts where the soils collect or conserve more moisture, is the water-supply sufficient for tree life; hence over the central areas stretch the open, treeless plains of the Pussta.

Although on the Carpathian borders many streams have cut their valleys, and although the great rivers have clearly marked flood-plains, over much of the country the relief has been smoothed by a thick mantle of fertile loess. From the point of view of the farming resources, however, this area has been reduced by the liability to flooding in certain districts, particularly near the north-western part of the course of the Tisza and between the lowest reach of the Tisza and the Danube (see Fig. 56). Moreover, at a past period sand was formed and blown into dunes which covered much of the area between the Danube and the Tisza and the country in the angle formed by the northernmost part of the course of the Tisza. Now that the climate is not so arid, vegetation has grown upon the sand and checked the movement of the dunes, but they are still the characteristic features of much of those two specified areas.

The fertile loess plains have now become great fields of wheat and maize, but after the harvests are reaped, the stubble-fields again give to the country its steppe-land appearance. Maize is the common food of the people and is fed also to enormous numbers of poultry and pigs; wheat was sown as the main crop on the large estates of the wealthy landowners, and grown for export. Cattle, sheep and horses are widely reared, but they

are now generally fed more upon sown grasses or other crops than upon natural pastures.

The loess lowlands which are liable to flood have been in part protected by dyking and draining, but where the rivers may still spread out over the country, only pastoral work can be carried on.

The sandy regions have also been considerably developed, but the absence of streams in these regions has made this work largely dependent upon the construction of deep wells.

Scattered over the great plains are a number of large towns, or perhaps one might say huge over-grown villages, for although their populations in several cases number about 100,000 persons, they sprawl loosely over wide areas ; a large proportion of their inhabitants are the farming families who work the surrounding lands, or are shopkeepers or merchants dealing in the products or the requirements of the farming folk. Some of these towns, however, are also the railway junctions and serve a wider area. The largest of such settlements are Subotica and Debrecen.

The Rivers and Flood-plains.—The Danube and its tributaries flow with complicated meanders or side-channels through broad valleys, normally marshy and frequently flooded, set with great thickets of reeds and clumps of alders and willows. In parts of the basin canals have been constructed across the plain to facilitate drainage, and some of these, like the larger rivers, are, or should be, navigable. But systematic control of the waterways is necessary to keep the courses clear, especially in the later part of the dry summers, and to prevent flooding when the melted snows from the surrounding highlands add greatly to the volume of water in spring. This work would require a unified control of the whole of the basin, but when, in 1918, Hungary was divided up, the river control was disorganized and traffic in general declined.

Budapest, however, carries on a good deal of trade by water, and Szeged, near the junction of the Tisza and the Mures, is the second largest town of Hungary. Belgrade (Beograd), at the junction of the Sava and Danube, is essentially a border city of the Balkan Peninsula.

The Lower Danubian Lands.—The surface conditions give the basis for a threefold division of these lower Danubian lands : (i) Walachian Hill-lands adjoining the Transylvanian Alps ; (ii) the Walachian Plains, widening towards the east and including the Dobrogea across the Danube in the angle between the

lowest part of its valley and the delta; (iii) the broad valley and the delta of the Danube,

The Walachian Hill-lands.—This area is relatively well watered and has been fairly deeply dissected by the streams from the Transylvanian Alps ; consequently there is a marked difference between the ridges, to a considerable extent still forested with oaks and other deciduous trees, and the valleys utilized for cultivation and settlement. In these valleys there are alluvial terraces, on which cereals are grown, while vines and fruit trees cover the slopes.

An important oilfield is worked in the hill-lands adjoining the Transylvanian Alps north of Ploesti; at this town, as well as elsewhere on the field, are great refineries, and pipe-lines convey the oil for export to the port of Constanta (Constantza) on the Black Sea, and for home use to the river-port of Giurgiu on the Danube, and to the capital, Bucharest.

The Walachian Plains.—Here a scanty rainfall makes itself manifest, and this area, together with the Dobrogea across the lower Danube, must be regarded as a distinct sub-region and grouped with the Steppe-lands of eastern Europe.

Except in the rather shallow valleys in which recent alluvium has been laid down and where cultivation has assumed varied forms, the wide plains are generally covered with loess and have a monotonous appearance.

The better-watered areas are very productive and support many people, who grow wheat and maize for their own consumption, and oats and fodder crops for the sheep, cattle and horses, which they keep in considerable numbers. Other parts are relatively barren, and in the east is a region still known as the Baragan Steppe ; indeed, there are districts bordering the larger valleys where the wind has blown the finer river sand across the plains and formed miniature deserts.

Almost in the middle of the plains region is the capital of Rumania, Bucharest (Bucuresti), from which roads radiate in all directions ; it has become the commercial as well as the political centre of the country, and its population is well over half a million persons.

The Dobrogea.—This is a low plateau formed of a block of ancient rock whose surface is partly covered by loess ; the porous soil increases the aridity due to low rainfall, and the natural condition is that of steppe-land. Although an increasing area

is cultivated or used for pasture, it supports few people, and the only town of any size is the port of Constanta.

The Danube Valley and Delta.— A complete contrast to such districts is afforded by the broad valley in which the Danube meanders and in parts forms a network of channels. In spring much of the region may be flooded.

Lakes, marshes and floods render the wide valley a serious obstacle to traffic, and only one railway crosses the Danube in the whole of its lower course ; this is at Cernavoda, on the line between Bucharest and Constanta.

In its northward reach the lower Danube valley widens considerably, and after receiving the Seret and Prut, the river turns eastward and forms a great delta as it deposits its load of mud in the Black Sea. The delta is shut off from the sea by a sand-spit through which the northernmost of the three main channels discharges the greater part of the river water. The middle channel has been straightened and used for navigation, and the chief ports are Galati (Galatz) and Braila, at the head of the delta. These ports export mainly wood from the Carpathians and grain from the plains of Rumania, but are closed by ice for several weeks in the winter.

Owing to the obstacles to navigation in several parts of its course, the Danube has less importance as a highway of communication than its great length might suggest, its value being further diminished by the fact that it flows, not westwards from central Europe to the open ocean, but eastwards to an almost enclosed sea.

QUESTIONS

1. Give a brief account of the relief and the associated structure of the Carpathian Highlands.

2. Show how the physical geography of the North-western Carpathians (including the Ore Mountains) is related to the means of communication and the occupations of the people of this region.

3. Describe the Moravian Corridor (including the Moravian Gate and the Vienna Basin) from the points of view of its internal conditions and its relations with other regions.

4. Make a systematic study of the physical and economic conditions of the Transylvanian Basin.

5. Give an account of the climate, and show how it is related to the farming, of the Upper Hungarian Basin.

6. Compare and contrast the West Danubian Plateau with the East Danubian Plains.

THE BALKAN PENINSULA

THE Balkan Peninsula appears to be such a tangle of mountains and valleys that before giving a description of its constituent regions, it will be convenient to examine its relief and routes, and refer also to its climate and vegetation, in general.

Relief and Routes.—If the geological structure is ignored, a map showing only elevation of the land would suggest that the South-eastern Pre-Alps are continued behind the Adriatic Coast. Three regions may here be distinguished : the irregular coastlands of Dalmatia ; the high plateaus of Karst formation, including the Dinaric Alps ; the mountains and valleys, inhabited by Croats and Serbs, which drain eastward to the Sava and Morava tributaries of the Danube (see Fig. 59). From the Karst Plateau region only one river of any size, the Neretva (Narenta), drains westward. The only important routes from the interior to the coast are where the mountain barrier is narrowest, in the extreme north-west; here are the ports of Trieste, Fiume and Susak.

Farther south, the coast changes its direction : Albania approaches the " heel " of Italy, and at the Strait of Otranto the entrance to the Adriatic is almost closed. Behind the coast lie the Albanian Lowlands, and behind this region is an almost chaotic group of mountains, valleys and basins, situated partly in Albania and partly in Macedonia, the latter being a rather vaguely defined area politically divided between Yugoslavia and Greece. Through Macedonia the valley of the River Vardar runs almost back-to-back with that of the Morava, and the two valleys together form the main route between central Europe and the Ægean Sea at the port of Salonika or Thessalonike (refer back to Fig. 20).

A partial submergence of the whole area around the Ægean Sea has caused the drowning of all the lowlands, while the surrounding ranges become lower and break up into peninsulas and islands, such as Krete and Rhodes (Rodi); on the farther side of the Ægean Sea they again appear as mountains in Asia Minor (see Fig. 58).

Returning to the north of the Balkan Peninsula, we note that the Banat Mountains curve round into the Balkan Mountains (or Stara Planina), and between these and the Danube is a rather low plateau region. South of the Balkan Mountains rises the great mass of the Rodopi (Rhodope) Mountain region, the highest of the Balkan Peninsula, reaching about **10,000** feet.

Between the Balkan and Rodopi Mountains are two important basins, the higher and smaller being that of Sofia, and the lower and more extensive that of Plovdiv (Philippopolis); through the latter runs the River Maritsa, which then turns southward through the Edirne (Adrianople) Basin to reach the *Ægean*. These three basins form parts of the mainland route between Europe and the Near East, for the "Orient Express" line (again refer to Fig. 20) leaves the Danubian lands at Beograd, goes up the Morava valley to Nis (Nish) and thence south-east by the tributary Nishava; it next crosses the water-parting into the Sofia Basin, and then another water-parting to the Maritsa valley, which it follows through the Plovdiv Basin and into the Edirne Basin; finally it passes into the Marmara region and reaches Istanbul (Constantinople), the historic meeting-place of West and East.

In a past geological age there was here a continuous land-bridge between Europe and Asia, but the subsidence of the whole region transformed what were then river-valleys into the present straits of the Bosphorus and the Dardanelles, which join the Black Sea to the Sea of Marmara and the *Ægean*.

North of the Marmara region are the lands which look out, as it were, to the Black Sea, and have climatic similarities with the other regions on the European shores of this sea. Also, there is the fertile valley of the upper River Tunja, which lies sheltered and confined between the Balkan Mountains and a narrow offshoot called the Anti-Balkan range. The River Tunja does not, however, continue its eastward course from this valley to the Black Sea, but turns abruptly southward to join the Maritsa.

Climate and Vegetation.—The broad bulk and the generally considerable elevation of the northern part of the Balkan Peninsula have the effect of prolonging the "temperate" climate conditions far into southern latitudes; only those regions of **the** south and west which are directly influenced by the

Adriatic, Ionian and Ægean Seas have the characteristic Mediterranean climate.

The temperate type of climate is exemplified in the meteoro-

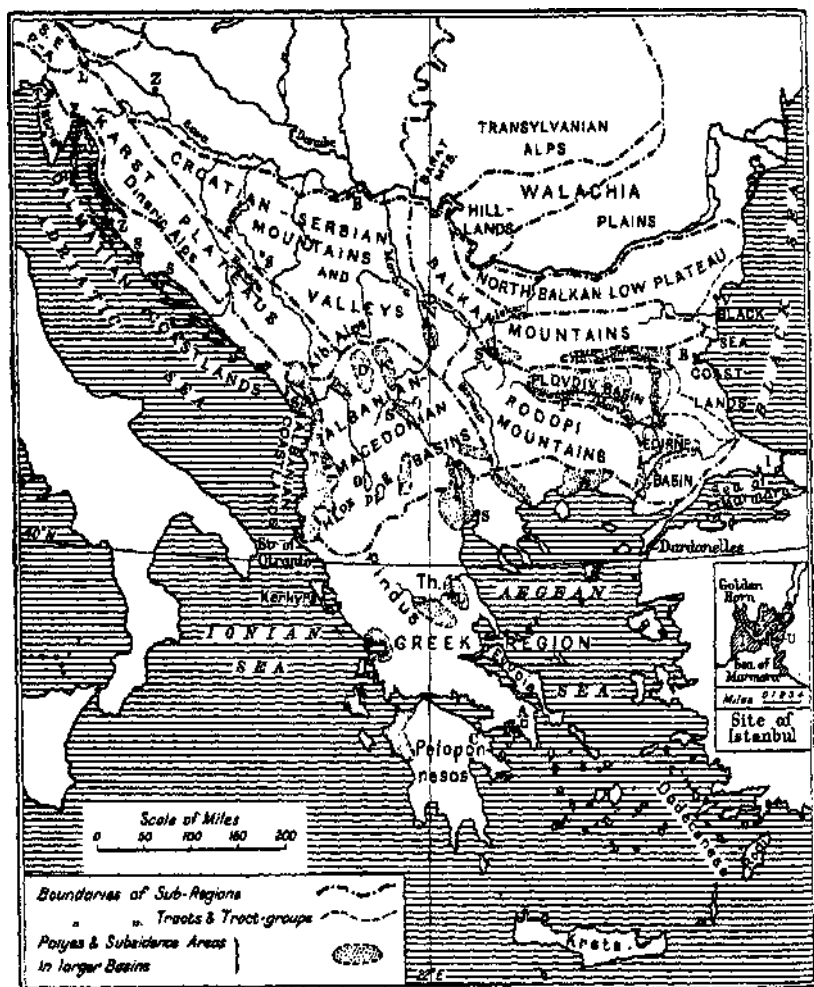


FIG. 59.-REGIONS OF THE BALKAN PENINSULA.

logical records for Sofia. Here, in the heart of the peninsula, and in an enclosed basin 1,800 feet above the sea, are temperature conditions very similar to those of Budapest, for the more southerly latitude is counterbalanced by the greater elevation;

in respect of rainfall, also, there is but little difference between Sofia and Budapest (see the figures on p. 26).

Yet within this northern or non-Mediterranean part of the Balkan Peninsula the variations of altitude are so considerable that the local climates dependent upon elevation are accompanied by marked contrasts in the natural vegetation. In the valleys and basins this has been displaced or largely modified by cultivation or by the use of the land for pastoral purposes, but the slopes and highland areas are still partly covered by forests, "mixed" at moderate elevations and coniferous at higher levels; an alpine zone of low growths is found in the highest parts of the Dinaric Alps and the Rodopi Mountains.

In the highlands of Albania and Macedonia these climatic conditions and their associated forms of vegetation continue far to the south between the Ægean and Adriatic areas and form an indefinite boundary between the regions which can be clearly distinguished as "Temperate" and "Mediterranean" respectively: even the Pindus Mountains of Greece show rather similar characteristics, although they rise from the clearly Mediterranean part of the Peninsula.

The true Mediterranean climate and life-forms are indeed only found on the lower slopes of the coastal mountains, and in the adjoining valleys and plains. Yet this Mediterranean region is situated so far southward, that on the lowlands it has its full development of winter warmth and summer drought. Accordingly the figures for Athens (as given on p. 26) show remarkably high temperatures both in summer and winter; also, while the total annual rainfall at Athens is only 15 inches, that of the three summer months combined is less than one-tenth of this amount. With such climatic conditions, trees of the evergreen, hard-leaved type form woods in situations where man has not destroyed them, but maquis and expanses of thorny shrubs, such as thistles, are common.

Along the Dalmatian coast the Mediterranean conditions extend exceptionally far to the north, for in the Adriatic Sea currents flow in a counter-clockwise direction and take warm waters northward along the coast, while the great mountain barrier of the Dinaric Alps is at least a partial protection from the winds which would otherwise bring cold air from the north-east in winter time. Yet the Dalmatian coast-lands are occasionally visited by a bitterly cold north wind, the Bora, which comes

down from the Karst Plateau region, and is produced in the same way as the Mistral of southern France.

On the eastern side of the Balkan Peninsula, open both to the north and to the east, the true Mediterranean conditions give place before greater winter cold, and save in exceptional spots the olive extends only as far as the shores of the Sea of Marmara. The Black Sea coast-lands show a transition towards the steppe type of climate, and while woods are found on the higher lands, the chief natural growths of the lower country are drought-resistant shrubs and the spring-flowering herbaceous plants and grasses.

Constituent Regions.—*The Dalmatian Coast-lands.*—In the north-west of the Balkan Peninsula the limestone mountains of the South-east Pre-Alps are continued behind the Adriatic sea-board, with folds running in a north-west to south-east direction (refer back to Fig. 58). The structure is, however, more complicated than this statement alone would suggest, for in the coastal area there have been overthrusts, faultings and sinkings, which have produced the succession of peninsulas and gulfs, islands and inlets, small coastal plains and precipitous cliffs which make up the Dalmatian Coast-lands region.

On either side of the plateau of Istria deep gulfs allow ships to reach the narrowest part of the mountain barrier. Here the ancient city of Trieste flourished while it was the outlet of the Austrian Empire, but when this broke up and Trieste passed to Italy, its commercial significance declined, although industries have been developed under the new regime and the city has a quarter of a million inhabitants. Similarly, Fiume became important as the port of Hungary, but when that country lost its sea-board and Fiume became Italian, the trade decreased. The suburb of Susak, however, remained in the hands of Yugoslavia and has become the chief port of that State.

As the highlands rise steeply behind much of the Dalmatian sea-board, there are relatively small areas of productive lowland. The slopes are in part well forested, and timber is sent out from several ports, but cultivation is mainly limited to the islands, the Istrian peninsula, the coastal lowland between Zara and Split and terraces on the hills bordering the sea. Maize, wheat and barley are the cereals; vineyards and olive-yards are scattered along the coast.

Fishing, as well as cultivation, is the work of the people in

many villages ; moreover, an increasing number of visitors from other lands are attracted by the beauty of the scenery.

Bauxite (from which aluminium is prepared) is obtained from the Istrian Peninsula, the inner margin of the Zara-Split lowland and at some points farther south ; it is exported from Split and Sibenik. There is but poor railway communication inland from these ports ; hence, although industries are now being developed, the trade and population are not great.

The Karst Plateau Region.—Behind the coast-lands, the fold-mountains have been peneplained and subsequently uplifted, with the result that steep walls of rock bound high plateaus, which in the south reach 8,000 feet above sea-level. The limestone of which they are mainly formed has been but little dissected by surface streams, and much of the drainage is underground. Deep gorges cut the plateaus, and in some of them rivers issue from the depths and after a course of some miles disappear into subterranean tunnels and caverns. The surface is occasionally pitted by dolines, i.e. solution hollows, and in these there is generally an accumulation of soil, reddish in colour and clayey in composition, which has remained when the limestone has been dissolved away.

On the plateau levels the permeable surface is commonly dry, in spite of a heavy rainfall, and with the coldness of the winters conditions do not favour vegetable growth. Poor pastures on which feed sheep and goats, but relatively few cattle, are the main resource of the higher areas, though in dolines and some valleys cultivation can be carried on. There is little mineral wealth, though bauxite is quarried near the Neretva valley, which enables it to be conveyed to the coast for export. The gorge-like valleys generally hinder rather than help communication, and the population is small.

The Croatian-Serbian Mountains and Valleys.—Behind the Karst belt the structure is more complicated; eastward the limestones are less pure, and are then succeeded by older rocks, including granites. With the greater variety in the bed-rock the soils improve, and with the lower elevation the country becomes more habitable. The higher areas bear forests, in which oaks are specially valuable, both for their timber and also for acorns which give food for the many swine kept in these districts. As the valleys become lower and broader towards the Sava and Morava, agriculture becomes the main occupation :

maize, wheat and potatoes are grown on the level lands, and on the slopes are plum, mulberry and other trees, and vines. The older rocks contain a considerable variety of minerals: zinc, iron, lead and manganese are worked at several places, but although some coal and lignite are also found, there is a lack of suitable fuel for smelting, and consequently there is little industrial development beyond some chemical works.



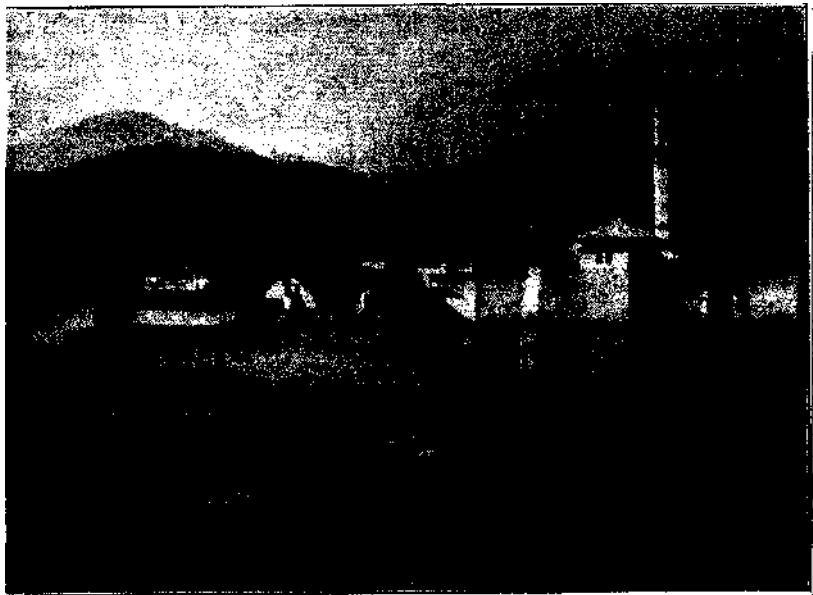
[Royal Geographical Society.]

FIG. 60.—VIEW ON THE KARST PLATEAUS.

Note.—The view shows how the almost level surface of the plateau is cut by steep-sided valleys which make communication very difficult. The photograph was taken in spring when the snow had almost melted, and it may be seen that little vegetation exists. The almost vertical walls of the valley, above the screes, are bare, and expose the strata which form the plateau.

The productive valleys lead down to the Sava and Morava and along the valley of the latter river comes the traffic from the Mediterranean and the East; consequently the district where the two rivers meet the Danube is the focus of routes both from all parts of Yugoslavia and from a much wider area. Beograd, with an elevated site above the junction of the Sava and Danube, is therefore well placed as the capital of Yugoslavia; as a political and commercial, and to a less extent industrial, city it is the centre of a conurbation of over 300,000 persons.

The Albanian Coast-lands contrast with those farther north in showing less effect of subsidence and having considerable areas of recent formation. The region is in part alluvial with swamps and lakes, and in part consists of low hills covered with maquis. In recent years reclamation has allowed the extension of the cultivable land, and farming has now outweighed the winter pasturing for which alone the Albanians earlier utilized the region. Maize is the chief grain crop, while tobacco is grown in



{Royal Geographical Society.

FIG. 61.—VIEW ON THE RIVER BOSNA.

Note.—This is a scene in the higher part of the "Croatian-Serbian Mountains and Valleys" region; there is here but little agricultural land, and the forests are the chief resource of the area. The minaret shows that in this district of Yugoslavia the people are Mohammedans.

the north and some rice and cotton in the south. Olives and mulberries are obtained, and in the warmer parts oranges and lemons. The towns are small: Shkodra (Scutari) has only about 25,000 people, and the capital, Tirana, has still fewer inhabitants.

The Albanian-Macedonian Highlands and Basins.—The Karst Plateaus and the adjoining Serbian Mountains end southward in heights, sometimes called the North Albanian Alps, which overlook a series of relatively low areas lying between the north of the Albanian coast-lands and the upper Morava valley. This

series of lowlands comprises the basin in which Lake Shkodra (Scutari) is situated, the north-easterly part of the valley of the River Drin, and the two basins of Djakovica (Diakova) and Kosovo (" D " and " K " in Fig. 59). These depressions afford a moderately easy way across the highlands, and to them collectively has been given the name of the Albanian Gap.

Towards the south and east of the Balkan Peninsula appear more of such basins, known as polyes. They have been formed probably by subsidence as well as solution ; they are often bounded by steep walls, and in them water tends to collect. Lakes have commonly resulted, and in some cases still remain, e.g. Ohrid and Prespa on the borders of Albania and Macedonia. In most cases, however, the lakes have disappeared and their beds yield soils which, though liable to floods, give almost the only extensive areas for cultivation and settlement in the highland regions.

South of the Albanian Gap there is a complicated mass of mountains, difficult to cross. The western part is Albanian, and here the structure is like that of the Dinaric Alps to the north. The eastern part is in Macedonia, where granites and other crystalline rocks predominate, as the area forms part of the great mass of ancient rock which lies between the folds of the west of the Balkan Peninsula and those of the Balkan Mountains proper ; in this block, sometimes known as the Rodopi Massif, minerals have been found, and there are also considerable areas of recent eruptive rock.

The highlands, especially in the Albanian portion, have an irregular relief, and the country often has a wild and savage appearance. It is mainly used for the summer pasturing of sheep, goats and cattle. The polyes are the sites of all the important settlements ; in them are grown maize and wheat, the vine and fruit trees, while in sheltered areas in the south even olives are produced.

Petroleum has been found in the marginal district between the highlands and the southern part of the Albanian coast-lands; some copper is obtained, and chromium and other metals are known to exist in the mountainous parts of the region, but mining and industries have not been developed to any considerable extent.

The Balkan and Rodopi Mountains.—The Balkan Mountains which curve southward from the Danubian gorges increase in

height till, where they run parallel with the river, the highest ranges attain a height of nearly 8,000 feet. The foldings have involved rocks of varied age and composition, and in them are some mineral ores and lignite deposits. In the small portion belonging to Yugoslavia in the north-west considerable amounts of lignite and copper are mined.

The ranges are cut by a number of river valleys, and half a dozen passes lead roads across from the north to the south of Bulgaria. Forestry is carried on, and animals are sent up to pasture during the summer, while in the valleys there is mixed farming.

The Rodopi Mountains rise higher, and since they are relatively flat-topped there are wide elevated areas on which the only vegetation is of the sub-alpine or alpine type. The slopes, however, are well wooded, and forestry, with the production of charcoal and the sawing and working of timber, is the principal resource of the small population. There are a few fairly wide valleys, notably that of the River Struma, but in the main the upland edges are cut only by small streams.

The *Sofia Basin*, situated between the Balkan and Rodopi highland regions, is on the great route from central Europe to Istanbul and the East, while the Iskar and Struma give passages to northern Bulgaria and the Ægean Sea respectively. Due to this nodal position, the city of Sofia has had a long history, and it is now the capital of Bulgaria, with 300,000 people.

The soil conditions of the elevated basin, however, are not favourable and the climate may be rather severe ; the chief grain crop is a hardy mixture of rye and wheat, and potatoes and vegetables occupy much of the cultivable land, though in the more sheltered positions there are extensive orchards.

The Eastern Lowlands.—This is the part of the peninsula which is distinguished by steppe-like or almost steppe-like conditions. Together with the Walachian Hill-lands, it forms part of the sub-region of Temperate Europe called the "Drier South-eastern Lowlands," marked "10" in Fig. 21, and it comprises the following areas. The *North Balkan Low Plateau* is formed of almost horizontal layers of limestone, which give a uniformity in scenery, although in parts layers of clay and loess add greatly to its fertility ; on the great plains maize and wheat are produced in large amounts. Only in a belt of foot-

hills adjoining the Balkan Mountains is there any marked variety in relief and any extensive growth of trees.

The *Black Sea Coast-lands* are varied in structure and relief. The higher lands have oak woods, low scrubby growths and poor pastures used mainly for sheep, but the lower lands are cultivated with barley, wheat and maize, and fruit trees. Situated by inlets due to subsidence are Varna and Burgas, the two ports of Bulgaria ; the latter has the greater amount of trade because of its more direct railway communication with the chief towns, Plovdiv and Sofia.

The *Plovdiv Basin*, open only to the east, has rather extreme temperatures and a low rainfall; consequently its most prosperous agriculture depends on the natural water-supply being supplemented by irrigation. With this help the meadows yield good pasture, the fields bear wheat, tobacco and even some rice, and the slopes have orchards of warmth-loving fruit. Plovdiv, on the banks of the River Maritsa, and on the main commercial route, has over 100,000 inhabitants.

Communicating with this basin, and sheltered from the north by the Balkan Mountains, is the narrow but very fertile valley of the upper Tunja ; it is famous for extensive gardens of roses, from which scent is distilled.

The *Edirne Basin* is the southernmost of the steppe-like Eastern Lowland regions. Cultivation, mainly of barley and rye, has not widely developed, except in the river valleys ; in these, however, even cotton and rice are grown to a limited extent, for the summer heat is considerable. The basin is drained by the lower River Maritsa, which forms the boundary between Greece and Turkey ; Edirne, at the junction of the Tunja and the Maritsa, is in Turkish territory.

The Marmara Region.—The main significance of this region, situated along the north-western shores of the Sea of Marmara, lies in its position at the crossing from one continent to another.

Near the southern end of the Bosphorus, a small inlet known as the Golden Horn gives good harbourage, and here in ancient times arose the city of Byzantium, later called Constantinople ; when the Roman Empire was divided into two parts in A. D. 395, the city became the capital of the Eastern or Byzantine Empire as well as the centre of the Eastern or Greek Church. For many centuries it was the focus of the civilization and trade of

all the lands around the Eastern Mediterranean. In A.D. 1453 it was captured by the Ottoman Turks from Asia Minor, and its trade declined ; in recent centuries its chief importance was in being the capital of the Turkish Empire, which extended far into Europe. When, after the war of 1914-18, the Turkish territory in Europe was restricted to its present small limits, the capital of Turkey was removed to Ankara in Asia Minor, and the old capital, now known under its Turkish name of Istanbul, lost much of its significance.

Yet Istanbul still has a population of nearly a million, if the suburbs of Galata and Pera on the opposite site of the Golden Horn, and Uskudar (Scutari) across the Bosphorus, are included. The city has a markedly Oriental appearance, with the numerous cupolas and tall minarets of its mosques.

The Greek Region is that which is most truly Mediterranean in character. On the mainland it almost coincides with the political territory of Greece, and it includes the iEgean islands.

The region is composite, in that it is formed in the main of three types of country, distinct in character, though intricately associated in situation. First, there are the mountainous areas, broadest and highest on the mainland, but reappearing on the larger islands. They are usually rugged in their relief, and have only a sparse population living in small villages in the valleys ; on the heights are summer pastures for sheep and goats which winter in the adjoining lowlands.

In marked contrast are the low and level basins ; the largest of these afford relatively extensive lowlands, e.g. by the lower courses of the Struma and Vardar, by the northern coasts of the Ægean, in the plains of Thessaly (marked " Th " in Fig. 59) and by the Ionian Sea. They have the possibility of considerable agricultural production ; wheat, and to a less extent, barley and maize, are grown, particularly in Thessaly, and tobacco on the northern plains. But marshes have in the past covered extensive areas, and, as in many of the Mediterranean lowlands, the mosquitoes which bred in the marshes made malaria a very serious scourge to the population. Now drainage is being carried out, malaria is being reduced, and cultivation, even including in some parts cotton, is being extended.

The third important type of country is that of the hilly coastal areas of the mainland and the islands. Such areas may have small lowlands, though for long stretches they are formed by

slopes terraced for cultivation. ' Cereals are grown, but the characteristic production is of olives, tobacco, grapes and other fruits. The grapes are in part used for the making of wine, in part dried and exported ; currants are obtained mainly from the southern shores of the Gulf of Corinth (whence the name " currant " was derived) and the neighbouring coast-lands of the Ionian Sea, and sultanas mainly from the island of Krete.

The other fruits include figs, locust beans, oranges, mandarines, and the lemons which are grown chiefly in the southernmost districts. On the northern shores of the *Ægesm* Sea mulberry trees are grown and silk-worms are reared ; the cocoons are mainly exported to the silk mills of western Europe.

Minerals, including iron, emery, magnesium, chromium and lead, are obtained in several parts of Greece, but in no large quantities ; industrial development is handicapped by a lack of fuel, though lignite is found on the island of Ewoia (Euboea) and the neighbouring mainland.

Fishing is another resource. Moreover, the people are further encouraged to become seafarers by the fact that the land traffic is hindered by the highlands of the interior and by mountainous spurs which reach the sea and almost isolate the more productive basins ; on the other hand, the numerous islands facilitate maritime communication between all parts of the *Ægean* region. The greater part of the population of Greece lives in the coastal lands, and here are situated the capital and the largest trading towns.

Athens was at first only a small city-state in one of the small basins bordering the *iEgean* Sea, but in it art and science developed in almost miraculous fashion in those centuries preceding the Christian Era in which Greece was the centre of a civilization to which mankind owes more than to any other. Traces of the former greatness are still to be seen in the temples and statues remaining in and near the city, but for a very long period Athens shared the decline of Greek civilization and power. With the independence and growth of modern Greece the capital has also grown, but the manufacturing which has recently begun to develop has not added to its beauty, although it has increased its population. Being a few miles from the sea, Athens has as its port the Piræus, and the whole conurbation has about three-quarters of a million inhabitants.

The chief port of Greece is Salonika ; its trade is considerably increased by an arrangement by which Yugoslavia has a " free zone " through which goods to and from that country can pass without paying Customs duty to the Greek Government,

QUESTIONS

1. Discuss what truth there is in the dictum : the Balkan Peninsula turns its back to Europe and looks to the Orient.
2. Describe the chief trade-routes across the Balkan Peninsula, and show how they are related to the physical geography.
3. Give an account of the mineral resources of the Balkan Peninsula. How far has their relatively slow utilization been affected by physical conditions and by human factors ?
4. State the limits, and describe the character and productions, of the " Mediterranean climate " areas of the Balkan Peninsula.
5. Describe the coastal areas and their hinterlands as they would be observed on a journey along the eastern Adriatic Sea from the Strait of Otranto to Trieste.
6. State the location of the chief farming areas in the " Temperate climate " region west of the Balkan and Rodopi mountains ; give an account of these areas and the work carried on in them.
7. In what ways, and to what extent, may the north-eastern part of the Balkan Peninsula be considered as transitional to the Steppe-lands of eastern Europe ?
8. Make a comparative study of the four cities : Athens ; Belgrade ; Istanbul ; Sofia.

CHAPTER XIV

THE ITALIAN PENINSULA AND NEIGHBOURING REGIONS

The North Italian Plain.—Between the Alps and the Apennines is situated the great lowland sometimes called the Plain of Lombardy, but better named the North Italian Plain. It is, as it were, a half-way house between central and southern Europe, for while on the one hand its climate (as explained in Chapter II) is of the Mid-Temperate type, on the other hand it is so cut off from the north by the Alps and so easily accessible from the south, that in its human geography it is closely bound up with the Mediterranean lands.

The North Italian Plain has been greatly influenced by the adjoining Alpine region, for the lowland occupies a great depression within the curve formed by the Alps and Apennines, and its surface is formed mainly by deposits brought down from these mountains and particularly from the Alps. Indeed, the differences between the various tracts constituting the North Italian Plain are largely due to the nature of these surface deposits ; they are generally more elevated and of coarser and drier material on the margins, and become progressively lower, finer in texture and wetter towards the centre and near the Adriatic Sea.

Constituent Regions.—The " *Morainic Amphitheatres* " which are grouped round the southern exits of some of the larger Alpine valleys, from the Dora Baltea to the Tagliamento, recall the regions of recent glaciation on the northern margins of the Alps (see Fig. 53). The " *amphitheatres* " have outer rings of irregular, and sometimes quite high, end-moraine surrounding areas of clayey ground-moraine ; the latter are sometimes wet and moor-like, but because of the southern aspect and lower altitude they are more responsive to cultivation than the northern Alpine margins, and indeed are in parts so sheltered from winter cold that fruit trees and even olive trees can be grown.

A continuous belt along the whole of the Alpine border of the plain, and another on the eastern part of the Apennine border,

may be termed the *Drier Margins*, as compared with the better-watered interior. On these margins, rather coarse material has been spread out by the streams ; it is often permeable and the water-table lies well below the surface, which is therefore dry and not remarkably fertile. In parts there are still some heath-lands or wood-lands, but most of the land has now been farmed. The productions are those which one would expect from the fact that the climatic conditions resemble those of the Rh&ne valley in the same latitudes on the other side of the Alps : maize is the chief grain crop, followed by wheat ; mulberry trees are grown for the culture of silk-worms, and there are vineyards and orchards.

The Well-watered Plains are of lighter material, and the soil is generally a fine and fertile loam. Much of the natural inequality of the surface has been obliterated in the construction of extensive irrigation systems. North of the Po, the water is derived from innumerable pools known as fontanili, which are mostly artificial reservoirs, fed by water which seeps out from below the coarser material of the drier margins, where this overlaps the finer deposits along the northern edge of the well-watered plains.

The water is available during the whole year, and during the winter and spring it has been kept at a relatively high temperature while beneath the surface of the northern margins. Consequently its warmth is very useful when in spring it is allowed to spread out over the meadows of the lower plains ; it aids the rapid growth of the grass, which is cut for hay six or eight times during the year. Cattle are stall-fed on this fodder, and milk and cheese are important products of the plain.

The streams, too, are used for irrigation, and the natural drainage system has been supplemented by canals ; some of these are employed also for transport. Irrigation is necessary for the flooding of fields for rice, grown either as an annually repeated crop or in rotation with others, such as maize and flax. There are also unirrigated areas dependent on the rainfall, and these also yield a great variety of products.

It is in this most thoroughly cultivated and extraordinarily productive region that the same field may be planted with lines of mulberry trees, with vines trained along them, and grain growing between the rows.

The *River-valleys* of the larger streams are generally broad and

liable to flood ; they are therefore less used and are avoided as building sites. The innumerable large villages and towns of all sizes in this densely populated plain usually stand away from the rivers ; it is noteworthy that between Turin and the sea there are only two cities on the River Po, and these, Piacenza and Cremona, are situated on the high banks on the outer side of the river-meanders.

The *Deltaic Areas* are of relatively recent formation, as is



[E.N.A.]

FIG. 62.—VIEW ON THE NORTH ITALIAN PLAIN.

Note.—Men are preparing a rice-field ; it is a shallow, rectangular basin irrigated from the canal shown in the background. On the banks are planted rows of pollarded poplar trees—a common feature of the landscape of the plain.

shown by the fact that Adria, from which the sea was named, is now 14 miles inland. The Po has seven distributaries ; these have deposited so much material that the other streams which once joined the Po, such as the Adige and Reno, have been forced into independent courses.

The rivers of this region have to be dyked to prevent disastrous floods, and reclamation like that of the Dutch polders has been undertaken. By the coasts, sand is washed southward by the counter-clockwise currents of the Adriatic, and sand-spits and dunes have cut off great lagoons.

The " *Hilly Enclaves* " are exceptional areas in the North Italian Plain, The largest is that of Montferrat, which may be thought of as a detached and lower portion of the Northern Apennines ; on its rounded slopes are orchards and vineyards and " Asti " wine is named from a town on its southern border.

In the north-eastern part of the plain rise the Berici and Euganean Hills ; they are formed partly of volcanic rock, from which trachyte was taken to build the palaces of Venice amid the coastal swamps and waters.

Communications and Cities.—The largest settlements are commercial centres whose positions are to a considerable extent related to the Alpine valleys which open upon the plain. The largest city, Milan, with well over a million inhabitants, is at the meeting-place of routes from the Simplon, St. Gothard and Spliigen Passes. Its nodal position, with roads and railways constructed from it to all parts of northern Italy, has helped to make it the most important commercial and industrial centre of the whole Kingdom. Water-power from the Alps has aided in its manufactures of silk and other textiles, and in engineering of all kinds; there is also much preparation of food-stuffs, and the city is a centre of book-production and publishing.

A similar development has occurred at Turin, where the route from the Mont Cenis Pass reaches the Po ; here, also, water-power from the Alps is used for a similar group of industries, including the construction of motor-cars and associated rubber manufactures. The population of Turin is approaching three-quarters of a million.

Where the more easterly and commercially less important Alpine valleys open upon the plain are a number of smaller cities, including Verona on the Adige.

An ancient route led from the crossing of the Po at Piacenza, south-eastward along the Dry Margins of the Apennines to the Adriatic coast, and along this route a series of towns grew up, including Parma, Modena and Bologna. The last-named city is the most important, for it is the crossing-place of the easiest route from Northern Italy, by the La Futa Pass through the Apennines, to Florence, Rome and southern Italy.

The one port along the difficult Adriatic shore of the plain is Venice, on the " safe " side of the Po estuary away from the current-drifted silt. Here, in the early Middle Ages, refugees from a Hun invasion of the mainland made a settlement on an

island. Later, Venice became the centre of trade with the East and arose to political as well as commercial dominance in the eastern Mediterranean. When the fall of Constantinople stopped the trade, the power of Venice declined, but its past wealth is still shown by the palaces standing by the canals which serve as streets. More recently the trade of Venice has revived, and there are plans to connect it by a ship-canal to **Milan** ; at present it has a permanent population of nearly a quarter of a million, and many visitors are attracted by its historic and architectural interest, and by the fashionable resort of the " Lido," the sand-spit which encloses its lagoon.

Peninsular Italy shows " Mediterranean " characters, with the exception of the north-facing part of the Northern Apennines. We have earlier made a distinction between the cooler part of the Mediterranean region in which the olive is the typical plant and the warmer part where the citrus fruits flourish ; following this distinction we may separate the peninsula into two sub-regions, central Italy and southern Italy, as shown in Fig. 63.

Central Italy.—The Apennines, the " back-bone " of Italy, consist of broad uplands which occupy a large proportion of the peninsula. In central Italy they curve round so as to leave a narrow coastal lowland by the Adriatic, while within the curve there is a wider area of generally hilly country facing the Tyrrhenian Sea ; thus there are three well-contrasted tract-groups in central Italy.

The Northern and Central Apennines.—The north-eastward curve of the Apennines shows some similarity with the outer, north-western portion of the curve of the Alps, for in both cases there have been overthrusts towards the outer side of the folded areas, and in both cases the rocks are largely either limestones, or flysch comprising sandstones, marls or clays. In central Italy the Apennines show the characters of more recent uplift, and broad terrace-like plateaus are divided by relatively narrow valleys.

The *Northern Apennines* are transitional in character, for they are " Mediterranean " only in the sheltered Riviera region. The climatic statistics for Genoa (see the table on p. 26) show that the winter temperatures are remarkably high for the latitude, and to such a degree that even citrus fruits here find an exceptional possibility of growth in the northern Mediterranean region. As in the French part of the Riviera, the tourist

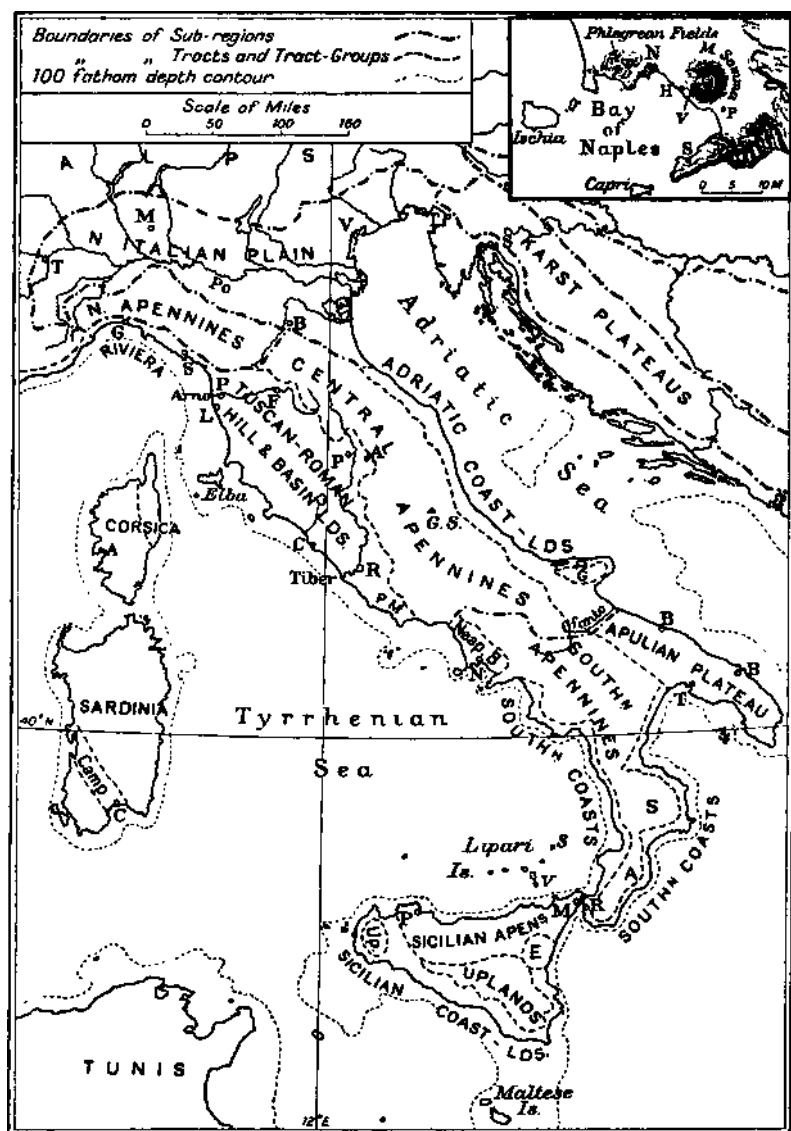


FIG. 63.—REGIONS OF THE ITALIAN LANDS.

industry has led to the rise of a chain of large and small settlements along the coast. Genoa is the great port, for behind it the Giovi and Bocchetta Passes give easy roads across the Apennines to the North Italian Plain, and thence by the Alpine routes to

central and north-western Europe. Around Genoa have grown up industries, especially, those connected with ship-building, and the population of the port numbers about 400,000 people.

Li a sheltered harbour farther east is the naval dockyard of Spezia. Near here the limestones of the Apennines have been metamorphosed into marbles which at Massa and Carrara have been for many centuries quarried and exported for buildings and statuary.

The Central Apennines.—These mountains rise to over 9,000 feet in the great limestone range of the "Gran Sasso d'Italia," the highest point in the peninsula. The more elevated areas are generally almost bare, and even at rather lower elevations there is little forest remaining; below the waste or *macchia*-covered heights there is a zone of chestnut woods, and the valleys are cultivated. In the *flysch* areas the peasants are menaced by land-slides and mud-streams, which result from heavy rainfall on the heights washing down unconsolidated marl and clay into the valleys. These "frane" rank with earthquake shocks as being as destructive in central Italy as the floods in the northern river-valleys, or as volcanic outbursts and earthquakes in the south.

On the plateau areas there is summer pasture for sheep and goats, and "transhumance" between the uplands and the lowlands on both sides of the peninsula is a feature of the life of central Italy. In the Apennine region east of Rome are deposits of *bauxite*, which are important as giving supplies of aluminium to Italy, a State rather lacking in mineral resources.

The Adriatic Coast-lands.—The low terraces of the eastern Apennines gradually descend to a coastal plain, which is very narrow for most of its length. It is, however, important in affording an easy land-route from the north to the south-east of Italy, and thence by sea to the Orient. In this part of the peninsula the coast is regular, with the exception of the spur-like promontory formed by the upraised and karst-like limestone block of Monte Gargano.

The Tuscan-Roman Hill-lands.—This is a region of complicated structure and correspondingly varied relief and character. There are hilly districts of ancient and crystalline rocks in which some iron, lead, quicksilver and other minerals are found; to these areas may be added the adjacent island of Elba, which yields iron ore. There are also districts of eruptive rock, and

others where recent volcanism has occurred ; the heat obtained from vapour from " fumaroles " is utilized in electrical power-stations. The Alban Hills south of Rome and the small lakes north-east of the lower Tiber are of volcanic origin.

Much of the region has been shaped by the erosion of sedimentary rocks of various composition, and the result is a land of numerous small ranges of hills, divided by narrow valleys or by wider basins. In general, it is fertile country producing the wheat, fruit, olives and wine characteristic of the northern Mediterranean region. The hills are often crowned by villages or small walled towns, built during earlier centuries in situations where defence was easy, although the peasants might have to go some distance to their fields. Perugia and Assisi, with their old buildings and beautiful outlook over the surrounding country, are small hill towns which attract many visitors.

By the coasts are small lowlands, once malarial marshes, but now reclaimed. South of Rome are what were formerly the Pontine marshes (" P.M." on the map in Fig. 63); here and by the mouth of the Tiber fields have been laid out and new cities have been built in the work of reclamation.

But if some features of the region are quite new, others are very old, for the history both of Tuscany and the Roman country goes back many centuries. Florence, on the banks of the Arno, with its palaces now used as museums and picture galleries, is still a rich treasury of mediaeval art and life, though around the old city tenement houses and factories of the machine-age have grown up, and raised its population to over a quarter of a million.

The chief port of the Tuscan area is Livorna (Leghorn) on the " safe " side of the mouth of the Arno. A few miles up the river is Pisa, once the port of Florence, but the silt of the river has destroyed its shipping trade, and, incidentally, proved an insecure foundation for the Campanile, which became the " leaning tower of Pisa."

Still older than the mediaeval buildings of Tuscany are the memorials of ancient Rome, the " Eternal City." In the beginning it was a small settlement built on " the seven hills " (merely the eroded banks of the Tiber and small side-streams) at a point where a narrowing of the swampy valley made crossing relatively easy. On this site the city became the chief town of Latium, and, when the power of its rulers increased, its central and accessible position enabled it to become the capital of their

extended dominions. In this respect the history of Rome resembles that of other capitals of Europe, but with the unparalleled growth of the Roman Empire it virtually became the centre, both politically and geographically, of the civilized world.

When the Roman Empire fell, Rome declined, but it recovered to some extent with the growth of the power of the Popes, and became the spiritual capital of the world. Yet although its central position in the Mediterranean made it a good centre for widely extended realms, it has no large productive area in its vicinity and it is off the main lines of commerce ; hence with the growth of trade near the end of the Middle Ages, Rome fell behind the other Italian cities in population, and its ancient buildings, streets and aqueducts continued to decay.

When, in 1870, the new Kingdom of Italy was formed, Rome became the political capital, while continuing to be the seat of the Papacy. The memorials of its ancient grandeur which remained throughout its chequered history, the many traditions of the past, and the reverence attaching to its spiritual eminence, —these have drawn to Rome visitors, and even residents, from all parts of the world.

Recently the growth of national feeling in Italy has led to restorations and improvements in the appearance of the city and to its development as the centre of the national life. Its population has increased, and now numbers considerably over a million people. Settlements have spread down the Tiber valley, where marshes have been reclaimed, but the chief port of the region is Civitavecchia, situated to the north, away from the sediment brought down by the river.

Southern Italy.—This is the part of Italy in which is experienced the full development of the "Mediterranean" characteristics of mild or even warm winters and pronounced summer drought, strikingly exemplified in the coastal regions on each side of the "toe" of the peninsula.

The Apulian Plateau.—On the Adriatic side, the low plateau of Apulia is exceptionally dry, and the limestone of which the region is formed is so permeable that there is no surface stream between the Ofanto and the far end of the "heel" of Italy, a distance of 150 miles. Nevertheless, there are fields of drought-resistant wheat, and the water-supply is carefully utilized for growing vines, olive trees and almond trees.

Round the coast there is a fairly considerable population, and

Bari and Taranto are fair-sized towns. Brindisi, which has a good natural harbour, is the port for traffic which has come as far as possible by the quick over-land route for mails and passengers to the East.

The Neapolitan Basin.—On the opposite side of the peninsula is the Neapolitan Basin ; it is separated from central Italy by uplands which extend from the main mass of the Apennines to the coast of the Tyrrhenian Sea. In the lowland around Naples the winters are appreciably warmer than at Rome, and warmer even than on the sheltered Riviera ; consequently the citrus fruits grow well. The Neapolitan Basin is an area of subsidence surrounded by macchia-covered limestone heights, and within the region are both alluvial and volcanic deposits ; here, as in several parts of southern Italy recent volcanism has important geographical consequences.

West of the town of Naples are the " Phlegrean (burning) Fields," a volcanic area in which small craters are to be seen and the " solfatara " still emit steam and hot, muddy water (see inset map in Fig. 63). East of the town the great cone of volcanic ash of Vesuvius rises to about 4,000 feet, capped by clouds of steam which occasionally rise to a glowing column ; at intervals there are outbursts of ash and streams of lava pour down the sides. Vesuvius stands within the broken crater of what was once a much greater volcano, Monte Somma, whose eruption in A.D. 79 destroyed part of its cone and overwhelmed the ancient cities of Pompeii and Herculaneum.

The lava of Vesuvius weathers to such a fertile soil that the peasants take the risk of cultivating the slopes for vineyards and orchards. Indeed, the Neapolitan basin in general is very productive ; besides grain, fruit and vegetables, tobacco and hemp are grown, and the region is densely populated.

The city of Naples is primarily the market and port of this productive area, and also for the wider region of southern Italy, of which at one time it was the political capital. There has been a recent growth of industries of various kinds, and there are many hotels to accommodate the visitors drawn especially by the interest of Vesuvius and the beauty of the Bay of Naples. The population of the city now numbers about one million.

The Southern Coasts.—From the Neapolitan Basin southward, and around the coasts of Calabria, the " toe " of Italy, are many small patches of lowland and stretches of terraced hill-sides on

which there is an intensive cultivation of vines and olives, figs and almonds, oranges and lemons.

Around these coasts and farther east on the peninsula of Apulia are the remains of Greek settlements, temples and statues, for here was "Magna Græcia," a region of Greek colonial expansion long before the rise of the power of Rome.

Facing the Strait of Messina is Reggio, a "ferry-port" for the narrow crossing to Sicily. The break between the peninsula and the island is due to faulting, and the earth's crust is here still so unstable that an earthquake in the early part of the present century reduced both Reggio and Messina almost to ruins.

The Southern Apennines.—Although at several points fertile valleys lead through these mountains, the uplands are less productive than in central Italy; the flysch districts are often poor and the limestone areas bare. In the far south the structure is different: the Sila mass (marked "S" in the map) is formed of granite and other crystalline rock, and has rounded heights reaching to over 6,000 feet, while Aspromonte ("A") is of gneissic rock, has sharper outlines and is of rather greater elevation. Although the highest parts are snow-covered in winter, the middle slopes bear deciduous trees and the lowest parts have extensive chestnut plantations. On the Sila there are great water reservoirs intended both for irrigation and for the supply of electricity for industrial development.

Sicily is essentially part of southern Italy. Its northern heights may be termed the Sicilian Apennines, for across the Strait of Messina appear mountains of gneiss like those of Calabria, while the rest of this area is mainly formed of massive limestone uplands.

By the east coast the great volcanic cone of Etna rises to a generally snow-clad summit 10,000 feet in height. Like Vesuvius, its slopes have small craters and lava-streams which menace the olive-yards, vineyards and dwellings of the very considerable population which has invaded it.

The rest of Sicily is, in the main, a much-dissected plateau of sedimentary rocks with a lower coastal zone, and these, too, have been well utilized. The interior of the island grows much corn, especially wheat, and by the coasts is an intensive cultivation of fruit, for which the climate is specially favourable.

But the sirocco wind, felt throughout the central and southern parts of the Mediterranean, blows here frequently and very

unpleasantly. It is a southerly wind accompanying the passage < of depressions along the Mediterranean Sea, and it brings very hot and dust-laden air from the North African desert.

A minor resource of Sicily is sulphur, but this is now of less importance than formerly. Many tourists come to enjoy the warm and sunny climate, the beautiful scenery, especially in the neighbourhood of Etna, and the memorials of ancient Roman and Greek occupation. With its varied resources, and the export of much wine and citrus fruit, the island supports quite a dense population. On the east coast is the port of Catania, with a quarter of a million inhabitants, while on the north coast the capital, Palermo, has nearly half a million people.

The Lipari, or Molian, Islands, which emerge steeply from the Tyrrhenian Sea, are of volcanic origin; Stromboli is almost constantly in eruption, and on the island Vulcano, from which the name volcano was derived, there is occasional activity.

The Maltese Islands are small limestone areas which rise from the shallows separating the eastern and western basins of the Mediterranean. They are most thoroughly cultivated, and are extraordinarily densely populated. They are a British possession, valuable as affording a port of call and a naval base on the Mediterranean route to India and the East.

Corsica and Sardinia.—In the main, these islands are composed of great masses of granite and other crystalline rocks which have been caught up among the folds of Alpine date. They are the highest parts of a belt of the earth's crust which has escaped the great subsidence of the Tyrrhenian Sea on the one side and of the western basin of the Mediterranean on the other. A rift-valley cutting off the south-western corner of Sardinia stands only just above sea-level and gives a lowland, the Campidano, which is exceptional in these high and cliff-bordered islands.

The very irregular relief and considerable altitude of much of the land would greatly limit cultivation, while parts of the coastal lowlands and the Campidano of Sardinia are naturally swampy and malarial. There have been recent improvements, but on the whole human agency seems to have brought about a deterioration of the natural conditions, for the widespread destruction of forest has led to the growth of almost valueless maquis over a great deal of the country.

Olive-yards and vineyards are cultivated at various parts of the coastal belts of both islands and in the Campidano lowland,

while on the uplands there are rather poor pastures for sheep and goats. Sardinia has a considerable amount of ores of lead, zinc and iron, and these are exported for smelting in Italy.

The capital of Sardinia, Cagliari, is a rather small town, and Ajaccio, the capital of Corsica, is still smaller, though it is the centre of a tourist industry attracted by the natural beauty of the island.

Sardinia is the least populous part of the Kingdom of Italy ; with about the same area as Sicily it supports only about a quarter as many inhabitants. Similarly, Corsica, which is one of the " departements " of France, ranks among the least densely populated areas of that country.

QUESTIONS

1. **Write** an account of agriculture in the North Italian Plain, tracing as far as you can the causes of the facts you adduce.

2. Make a reasoned study of the cities of North Italy, with special reference to their commercial and industrial development.

3. **How** far is it true that the Apennines are an unproductive barrier between the productive lowlands of Italy ?

4. What differences of climate can be observed in Peninsular Italy (apart from mountain regions) ? Show how these differences are related to the positions and productions of the various parts of the Peninsula.

5. Make a study of Rome and its evolution in relation to its site and its position both in Italy and also in the Mediterranean Lands as a whole.

6. Compare and contrast the islands of Sicily and Sardinia in as many respects as possible.

7. Examine the mineral resources of Italy with special reference to its industrial activities.

8. State and account for the broad features of the distribution of population in the mainland territory of Italy.

THE IBERIAN PENINSULA

Introduction.—Although the Iberian Peninsula almost forms a bridge between Europe and Africa, for long periods it has remained apart from the main currents of human life, as it points south-westward, away from the older regions of civilization, towards the Atlantic Ocean and towards a corner of Africa which is itself separated by desert from the wider world of men.

Yet it was from north-western Africa that, about A.D. 700, the Moors overran the Peninsula as far as the mountains of the north. For a period of about 400 or 500 years they dominated much of the country, and their influence is still to be seen in many ways, especially in the south, where they maintained themselves longest. Here are the "huertas," the "gardens," in which the most intensive forms of cultivation are carried on by methods of irrigation brought from Africa; here are mosques and other buildings of "Oriental" aspect, while the costumes, words, names and even the physical appearance of some of the people bear further witness to the Moorish occupation.

The Pyrenees almost cut off the Peninsula from the rest of Europe, while other highlands hinder movement across it and to a large degree isolate its most habitable parts from one another. We will therefore first examine its relief and structure from this point of view.

Relief and Structure.—There are three main elements in the structure of the Iberian Peninsula (refer back to Fig. 58). First, there is the Hercynian massif, the broad upland known as the Meseta, which forms the greater part of the west and centre of the Peninsula. An ancient peneplain was raised to form a ridged and dislocated plateau at the time of the Alpine disturbances. As a whole the Meseta was tilted with a slope from its high eastern margin down towards the Atlantic, and in this direction flow the Rivers Douro, Tagus and Guadiana. In the north-west, however, the Galician portion of the massif drops by fault-edged coasts to the ocean.

Also, dislocations within the Meseta area have uplifted a series



FIG. 64.—REGIONS OF THE IBERIAN PENINSULA.

of resistant blocks in the region of the Central Sierras, namely the Sierra de Gata, the Sierra de Gredos and the Sierra de Guadarrama.

On each side of this central highland region warpings of the Meseta have formed two shallow upland basins, those of Old Castile and New Castile, in which have accumulated deposits mainly of Tertiary and later age. In the high basin of Old Castile, the waters from the surrounding mountains collect to form the Douro, which flows slowly over the fairly level surface of the basin as far as Zamora; below this town the river runs more swiftly and has cut through the upland area marked on the regional map as the Douro Plateau, first by a gorge in the south-westerly part of its course and then by a wider valley where it flows more directly westward to the Portuguese Coast-lands,

In the high basin of New Castile, the Tagus and the Guadiana similarly run slowly and have relatively shallow valleys in the basin area, and have cut more marked valleys where they cross

the older rocks in the region which may be termed the Tagus-Guadiana Plateaus.

The second main element in the structure of the Peninsula consists of the highlands due to the foldings and thrusts of the Alpine type. In the north are the Pyrenees, continued westward in the Cantabrian Mountains behind the north coast about as far as Oviedo, where the folded mountains are welded, as it were, into the north-western corner of the Meseta. In the south are the ranges forming the Andalusian, or Betic, Cordillera, which appear to swing round from north-west Africa and the Strait of Gibraltar north-eastward, breaking down at Cape de la Nao under the Mediterranean Sea, but reappearing in the Balearic Isles.

To these fold mountains of definitely Alpine type may be added two other upland areas which were raised as a result of the same series of disturbances : the relatively narrow Catalanian Mountains which shut off the Ebro Trough from the Mediterranean, and the broad mass of the Iberian Highlands where Secondary limestones previously laid down upon the Meseta were uplifted to form its high eastern edge.

The third element in the structure is shown in the lower lands, generally areas of dislocation and subsidence, which border the upraised tablelands and mountains, and are floored by sedimentary deposits of Secondary, Tertiary or later age. Of this type is the Ebro Trough, whose steep south-western wall is the fault-bounded edge of the Meseta, but which rises more gradually on its northern margin to the Pyrenees. From all sides it collects the waters to the River Ebro, which meanders through the lowlands of the Trough and then cuts a narrow and tortuous course through the Catalanian Mountains to the sea.

Of rather similar formation is the Andalusian Trough, above which rises the rampart of the Sierra Morena, while the south-eastern side rises by hills and plateaus to the Andalusian Cordillera ; unlike the Ebro Trough, however, it is open to the ocean, and the Guadalquivir flows to the Atlantic through a broad, delta-like lowland.

The eastern highlands of Spain break down towards the Mediterranean in a series of great curves, and within these curves, between the mountains and the sea, are a number of lowlands important as areas of production and population.

The Portuguese Coast-lands are of composite formation. In

the north the ancient rocks of the Meseta sink gently to the coast; south of the Douro is an area of subsidence floored by relatively recent deposits; south of this area a line of heights extends westwards from the Central Sierras to the hills of Cintra behind Lisbon—this line may be conveniently termed the Cintra Hills; next follows another lowland of recent deposits, through which the Tagus winds slowly to the Atlantic; then the platform of the Meseta reaches to the Atlantic and its south-western corner projects in Cape St. Vincent; finally a low coastal strip forms the southernmost part of Portugal.

The consequence of the structure of the Peninsula is that the upland of the Meseta and the fold mountains together bar easy communication across the Peninsula in any direction; the lower and more populous areas are cut off from one another to an unusual degree. The Peninsula has therefore been described as a region of isolations.

Climates.—The position and relief of the Iberian Peninsula together give it a strongly contrasted set of climatic conditions.

In the first place, its northern part is in the climate belt in which cyclonic conditions are common throughout the year. The north-west is so exposed to the Atlantic on two sides that it has the oceanic temperate type of climate (refer back to Fig. 15). The figures on p. 26 show that Santiago, in Galicia, in spite of being over 800 feet above the sea, has rather warmer conditions, both in summer and winter, than Brest, while it has a heavier rainfall than any other place mentioned in the table except Bergen. Conditions are not greatly different along the well-watered Cantabrian region, and in this northern belt a lack of rainfall becomes noticeable only on the southern side of the Pyrenees.

The "Mediterranean" climatic region begins to the south of the northern belt of the Peninsula, but the differences of relief allow the typical Mediterranean conditions to be experienced only over parts of the area. The high Central Sierras have a relatively heavy rainfall and relatively low temperatures, and thus lack both the drought of summer and also the mildness of the winter; their climate is, indeed, similar to that of north-western Europe. The Iberian Highlands region and the high Basin of Old Castile have summer drought, but over most of their area the winters are too cold for the growth of the olive (see Fig. 18), and on this account can scarcely be regarded as

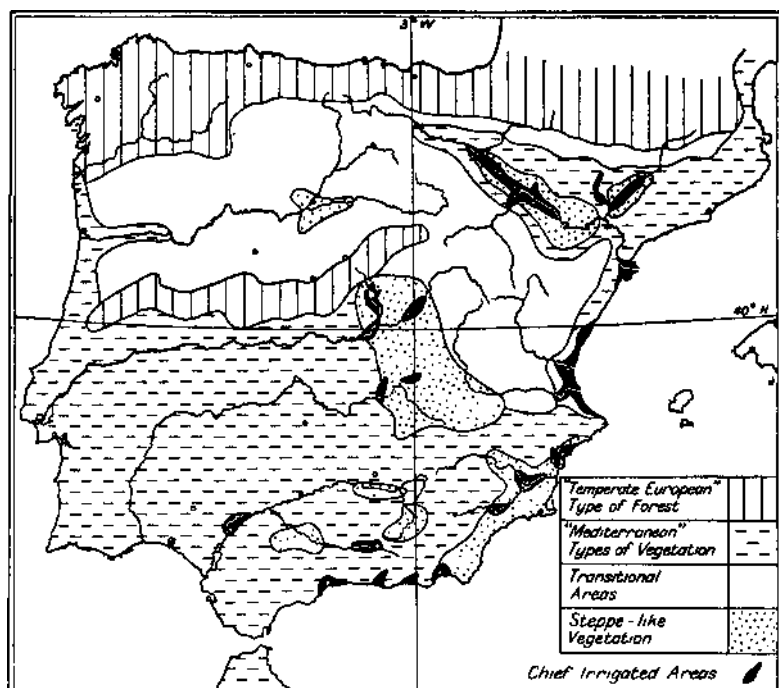


FIG. 65.—NATURAL VEGETATION-TYPES AND IRRIGATED AREAS OF THE IBERIAN PENINSULA.

having a truly Mediterranean climate. The Douro Plateau region is also transitional in regard to climate, for only its more sheltered valleys, not the exposed uplands, are mild and dry enough for the typical Mediterranean products.

Of the remaining regions of the Peninsula, the greater part may be classed as having the Mediterranean climate, and olives are grown in all areas except where the altitudes are too great. But on the eastern side of the Peninsula, barred by highlands from the moisture-bearing winds of the Atlantic, the summer drought is so long, and even at other seasons the rain is so little, that the climate almost approaches that of the semi-deserts.

In the driest areas irrigation is needed to obtain the common Mediterranean products ; the natural vegetation is very scanty and the growths are like those of the steppe-lands, esparto grasses being at one time the characteristic plants of the more southerly of these semi-arid regions. Because of the natural vegetation, the drier parts of the eastern lowlands of Spain are

sometimes described as having the steppe type of climate, but they do not have the cold winters of the true steppes.

The map in Fig. 65 shows the broad distribution of some of the forms of natural vegetation, and from this distribution some of the more significant climatic conditions may be deduced.

One important feature of the climate remains to be described. The broad and high areas of the central part of the Peninsula are greatly heated by the sun in summer, and greatly cooled by outward radiation in winter. Consequently the annual range of temperature is greater than in other parts of the Mediterranean region, and the table on p. 26 shows that at Madrid it is 36° F. The daily range is also great, especially in summer, and the mean annual maximum at Madrid is 104° F., a figure higher than that given for any other station in the table, although Madrid stands at a height of more than 2,000 feet above the sea. The winter nights are frequently bitterly cold, and the figures show that at Madrid, although the average January temperature is 40° F., the mean annual minimum sinks to 14° below freezing-point.

As a result of this contrast between summer and winter, something like a small monsoonal condition tends to occur over the Peninsula; the summer becomes a season of considerable heat, with relatively low air-pressures and in-blowing winds, while the winter is a season of cold, with relatively high air-pressures and out-blowing winds. Yet it must not be supposed that these systems develop to a degree which brings about the summer rain and winter drought typical of a monsoon climate; the general conditions of the Atlantic wind systems and the paths of depressions give the normal conditions of winter rain and summer drought to the greater part of the Peninsula.

Constituent Regions.—The marked differences in relief and in climate necessitate a division of the Iberian Peninsula into a relatively large number of sub-regions of contrasting characteristics.

The Northern Mountain Regions.—*Galicia* is mild and well watered, and has forests of "mixed" character. Apple trees are common, and from them cider is obtained as a common drink of the people; the vine, mulberry and fig trees are grown, and maize is the chief cereal. There is much meadow-land and cattle-rearing is an important element in the farming. The "drowning" of the coast has given good harbours, and encouraged maritime pursuits; in *Galicia*, *La Coruña* (*Corunna*)

and Vigo are fishing ports, and the latter is a port of call for liners, while the deep and almost land-locked harbour of Ferrol is a Spanish naval station.

The Minho is the largest river of Galicia, and its tributary the Sil comes from a more inland area ; consequently this tract of the Upper Sil is drier, less productive and has fewer inhabitants than Galicia, which ranks among the more populous regions of Spain.

The Cantabrian Cordillera.—Here the climate and productions are broadly similar to those of Galicia, but the granitic block gives place eastward to sedimentary rocks and near Oviedo a Carboniferous basin yields the most important supply of coal in the Peninsula. With coal and other minerals found in the same district Oviedo has become an industrial town, with Gijon as its port, and this province of Asturias is fairly well populated.

Farther east, limestones folded in the "alpine" disturbances rise to nearly 9,000 feet and form one of the highest parts of Spain, making an effective barrier between the north coast and the inland areas of Leon and Castile. There are, however, passes behind Santander which enable that town to serve as a northern outlet for the interior.

The Basque Mountain Region links the Cantabrian and the Pyreneean mountains, but its lower elevation gives relatively easy routes from France through Old Castile to central Spain.

For a mountainous region, the Basque country is productive, obtaining the same commodities as the more westerly regions of the northern belt, and it has a number of towns of moderate size. The largest is Bilbao, which owes its importance mainly to the occurrence of iron ore ; this is found near the deep inlet which forms a good harbour from which part of the ore is exported, while the rest is smelted at Bilbao with imported coal.

This coastal region and that of Catalonia are the two most densely populated and most highly developed parts of Spain, and in each case the character of the people has been an important factor in their advance. The Basque people are distinguished by qualities of industry and energy as well as by their retention of an ancient language, old customs and a tenaciously held tradition of a nationality different from that of the other inhabitants of Spain. It should be noted that the region here marked out on a geographical basis does not quite correspond with that occupied by the Basque-speaking people, for it extends

farther to the south than their country, while many Basques live in the Pyreneean region, even across the French frontier.

The Pyreneean Region.—These mountains are not one "range"; they are composed of a broad belt of highlands, with a longi-



[French Railways—National Tourist Office.]

FIG. 66.—VIEW OF THE CIRQUE OF GAVARNIE.

Note.—The Cirque of Gavarnie is on the French side of the water-parting of the Pyrenees, which here forms the political boundary. It is one of the most striking witnesses of past glaciation: a colossal amphitheatre two miles across, whose vertical sides rise in terraces to a height of about 5,000 feet above the floor of the rock basin. The summit shown in the view is about 10,000 feet above sea-level, and a mile or two behind this is Mt. Perdu, the culminating peak of the Pyrenees.

tudinal axis of crystalline rocks and with folded and faulted sedimentary strata on both flanks.

The crystalline zone is widest and highest away from the Atlantic and the Mediterranean; in this central area a number of peaks reach over 9,000 feet, the lowest passes are well over 6,000 feet and crossing is very difficult. The difficulty is

increased by the cirque formations, due to glaciation in the Ice Age, which give abrupt ends to the valleys. One of the most striking features of the scenery is the huge amphitheatre of the "Cirque of Gavarnie," which is overlooked on the Spanish side by Mt. Perdu, over 10,000 feet in height.

At each end of the region the contorted and broken sedimentary rocks, often limestones, occupy more of the area, and these are most widely developed on the southern side. Here they have been eroded into irregular tilted plateaus, whose steep scarps are so notched that they are called "Sierras," i.e. "saws."

Where the high crystalline region gives place to the lower areas of the two ends, railway routes have been constructed which tunnel below the passes connecting the Spanish and French valleys. The western line runs northward from Zaragoza by the Somport or Canfranc tunnel (marked "S" on the regional map), and the eastern one northward from Barcelona by the Puymorens tunnel ("P" on the map); the main railway traffic from the Iberian Peninsula, however, still goes by the routes skirting the seaward ends of the region.

On the Spanish side precipitation is generally scanty, and the chief resources are the rather poor pastures; here the aspect of the country is often barren and settlements are rare.

The Portuguese Coast-lands.—In the coastal region south of the Minho watershed, the climate is clearly "Mediterranean," as is shown by the temperature and rainfall figures for Oporto on p. 26.

In the *North Portugal Lowland*, marked "a" on the regional map, the warmth and the ample precipitation combine with fertile soils to allow a wide range of products; these, include both those, such as maize, which are characteristic of the warmer parts of Temperate Europe as well as the wheat and fruits of the Mediterranean Lands. Here is Oporto with an export trade of "port" wine, made from the grapes grown along the valley of the Douro where it cuts through the adjoining plateau. Taken as a whole, this northern part of the Portuguese Coast-lands is one of the most productive areas of the Iberian Peninsula.

The *Cintra Hills* ("b" on the map) are abundantly watered, and have woods of chestnut, pine and oak as well as groves of orange and lemon trees.

South of the Cintra Hills, the *Tagus Lowland* (marked "c") tends to suffer from a lack of water. Much of the area is occupied

by poor pastures or the maquis type of vegetation, though in the neighbourhood of the River Tagus grain and olives are produced to a considerable extent. Centred upon Setubal are two other resources : fishing, especially of sardines, and the extraction of salt from coastal lagoons.

On the shore of the Tagus estuary stands Lisbon, the capital of Portugal, in a convenient position mid-way along the coast of the country ; the city has a population of about two-thirds of a million people. Lisbon has a beautiful situation overlooking the broad, lagoon-like estuary and extending by terraces up the slopes of the Cintra Hills. Yet it is in a part of the Peninsula where crustal instability still persists, and less than two centuries ago an earthquake destroyed the western part of the city and cost scores of thousands of lives.

The *South Portugal Uplands* (marked " d "), where the Meseta extends to the Atlantic, are noteworthy as having the chief mineral resources of Portugal; near the Spanish frontier there is a considerable development of copper-mining.

The *Algarve Lowland* (marked " e ") has a fertile soil and a south-facing aspect, and obtains water from the adjoining uplands. With a closely settled and hard-working population deriving methods of cultivation from the Moorish occupation, it is an area of great productivity, and in addition there are a number of fishing settlements along the coast.

The Douro Plateau.—Into this upland the rivers have cut deep valleys. The south-westerly course of the Douro is rapid, and encumbered by reefs, and the valley walls are sometimes canon-like. Where the river resumes its westward course the valley widens, and on the terraced slopes are olive-yards and vineyards; the difference of vegetation types is shown in Fig. 65.

On the upland parts are heaths and pastures, while wheat and the Mediterranean fruits are grown in the more favourable valley areas. There are no large settlements, and as a whole the region is not well populated.

The Basin of Old Castile.—The larger part of this region lies at an altitude of about 2,500 feet, but it is enclosed by still higher areas ; consequently it is relatively little influenced by winds from the sea and its climate is marked both by a cold winter (Valladolid has a mean January temperature lower than that of London) and also by a lack of water, particularly in summer (Valladolid has a mean annual rainfall of about

12 inches, of which less than 2 inches fall in the summer season).

Moreover, the daily range of temperature is great, and often the ground is subject to rapid alternations of frost and thaw, while in summer it may be cracked by drought and heat. In addition, the soils which have developed upon the Tertiary and other deposits have, over considerable areas, a high salt content.

Under these conditions neither the forests of Temperate Europe nor the fruit trees of the Mediterranean region can have a wide distribution; the natural vegetation consists of the poorer growths of the Mediterranean type and in the driest areas approximates to that of the steppe-lands.

There are, of course, differences within this sub-region. For example, the higher northern and eastern margins are relatively bare, and often of stony appearance; around Burgos and Valladolid wheat is grown and large flocks of sheep are kept; south of Valladolid pine plantations are the chief resource; in the south-west of the region the less severe climate allows the cultivation of cereals, sugar-beet and even vines.

Valladolid is the centre of the railways and roads which traverse the region, and the other towns of moderate size are on the margins where these routes cross the encircling highlands.

The Central Sierras.—These high ranges, which rise to about 8,000 feet, have a fairly heavy precipitation, and on their highest parts the winter snows may last even till June. The deciduous forests of earlier times have now been largely destroyed and migratory pasturage is the chief resource, apart from farming in the valleys.

Although the steep slopes of the Sierras often present the appearance of colossal mountain-walls, there are gaps between them which offer routes connecting the more populated regions on either side.

The Tagus-Guadiana Plateaus have a somewhat similar structure and relief to those of the Douro Plateau, though the main river-valleys are in general broader and in parts open out into almost lowland areas. In consequence there is here a greater proportion of farmed land, and also the warmer climate allows the growth of the Mediterranean group of productions.

In this extensive sub-region three tract-groups may be distinguished. The western area, marked (1) on the map, is the best watered and therefore the most productive. The eastern

area (2) is more arid and more extreme in climate, and it can support only a rather scanty population ; on the north-east margin is Toledo. The southern area (3), which includes the irregular and in parts even rugged country of the Sierra Morena, is distinguished from the other plateaus by its mineral wealth ; mercury is obtained at Almaden ; copper is mined in the Rio Tinto district, and is in part smelted in the neighbourhood, in part exported from Huelva ; farther east some lead, zinc and coal are found ; on the south-east margin north of Linares lead is mined and smelted.

The New Castile Basin.—The temperatures here are normally higher than in Old Castile, and aridity is a common characteristic of the climate. Among the unpleasant weather conditions are the dust-storms of summer and the snow blizzards of winter. In the south the streams have an uncertain flow ; the upper Guadiana in normal conditions loses its water in the gravel of its bed and has an underground course for several miles, and the Manzanares, the small tributary of the Tagus on which Madrid stands, is completely dry for half the year.

Much of the region has a rather desolate aspect, like that of a poor steppe-land. There are, however, some fairly wide areas in which wheat and barley can be grown, and oasis-like valleys in which there are olive plantations and vineyards. Also, especially near Madrid, there are irrigated huertas, which stand out in strong contrast to the surrounding country.

The one large settlement is Madrid, which rose to importance only when, in the sixteenth century, it was made the capital of Spain ; for this purpose it was well situated, in the centre of the country and at the meeting-point of the chief roads. Now the railways converge upon it and it has become the centre of inland commerce with about a million inhabitants.

The Iberian Highlands.—This region comprises a group of plateaus relatively little raised above the centre of the Peninsula, but descending steeply by step-faults to the Ebro Trough. The rivers have cut deep valleys ; some of these, like the Jalon tributary of the Ebro, give routes into the interior, and some open out into wide areas or even productive basins. Other rivers, however, have canon-like valleys of little use even for roads ; this is particularly the case with the Jucar, Guadalaviar and other rivers in the southern part, and consequently Valencia and the neighbouring Mediterranean Coast-lands are

almost completely cut off from the Basin of New Castile and Madrid,

With a severe climate, the Iberian Highlands are in general unproductive and poorly inhabited.

The Ebro Trough.—This region is so shut off from maritime influence that it has a very scanty rainfall, Zaragoza receiving about 12 inches a year, and the soils often contain salt or gypsum and are generally infertile.

The margins of the region have the maquis type of vegetation, while the central portions are largely treeless steppes and in parts are even salt-wastes. Only where the waters of the Ebro and its tributaries are led out by canals is the generally desolate appearance of the country relieved by continuous ribbons of green ; in these irrigated valleys of the Ebro, Jalon and Segre are produced corn, beetroot, vegetables, olives and vines.

The upper part of the Trough, above Zaragoza, is better watered and the only part where the population is not very scanty, apart from the irrigated areas. Zaragoza is the one large city, situated in the centre of the routes which cross the region.

The Ebro is of little value in linking the region with the Mediterranean Sea, for its winding course is not navigable for large vessels and the delta is too shallow for sea-going ships.

The Catalanian Mountains are better watered, and the area includes a number of river valleys and interior basins in which the typical Mediterranean productions are obtained to a considerable extent; also there are some coal, salt and mineral springs. Together with these natural advantages must be considered the character of the people ; the Catalonians have shown themselves to be enterprising and active in mind and body. Hence the resources have been well utilized, industrial developments have been fostered, and even within the mountain region are areas of relatively dense settlement.

The Andalusian Trough.—Open to the Atlantic, this region has a greater rainfall than the Ebro Trough, but because of its more southerly latitude it has a marked period of drought in summer and higher temperatures throughout the year. Parts of the region have only the steppe type of vegetation, but others bear cereal crops. Below Cordoba the valley of the Guadalquivir is more fertile ; cereals, beet and vegetables are largely produced, and the Mediterranean fruits can here ripen to perfection. The natural water-supply is supplemented by irrigation,

and for this the Guadalquivir is particularly favourable, for the snow of the high Sierra Nevada and other ranges feeds its head-streams long after many of the rivers of southern Spain are reduced to a mere trickle or even run dry.

Below Seville is a swampy area, and along the sea-board of the region are marshes and lagoons from which salt is obtained.

In Cordoba and Seville are beautiful buildings, examples of the architecture of the time when the cities flourished during the Moorish occupation. Seville is still the most important trading centre in the south of Spain; with varied manufactures, especially of cotton and other textile goods, it has a population of about a quarter of a million inhabitants. Cadiz has a good situation as a port-of-call for Mediterranean traffic, and is a centre for the production and export of "sherry," the wine named from the neighbouring town of Jerez.

The Andalusian Cordillera.—This region includes two zones : (i) a northern area of moderate height, formed mainly of limestones and flysch ; (ii) a southern area formed largely of schists and other crystalline rocks, which rises to the Sierra Nevada, the highest part of the Iberian Peninsula. Between the two zones is a narrow interior belt comprising a series of valleys linking broader basins.

The higher crystalline zone reaches over 11,000 ft. in the Sierra Nevada, and cirques and mountain-lakes show the effect of past glaciation. It is well watered, but the woodlands which once covered the mountains are now almost gone. The snow on the heights lasts till late summer and the water is used both in the valleys of this region and on the neighbouring coast-lands. The valleys on the southern side are very productive : olives are grown to an altitude of over 3,000 feet; chestnut, mulberry and walnut trees to over 5,000 feet; rye and potatoes even above 8,000 feet. The sedimentary zone of the Andalusian Cordillera is in general poor country of maquis, with several steppe-like tracts and relatively small productive areas ; some of the limestone uplands have typical karst characteristics.

The narrow interior belt of valleys and basins is important as giving opportunities for communications ; also cultivation is favoured by water from the southern heights, and some of the basins have considerable populations. The vega¹ of Granada is still prosperous, though the town has lost the importance which

¹ " Vega " is the Arabic word for " huerta,"

it had when it was the capital, and the last bulwark, of the Moors in Spain ; the beautiful palace of the Alhambra, which overlooks the city, is a famous memorial of Moorish architecture.

Where the interior belt is cut by the Strait of Gibraltar, it descends into the bay named Algeciras, from the town on the western shore. The eastern side of the bay is formed by the steep-rising limestone mass of the Rock of Gibraltar, and here have been constructed the British fortress and dockyard to protect British interests in the Mediterranean route to India and the East,

The Mediterranean Coast-lands.—This term is used to denote the lands bordering the Mediterranean Sea, which are sufficiently low to have the typical Mediterranean products ; they comprise four tracts, which may be named after the chief towns : Barcelona, Valencia, Murcia and Malaga. '

, *The Barcelona or Catalanian Coast-land* has an irregular relief, and in parts is cliff -bordered . The greater part of the land is productive, and irrigation supplements the rainfall, especially for growing vegetables for the use of Barcelona and other towns of the region, as well as for export; much of the Ebro delta is devoted to rice cultivation.

The characteristic development of the Catalanian Coast-land is, however, industrial. At numerous smaller centres as well as at Barcelona there are manufactures of the various textiles and of machinery, glass and chemicals ; the work is carried on with the aid of imported coal, and with electric power derived largely from the Pyrenees and Catalanian Mountains. Besides being the largest industrial city, Barcelona is the chief port of Spain, and is also the cultural centre of the Catalanian people ; consequently the city is now the greatest in the Peninsula, having a population of over a million inhabitants.

The Valencia Lowland.—This region differs from that north of about latitude 40° in two respects. In the first place, it is an almost unbroken lowland, floored by relatively recent deposits or river alluvium. In the second place, it has higher temperatures and a very marked summer drought; hence much of the region is naturally of the steppe-land type. Now, however, there are only small " islands " of esparto grass, and very large areas have been converted into extraordinary productivity by irrigation.

The Guadalaviar, Jucar and other streams bring water from

the highlands, which is led out over the almost level country by a multitude of channels, and wheat, maize and barley, flax and hemp, rice, vegetables of all kinds, vines and olives, mulberries and pomegranates, almonds and oranges are obtained by intensive cultivation ; in the case of the grains and vegetables a careful rotation of crops allows more than one harvest in the year.

With an abundance of water, no great engineering schemes are



FIG. 67.—VIEW IN ELCHE.

[E.N. A.]

Note.—This is almost the only region in Europe in which date-palms flourish and ripen their fruit. In Elche there are about 80,000 trees ; these are well adapted to the occasional droughts by their deep roots, which draw water stored in the subsoil for a considerable period. The view shows the road from Elche to Alicante, with an irrigation-channel beside it. Observe the short shadow cast by the covered mule-cart—an indication of the altitude of the sun, and hence of the relatively low latitude.

required ; the method of irrigation is simple, although elaborate. The owners of the land have a right to a share in the water, and only rarely does drought necessitate a limitation of the supply.

A dense population finds work and subsistence in the region. Denia and Gandia have their names associated with the fruit sent abroad, but in Valencia is concentrated much of the commercial life of the region, and, with industries also, it has a population of about one-third of a million persons.

The Murcia Coast-lands.—Here the temperatures are still higher, while the rainfall is less and very variable ; occasional

floods may destroy the irrigation works, and droughts may cause the supply of water to be deficient or even to fail. Hence irrigation is mainly limited to the neighbourhood of Murcia, where the Segura brings water from a wide catchment-basin, Lorca, on a tributary of this river, Alicante and Elche.

Also, the organization of the system is different. Great barrages and costly canal construction are necessary, and the proprietors of these irrigation works sell the water to the owners or tenants of the land. When supplies are deficient, the price is raised and the cultivators may be seriously affected, both by the lack of water and by the cost of the small amount which they can procure.

The agricultural production of this region is similar to that of the Valencia area. In addition, minerals are obtained, especially lead and iron, from near Cartagena. This port sends out the ores and the fruit of the region, and having a good natural harbour is the chief Mediterranean naval station of Spain.

The Malaga Coast-lands are formed in part by relatively small areas of lowland, such as those of Almeria and Malaga, where there are vegas, and in part by the terraced south-facing slopes of the Andalusian Cordillera. In this region there is a better rainfall than on the eastern coasts, and a more ample water-supply from the highlands. The summer heat is sufficient even to allow the growth of bamboos, sugar-cane and banana trees. From the ports of Malaga and Almeria, wine and grapes are largely exported, and also iron ore from the adjoining uplands.

The Balearic Islands, of which the largest are Majorca and Minorca, continue the direction and the structure of the Andalusian Cordillera, and are in part mountainous, in part lowland. The uplands have large areas with the maquis type of vegetation, though their borders have terraces for olives, vines and carob trees; on the lowlands, irrigation is utilized for cultivation and almonds are produced in great quantities for export. Palma is a town of moderate size, and as a whole these islands are more productive and more densely populated than Corsica and Sardinia.

QUESTIONS

1. Describe the structure of the Iberian Peninsula, and indicate how it has influenced other factors of the physical geography.
2. Expand, and if necessary modify, the statement that the Iberian Peninsula is a region of isolations.

8. Consider what parts of the Iberian Peninsula have climatic conditions which are " typically Mediterranean " and " modified Mediterranean " respectively.

4. Select three areas with markedly contrasted types of natural vegetation in Spain. State the position of the areas, and describe and account for the characteristics of the vegetation-types.

5. Compare and contrast the position and physical characteristics of the Balkan and Iberian Peninsulas.

6. Write an essay on " Irrigation in Spain."

7. Make a systematic and reasoned study of the main facts of the geography of Portugal.

8. Show in what ways the Moorish invasion has influenced the present-day human geography of the Iberian Peninsula.

9. Examine the dictum : The outstanding fact in the human geography of Spain is the opposition between the central and the marginal peoples.

10. Contrast the average density of population in the Iberian and Italian Peninsulas ; trace the causes of the difference.

CHAPTER XVI

THE SCANDINAVIAN PENINSULA

IN Part I, the general characteristics of the major geographical regions represented in this Peninsula were described (refer back to Fig. 19); here more detail, particularly as to their economic development, will be given.

The Atlantic Margins of Scandinavia form part of Temperate Europe. They are composite regions in that they consist partly of lowlands and partly of uplands, but they have the following common characteristics: their climate and productions are greatly affected by oceanic influences; they have scattered communities of people throughout their extent; these communities look mainly outward towards the Atlantic, and not inland towards the rest of Scandinavia.

The extent of the region is great, covering over 13° of latitude; hence climatic conditions vary markedly and two sub-regions must be distinguished (see Fig. 68).

The South-Western Coast-lands begin with the southernmost point of Norway and include the region around the Trondheim Fiord. In the extreme south the coastal plain is relatively wide and continuous, and here agriculture, mainly the growing of oats and barley, is a relatively important occupation.

From Stavanger northward, the lowland appears only as small islands and patches of coastal plain (refer back to Fig. 2), whose hummocky morainic surface is grass-grown and mainly used for pasture. In addition there are only small habitable areas at the sides of the fiords, and at their heads where river valleys lead upward to the highlands; yet the considerable extent of the fiords (note the length of the Sogne Fiord as shown in Fig. 2) and their many branches allow scattered settlements to reach far into the interior.

The steep slopes behind the coast and by the waters of the fiords have occasionally terraces used for summer pasture or for growing hay fed to the cattle in their winter stalls. On the slopes, too, are woods which provide timber used for house-building and for many other purposes for which other materials

are employed in more southerly latitudes. There are innumerable waterfalls on the mountain sides, and many of these are utilized for obtaining electricity for lighting and for power used in

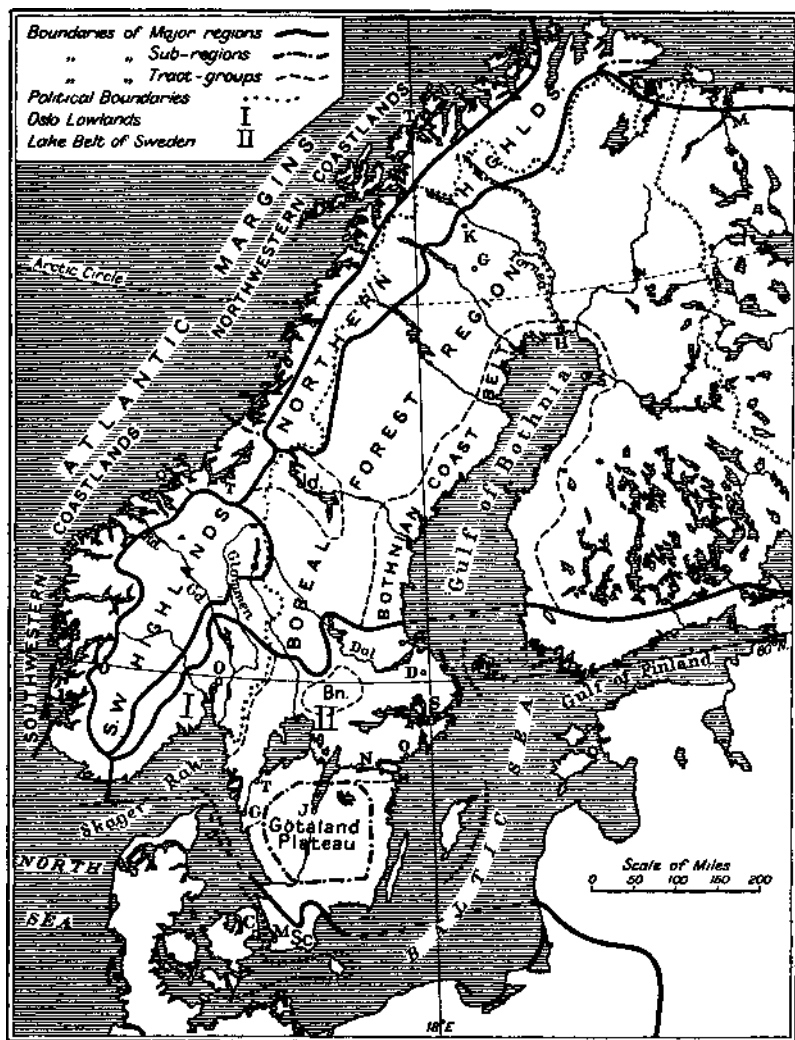


FIG. 68.—REGIONS OF THE SCANDINAVIAN PENINSULA.

factories, as, for example, in chemical works at Odde on a branch of the Hardanger Fiord.

Fishing is one of the chief resources of the people. In the

small settlements the family combine this work with the care of their animals and land ; the towns are all centres of fishing fleets, and in them are carried on the sale of fresh fish and the preparation, by drying, salting or canning, of fish for export. In the extreme south, as far north as Stavanger, mackerel are largely caught; herring become more important in the area which centres upon Bergen. This is the largest town of the Atlantic regions ; besides being a centre of local trade, it is the northernmost terminal of trans-Atlantic liner communication and is connected by railway across the highland with Oslo.

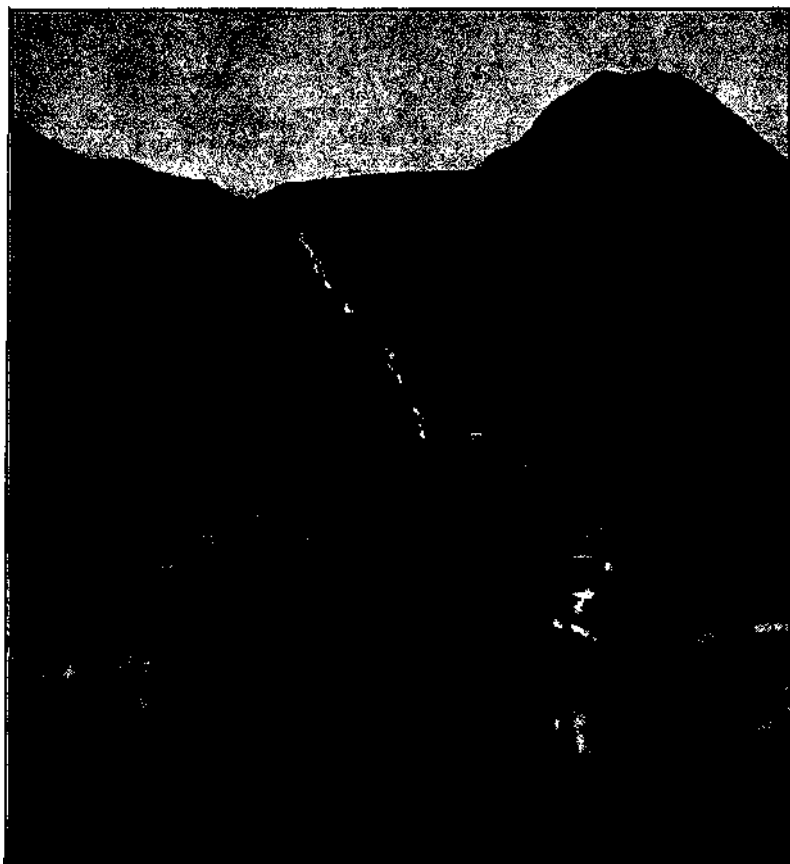
Trondheim. is situated in a wide lowland area ; its fiord, around which are quite extensive areas suitable for farming, is longitudinal to the coast. Structurally, the region is one of relative depression, and behind the coastal lowland is a break in the highlands which may be called the " Trondheim saddle " ; this gives fairly easy access to the eastern part of the Peninsula, and across it a railway joins Trondheim to Sweden. Two other lines go southward from Trondheim to the Oslo region, taking advantage of the Glommen and Gudbrandsdal valleys through the South-western Highlands.

Because of its situation in an unusually productive and accessible environment, Trondheim was in past centuries the centre of Norwegian settlement on the Atlantic coast and the capital of the old kingdom of Norway. Now, however, Trondheim is of far less importance than the modern capital, Oslo, and is even surpassed by the trading centre of Bergen.

The fiords count for very much in the life of the Atlantic Coast-lands ; traffic between the settlements is largely carried on by small steamers, for communication across the highlands is limited to certain routes and almost entirely stopped during the long winter. Also, the fiord scenery, with its beauty and grandeur, brings many visitors from overseas, and thus adds to the contacts of the Atlantic Margins with western lands.

The North-western Coast-lands are less favoured by climate, for the summers are colder and shorter, while the winters are longer and have very little daylight. Agriculture is very restricted, and Jbasky. is practically the only crop that can be grown. As the latitude increases, the supply of timber and the area of pasture-land become less ; fishing is the chief resource of the scanty and scattered population, while the trading towns are fewer in number and smaller in size.

A marked contrast with the south is shown by the lack of small, low islands, while the Lofoten Islands represent a partially drowned mountain region, showing the features of Alpine



[Norwegian State Railways

FIG. 69.—VIEW ON THE STOR FIORD.

Note.—This is the head of one of the smaller Norwegian fiords—about Lat. 62° N. A stream falls from a hanging valley into the main valley occupied by the fiord, in which it forms a small delta, partially seen on the right. Above the delta is a terrace used as a site for houses, while hotels have been recently built near the water's edge. Forest covers most of the land, but at the lower levels clearings have been made and utilized mainly for pasture.

ranges with peaks rising sometimes almost from the water's edge. They emerge from a wide sub-marine platform which forms a rich fishing-ground; here cod are taken in great numbers, and on the coasts are drying-grounds and plant for obtaining the cod-liver oil. Salmon-fishing is also carried on in

many of the fiords of northern Norway. Tromsø is the chief centre for the whaling and sealing fleets of the polar seas.

In a fiord behind the Lofoten Islands is the ice-free harbour of Narvik, from which is exported the iron ore of northern Sweden. Almost at the extremity of the Atlantic region is Hammerfest, the northernmost town in the world, a small trading centre and the site of whale-oil preparation.

Compared with most of the people of Europe, the inhabitants of this region, especially in the northern part, are unusually isolated, most of all during the long, dark winter.

The Scandinavian Highlands comprise two main areas which rise above the tree-line and bear only a scanty vegetation of the Alpine type.

The South-west Highlands include the most elevated parts of the Peninsula: the Hardanger "Fjeld" (i.e. high treeless plateau), the Jostedal "Brae" (i.e. ice-field) and the Dovre Fjeld. These are mainly broad and undulating, upraised peneplains, above which stand occasional peaks of highly resistant rocks; e.g. above the Jostedal Brae, Glittertind rises to over 8,000 feet. The ice of the plateaus works outwards on all sides, and is not concentrated into a few valleys with long glaciers as in the Alps; hence the Scandinavian glaciers are generally short.

The highlands are of little use to man, except for some summer pastures, but there is some mining of iron and copper in Norwegian territory near the margins of the Trondheim Saddle and also near the Arctic Circle.

The highlands are penetrated and even cut right across by a number of deep valleys, as shown in Fig. 2; in these valleys settlement is possible and through them roads and railways have been constructed. The Gudbrandsdal (dal = valley), which leads northward from the neighbourhood of Oslo, is quite continuous across a flat water-parting with the Romsdal which drains out to a fiord of the Atlantic coast; these valleys are marked "Gd." and "Rd." in Fig. 68.

North of the relatively low Trondheim Saddle, through which coniferous woods extend across the whole Peninsula, the treeless fjeld reappears in the *Northern* or *Kiølen Highlands*. These are not so high as those of the south, and because of the lower precipitation of northern latitudes snow does not accumulate to form such extensive snow-fields as in the south.

On their south-eastern side the northern highlands have a marked descent, the Glint, to the Baltic slopes ; in the extreme north they jut out to the sea in the precipitous headland of the North Cape, though towards the north-east they descend more gradually to the tundra of the Arctic Coast.

A strip of tundra land is included in Norwegian territory (see Fig. 68), and here, at Kirknes, are iron mines and ironworks and the terminus of the Norwegian coastal steamship service.

The Boreal Forest Region.—Immediately east of the Highlands is the little-utilized region of coniferous forest; it is narrow in the south, but north of the Lake Belt of Sweden it occupies all the eastern part of the Peninsula and almost corresponds with the historic region of the Swedish Norrland.

The severity of the winter can be judged by the fact that the land is snow-covered for a period which lasts for four months in the south of the region and for seven months in the north ; the shores of the Gulf of Bothnia are blocked by ice for more than three months in the year. But one should note also the fact that the temperatures for July at Haparanda, at the head of the Gulf, are rather higher than those at Bergen (see p. 26).

Along much of the western edge of the region the Glint descends into a long shallow depression, where many of the river valleys are occupied by long lakes. Between the parallel river valleys the land gently rises to moderate heights which are covered by almost unbroken forests ; in the valleys glaciation has interrupted the smooth flow of the rivers, and falls prevent navigation but give water-power, which is being increasingly developed.

The Bothnian Coastal Belt is distinct from the greater part of the region, and is continued around the head of the Gulf and along the shores of Finland. It is of lower elevation than the rest of the Boreal Forest region, and since the Ice Age has more than once been covered by water when the area of the Baltic Sea was considerably greater than at present. Hence behind the present coasts are sandy and clayey deposits which yield more fertile soils than those of most of the Baltic Shield.

The severity of the climate along this belt is somewhat modified by the lower elevation and by the neighbourhood of the sea, and the valleys which cross the area have pastures and even some agriculture, especially in the south.

Forestry is the main occupation over most of the Boreal Forest

region, but some farming, in the form of cattle-rearing and the cultivation of barley, is carried on in the valleys of two areas in which both the soil and the climate are rather more favourable. These areas are the Bothnian Coast Belt, and Jamtland ("Jd" in the regional map), where the Trondheim Saddle permits Atlantic influences to show themselves and where the relatively low country has a cover of unusually fertile glacial deposits.

A railway has been constructed around the Gulf of Bothnia along the inland edge of the coastal belt, and it is connected with the sea-board by branches which run down several of the valleys. The small settlements of the coast have seaward traffic in the summer, and there is some industrial development. This is especially connected with the timber floated down the rivers from the interior, and there are many saw-mills and factories for the making of products such as paper, matches and cellulose.

In the north of Sweden are the greatest known deposits of high-grade iron ore in the world. This is quarried from what are literally mountains of ore, adjoining which the small towns of Gellivara and Kiruna have grown up.

The northern part of the Baltic Forest region is the home of the Lapps, the nomadic reindeer-herders who seek the highlands in the summer; some of them have now permanently settled by the rivers farther south in Sweden, where they fish and keep their herds near their villages, and still more of them live as fishermen by the Norwegian fiords.

The Farmed Forest Lands.—All the south-eastern area of Scandinavia, except Scania, is part of the region which is partly still forested, and partly cleared and taken into cultivation. As was explained earlier, its climate is of the sub-boreal type, with summers as warm as those of southern Britain, but with much colder and longer winters, and the natural vegetation cover is forest of the mixed coniferous and deciduous type. Much of this forest growth has now been replaced by meadows on which cattle are reared or by fields on which fodder crops and grain are produced; among the cereals, oats are the main object of farming, while rye and barley are grown to a less extent.

Within the area, however, differences of structure and relief are bound up with differences of soil and surface conditions, and it is largely because of these factors that some areas are fairly thoroughly utilized while others remain under forest. Also

there are mineral resources in some districts, and the location and outlook of other areas have led to their relatively dense settlement. On these grounds the following divisions have been made. There is a broad lowland extending from the Norwegian lands north of the Skager Rak eastward across Sweden ; it may conveniently be considered as composed of the Oslo Lowlands in Norway, and the Lake Belt of Sweden. South of the Lake Belt, in the division of Sweden known historically as Gotaland, are the South Gotaland Lowlands, and in their centre rises the Gotaland Plateau.

The Oslo Lowlands.—The surface-forms of this region are largely the result of the great glaciers which worked their way down from the adjoining highlands to the hollow of the Skager Rak. Consequently the rivers have falls now used for water-power, while the lowlands in some parts show bare rock and in other parts have glacial deposits on which good soils have developed.

The subsidence of the area between the North Sea and the Baltic Sea has allowed the waters to penetrate the lower parts of the valleys of both the Norwegian and also the Swedish Lowlands ; the resultant shallow inlets with gently sloping banks are known as fiords, although their characteristics are entirely different from the fiords of the Atlantic Margins.

At the head of the largest of these lowland fiords is Oslo, the capital of Norway. It has a convenient situation between the sea (though the harbour is closed by ice for about four months in the year) and the valleys which penetrate the highlands and give access to the Atlantic side of the country. The city is practically in the centre of the Oslo Lowland region, the most closely settled and agriculturally the most productive part of Norway. Moreover, at several parts of the area iron ore is mined and water-power is developed ; there are scattered metallurgical industries, and works utilizing the products of saw-mills.

This economic activity is also found in Oslo itself and its neighbourhood, which is the most densely populated in Norway. With the trade and shipbuilding of the port, the capital has a population of over a quarter of a million persons.

The Lake Belt of Sweden.—Glaciation has had great influence on the land-forms here, as on the Oslo Lowlands, and in consequence there are such a number of small lakes that, like those of Finland, they can be shown only on maps of the largest scale. The existence and the general shape of the greater lakes, Vaner,



FIG. 70.—VIEW OF IRONWORKS BY THE RIVER DAL.

[Swedish Travel Bureau.]

Note.—The works are situated where the Dal most closely approaches the iron mines of the Bergslagen. At this point the river has a marked fall which is used for water-power at the works, though fuel is also needed, as is shown by the high chimney in the centre of the view. The industry is here carried on in a semi-rural district of the "Farmed Forest" region in which the trees have not been entirely cleared.

Vatter, Hjelmar and Malar, are due to faulting and the subsidence of portions of the Baltic Shield, as was explained in Chapter I, though the intricacy of their outlines is the effect of ice-action.

Another factor affecting surface conditions in the region is the occurrence of areas of recent sandy and clayey deposits, like those bordering the Gulf of Bothnia.

Because of the contrasts in surface conditions there are patches of almost barren rock, small areas of moorland, larger areas of uncleared forest, and very considerable stretches of farm-land, especially in the south. Climatic conditions are indicated by the figures for Stockholm in the table on p. 26, though in the west temperatures are a little more equable ; the account of agriculture in the farmed forest region, as described on p. 263, is particularly applicable to the Lake Belt. As a whole, this region is the most productive part of Sweden, with the exception of Scania.

The mineral wealth of the region is also considerable. Copper is found on its northern margin, though the deposits at Falun are now nearly exhausted. Iron is mined near Dannemora on the Baltic side, but the main area of iron production, where ore is obtained from great open quarries, is the district known as the Bergslagen (" Bn " on the regional map). In this area, stretching from the north of Lake Vaner north-eastward to near the River Dal, iron has been mined and worked for many centuries. The industry was originally based upon the proximity of iron ore, fuel from the forests and power from the rivers ; now the same factors are utilized, though by modern methods. The iron ore which is exported goes out largely through the port of Oxelosund, south-west of Stockholm, and to a less extent through Stockholm and through Gavle near the mouth of the Dal.

The remaining part of the iron ore is the basis of an important iron and steel industry in which machinery of many kinds is produced, and associated with this are other branches of metallurgy. The work is carried on at a number of quite small places as well as at several towns in the Bergslagen.

Water-power is obtained especially where the streams descend from the higher ground on the northern margin of the Lake Belt, and both at such points and at many others in southern Sweden there are works for the products of the timber which is floated

down the rivers or brought by coastwise shipping from the Gulf of Bothnia.

Thus there are varied forms of economic activity in the Lake Belt, and here live the great majority of the Swedish people.

Goteborg, with over a quarter of a million inhabitants, is the western outlet of the region and the chief port of Sweden. It is the terminus of oceanic commerce, which avoids the shallow and winding waterways through the entry to the Baltic Sea. Moreover, Goteborg is in a favourable situation both for trade and also as a manufacturing centre, because it is at the mouth of the River Gota which drains Lake Vaner; in its course this river forms the great Trollhatta Falls, now harnessed for water-power. By the River Gota and by canals Goteborg has water-communication through the Lakes Vaner and Vatter across the whole region to Soderkoping (i.e. South-market); this is a small port, at the head of a fiord on the Baltic Sea, near the larger port of Norrkoping (i.e. North-market) (see the map in Fig. 68).

On the Baltic side of the Lake Belt is Stockholm, which, although not well placed for trading with western nations, has other factors in its position which have enabled it to serve as the capital of Sweden. It is about 30 miles from the Baltic Sea, at the head of an inlet where a group of small islands marks the transition to the long Lake Malar. Together, the inlet and the lake form a water-barrier stretching far inland and separating the Swedish settlements on the Baltic from those near the Gulf of Bothnia; the islands, however, give a means of bridging the barrier, and here Stockholm grew up. Also, until the nineteenth century Sweden extended across the Gulf of Bothnia and included what is now Finland, and thus Stockholm had a central position as the capital.

Because it has been built upon a group of islands, Stockholm has been called "the Venice of the North," and because of its beautiful situation and its splendid buildings it is regarded as one of the finest capitals of the world. With a population of over half a million, it is the largest city of the Peninsula.

The South Gotaland Regions.—Between the Lake Belt and Scania are the regions of south Gotaland. The marginal areas are like those of the Lake Belt, except that there is relatively little industrial or commercial development, but the central plateau rather resembles the Norrland part of Sweden. Its climate is less extreme than in the north, but its altitude, which

at one point is over **1,000** feet, and its rocky nature are unfavourable to agriculture and the forest remains uncleared to a greater extent than in any other part of southern Sweden. Lake Vatter penetrates the region, and at the southern end is the small manufacturing town of JSnkoping ; there are a few other small industrial centres on the margins, but the population is scanty, and the people who get their living by agriculture have a poorer return than those of the adjoining regions.

The plateau and even the more favoured lowlands of south Gotaland stand in marked contrast to fertile Scania, which was described in the chapter on the South-West Baltic Lands and is indeed the most densely populated region of all Sweden.

Spitsbergen.—This island group, officially known as Svalbard since it was assigned to Norway in 1925, lies about half-way between North Cape and the North Pole. It has a complicated geological structure and a correspondingly complicated relief; there are fiord coasts, and at one point the land reaches an altitude of over 5,000 feet.

Even at the high latitude of 80°, the North Atlantic Drift has a warming influence, and while glaciers cover much of the surface the lowland areas have a tundra-like vegetation and reindeer and foxes can find a living. By the coasts polar bears and walrus are hunted and the down of eider ducks is gathered by a few people. The main resource of Spitsbergen is the occurrence of great deposits of good coal, which is mined throughout the year, giving occupation to a few thousand persons, and exported during the summer when navigation is not impeded by ice.

Iceland, which just touches the Arctic Circle, is also greatly influenced by the North Atlantic Drift, and its climate may be broadly compared with that of the northern part of Norway. Although built of volcanic material, its relief in general resembles that of north-western Norway, for most of it is a plateau bordered by fiords. Its highlands are covered by ice-fields and lower areas are tundra-like ; in the south there a few trees, pasture for horses, sheep and cattle, and fields where vegetables are grown. A population of about 100,000 people depends less upon farming, however, than upon occupations connected directly or indirectly with the sea. Fishing comes first; cod are taken in great quantities and to a large extent are salted and dried, and exported to Mediterranean countries, while cod-liver

oil is another important product. Trade and industries are also significant occupations, and about a third of the people live in the capital, Reykjavik.

Although Iceland has such a small population, because of its past history it now forms an independent State, united with Denmark by a personal bond of Union under the Danish king.

QUESTIONS

1. Describe the Scandinavian Highlands and examine their influence on the geography of the other parts of the Peninsula.
2. Write an essay on "The Norwegian Fiords."
3. Indicate, and briefly account for, the different types of climate experienced in Sweden.
4. State the distribution, and give an account of the utilization, of the mineral resources of Scandinavia.
5. Describe and explain the differences in the nature of the farming in various parts of the Scandinavian Peninsula.
6. Examine the sites and the functions of the chief ports of Norway and Sweden.
7. Make a systematic study of the lowland which includes near its margins the towns of Oslo, Goteborg and Stockholm.
8. Trace the influences of glaciation upon the Scandinavian people.
9. Compare and contrast the natural resources of Norway with those of Sweden.

EASTERN EUROPE

THE broad characteristics of the regions of eastern or Trunk Europe were described in the first part of this book, and in this chapter further details will be given, especially in connexion with the economic geography. Attention may well be directed particularly to the changes which have occurred in recent years, for in eastern Europe developments have been rapid.

In the old Russian Empire both social and economic conditions were in general behind those of the rest of Europe, and the developments which did occur were limited in the main to the western margin of the Empire into which people and ideas had come from Peninsular Europe. Thus when peace was established after the war of 1914-1918, and the new States adjoining Peninsular Europe (Finland, the East Baltic States and Poland) were formed, these countries were able to continue developments already begun.

In the rest of the Russian Empire only two regions stood out as markedly affected by western advances : (i) That around Moscow and to a less degree at Leningrad, where manufacturing had been started ; (ii) the Ukraine, where cultivation, especially of wheat for export, had been fostered by the great land-owners, and where the iron of the Dnieper district and the coal of the Donetsk basin were mined partly for use in the more northern industrial district and partly for manufacturing near the shores of the Black Sea and the Sea of Azov. Elsewhere there were but small-scale mining and manufacturing works, and there was little traffic with other countries ; even farming, which was the occupation of the vast majority of the people, was carried on by simple and in some parts even primitive methods.

On the other hand, the natural resources were great, and there was therefore opportunity for great improvements. Moreover, the new Communist Government took over the ownership or the management of all the natural wealth of the country, together with the organizations, such as the farms, mines, factories and railways, by which it was utilized. The rulers of the State made

a comprehensive review of the resources, and organized their development in successive "five-year plans," beginning in 1928. With the aid of foreign experts, large numbers of Russians were trained in new methods, production was pushed on by every possible means, and there resulted much geographical redistribution of industrial and agricultural activity.

In connexion with industrial developments, mining was increased or begun in a number of coal- and metal-bearing regions, the water-power of rivers was harnessed, and manufacturing was extended from the previously restricted districts to wider areas, particularly in the neighbourhood of the Ural Mountains, in the steppe-lands of European Russia, in Transcaucasia, and in parts of Asiatic Russia where coal and metals were discovered.

In farming, too, improvements took place, and in particular, agriculture was extended into the forests of the north, into the drier steppe-lands of the south, and by irrigation even into the semi-deserts. It is scarcely too much to say that in the space of twenty years from 1917, Russia experienced at the same time a political revolution, an industrial revolution and an agrarian revolution.

The major regions are determined mainly by climatic factors and correspond broadly to the natural vegetation regions ; hence the names of the larger regions as given in the map in Fig. 19. The subdivisions of these regions are more influenced by differences of relief, structure and surface conditions, and they show consequent differences in the utilization of the land. The major regions are so vast that a complete survey of each is quite impossible ; only the most important features, and a few of the outstanding subdivisions, can be described in the text or indicated as separate regions in the map in Fig. 71.

The Tundra.—In this region there has been little development ; away from the ports referred to below, the few inhabitants are the Lapps in the west and the Samoyeds in the east, who live mainly on the products of their reindeer and by fishing.

The wet Tundra is a barrier to communication when the coast is open in the summer ; it is crossed where help is given by rivers and inlets, and at such places a few small ports have been made, for example at the mouth of the River Pechora in the east and at Kola Bay in the west. The latter inlet so benefits from the North Atlantic Drift that its mouth is ice-free during the



FIG. 71.—REGIONS OF EASTERN EUROPE.

Note.—W indicates the White Russian Republic; U, the Ukraine; T, the Transcaucasian Republics.

whole year, and with the aid of ice-breakers ships can always reach the port of Murmansk. Because this port is open when Leningrad is closed in winter, a railway has been built through Karelia to Murmansk. Moreover, a naval base has been established nearby at Poljarno to supplement that at Kronstadt, the island near Leningrad in the Gulf of Finland, where war-ships are immobilized during part of the year.

The Boreal Forest.—In the European portion of this great region, three sub-regions may be distinguished. In the west is the area of the Baltic Shield marked by the occurrence of innumerable lakes ; east of this is the region, largely lowlands, where the forests resemble those of the Siberian taiga ; separating Europe from Asia are the Ural Mountains, which cause the forest area to bulge southward into the steppe-land.

The " Lake-Shield Area " may be a convenient term for the western sub-region. Politically it is divided between Finland, whose territory consists, except in the extreme north, of the basins of the streams draining to the Gulfs of Bothnia and Finland, and Russia, which occupies the easterly portion draining to Barents Sea and the White Sea or through Lakes Onega and Ladoga to the River Neva.

In several respects this sub-region forms a unity and shows a similarity to the Scandinavian part of the Baltic Shield. The forest trees are the same species as those of Sweden, and they yield timber which is the chief product of considerable areas. In the north the ancient rocks contain minerals ; in the Kola Peninsula, in Russian territory, ores of iron, nickel, aluminium and phosphates are mined, and with the aid of electricity, obtained both from water-power and from peat-fuel, metallurgical and chemical industries have been established within the Arctic Circle.

To meet the local needs of fresh vegetable food and milk, scientific methods have been devised to hasten the growth of the desired vegetables and hay, and even of barley and wheat ; at present this process is relatively costly, and can be carried on only upon a small scale.

The region has been heavily glaciated and the resultant innumerable falls and rapids have been utilized for obtaining electricity in many places in the Finnish area. Glaciation is responsible, too, for the other features of the " lake plateau " of Finland. Here there is an indescribable complexity of water-

surfaces : lakes of most intricate shape are set with numberless islands and interconnected by a maze of water-courses. These lakes alternate with swamps, and it is significant that the Finns name their country "Suomi," which is translated both as "swamp-land " and " lake-land."

Roads through the Lake Plateau region are often made upon the long winding eskers which stand like dykes above the waters. In the Russian region of Karelia a canal has been constructed from the White Sea, utilizing lakes and rivers in its course, to



[E.N. A.]

FIG. 72.—VIEW ON LAKE PAIJANNE, FINLAND.

Note.—This is one of the larger lakes immediately behind the morainic barrier separating the Finnish Lake Plateau from the coastal plain of South Finland. The view shows the irregular though low relief of the region, and some of the innumerable islands in the lake. In the foreground birch and spruce trees are seen as components of the Boreal Forest which still covers most of the land, and a steamer suggests the use of the water for communication.

reach Lake Onega; farther to the south, other canals and rivers complete water-communication through Lake Ladoga to Leningrad and the Gulf of Finland, and also to the Volga river system and Moscow. In considering the use of the waterways, it must be remembered that in the neighbourhood of Lake Onega they are frozen from mid-November till mid-April.

The south-western part of the Lake-Shield sub-region is the most developed. Here in Finland the Bothnian Coast Belt resembles that of Sweden, and there are coastal settlements where saw-mills are driven by electric power and some farming is carried on. In the Finnish Lake Plateau, too, there are

scattered settlements where there are areas of relatively fertile glacial clay and recent marine deposits like those on the Swedish side of the Gulf of Bothnia ; such cleared " islands " in the forests give pasturage for swine and cattle and have small fields of barley and, in the south, also of oats.

Along the southern edge of the Finnish Lake Plateau the waters are ponded back by a double line of terminal moraines ; in crossing this barrier the streams have falls which give much power. Where Lake Saima is drained to Lake Ladoga are the famous Imatra Falls, and in the south-west of the region water-power is one of the chief factors which have aided the development of a number of small industries at Tampere (Tammerfors).

The " Taiga " Area in European Russia is in the main still a forest region, with only small and scattered clearings. Save for the Timan Uplands it is a lowland, with considerable stretches of swamp. Most of the region drains northward, the largest rivers being the Dvina and the Pechora ; the south-east part drains to the Volga, mainly by the Kama. These rivers form the chief means of transport and the Dvina is connected by canals with the Volga and Kama, but like most of the other rivers of Russia, their navigation is subject to much interruption; when ice-covered, they can be utilized by sledges, but in spring floods render them useless, and in summer the lowness of the water may seriously limit traffic.

Timber is the main product of the region, and in the north its chief shipping port is Archangel, at the mouth of the Dvina ; much timber is also obtained from the southern part of the Boreal Forest region where it adjoins the better-populated areas requiring this commodity. In this southern part railways have been constructed, and from it a line goes north to Archangel. There is little mineral wealth in the region, though a coalfield has been discovered in the Pechora basin near the Arctic Circle.

Because of the climate and soil conditions, farming is restricted to very small areas save on the southern margin. Moreover, as it is generally carried on by relatively backward methods its return is rendered the more scanty ; the population is small and lives in poor, indeed often squalid, circumstances.

The Ural Mountains, because of the moderate uplift of the Hercynian massifs which form them, nowhere reach 6,000 feet in elevation, and in the central section the watershed between the European and Asiatic rivers is little over 1,000 feet above

sea-level. Also the tilt of the upraised peneplains is generally slight, especially on the European side, and hence these mountains do not form a difficult barrier between the continents.

Three railway lines cross the Central Urals from the west, uniting at Sverdlovsk (formerly Yekaterinburg) on the eastern flank, and another line traverses the broader and higher Southern Urals by the industrial centres of Zlatousk and Chelyabinsk.

The forests of the Ural region are valuable, and timber is still an important product; as a source of fuel it was one of the factors which aided the growth of industries in this far-distant border of Europe, but the mineral resources of the region are the main cause of its economic development.

In the south is the broad, longitudinal valley of the River Ural; the neighbourhood of this river at Orsk, just beyond the limits of the mountain region, yields deposits of iron ore containing also chromium and nickel. With the aid of an electric power-station and of oil brought by pipe-line from Emba in the Caspian basin, a group of closely linked chemical and metallurgical industries, the latter including the construction of locomotives, has been organized in the district, and a considerable population has settled in what was until quite recently an almost uninhabited area.

Farther north, in the same valley, a similar industrial development has occurred at a newly created large town, Magnitogorsk, named after the magnetic iron ore to which it owes its existence, while manganese is another mineral obtained in this district.

In the Central Urals west of Sverdlovsk, ores of iron, copper, aluminium, nickel and gold are found, and east of that town is a coalfield of considerable size. Hence in this section exists another industrial region, important also as being linked by railway on the one side with other sources of mineral wealth in central Asia, and on the other side with the manufacturing and consuming regions of Europe; Sverdlovsk itself has a population of about half a million people.

There is less economic activity in the Northern Urals, but some coal, iron and oil are worked and great stores of potassium salts have been discovered north-east of Perm. This town is situated beyond the upland region, on the Kama; from the river water-power is obtained and is utilized at Perm.

Centuries ago, the mineral wealth of the Hercynian massifs of central Europe drew people to their neighbourhood; now their

resources are largely exhausted while those of the similar areas in the east of Europe are in their turn transforming a wilderness.

The Farmed Forest Regions.—While the coniferous forests have been cleared only in patches, the "mixed" forest region, with its better climate and soil conditions and its easier accessibility from central Europe, has been far more thoroughly utilized. Yet different types and different degrees of development may be observed in the following areas :

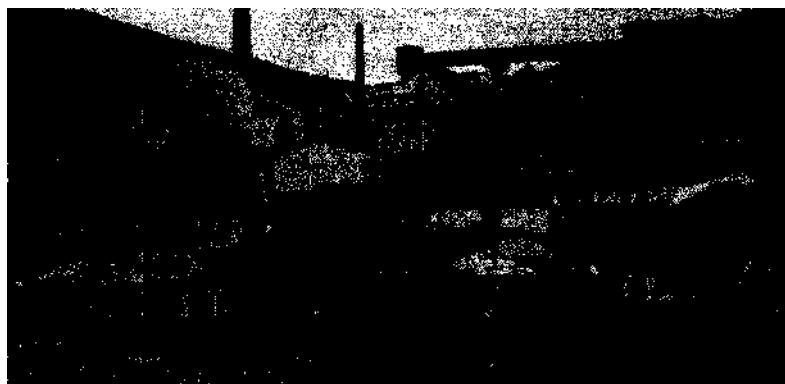


FIG. 73.—VIEW IN MAGNITOGORSK.

[E.N.A.]

Note.—The upper Ural River occupies one of the longitudinal valleys which dissect the broad plateau-like elevations of the Southern Urals. Overlooking the valley the height "Magnitnaya" contains one of the greatest deposits of iron ore in the world, and near it the first "Five-Year Plan" created a new town, Magnitogorsk, centred upon the great "Stalin" metallurgical plant, part of which is shown in the view. Coal is brought from the Kuznets field in southern Siberia, the iron and steel works are closely related to other metallurgical industries, and with the workmen brought from western Russia the settlement numbered about a quarter of a million people within a few years of its establishment.

The South Finland Coastal Plain.—North of the Gulf of Finland the ancient rocks of the Baltic Shield are largely covered by recent clays, which have been so well cultivated that this is the most productive part of Finland ; the farming is concerned mostly with the growing of oats and rye, and the keeping of cattle.

Off the coast is a swarm of small islands, continued across the entrance to the Gulf of Bothnia as far as the Aland Islands; the islands and the small inlets of the mainland are the homes of many fisher-folk.

The streams which issue from the lake-land of the interior give water-power for many saw-mills and other works utilizing the timber, and for metal, textile and other industries in the small ports of Turku (Åbo) and Viipuri (Viborg), and particularly in Helsinki (Helsingfors), the capital and the chief trading centre of Finland.

The East Baltic Lands.—South of the Gulf of Finland the strata of the Russian platform form a group of low plateaus which are separated by slight depressions generally marked by deposits from lobes of ice occupying these hollows in the Ice Age. Hence the States of Esthonia and Latvia and the north-eastern parts of Lithuania and Poland have plateaus farmed in much the same way as the coastal plain of Finland, but these alternate with lower and wetter areas, which still have a good proportion of forest and even marsh-land and lakes.

The most obvious of these lower areas is that largely occupied by the Gulf of Riga, around the margins of which are some of the less-productive farming districts. Yet the commercial advantage of the inlet has led to the growth of Riga, a short distance up the River Daugava (Dvina). This is the largest city of the three small Baltic States, and its importance dates from the time when it was the centre of the German colonization of these lands ; to that colonization is due, also, the general appearance and much of the architecture of Riga and others of the larger towns of the region.

In the time of the Russian rule over the east Baltic States Riga had much trade, aided by the fact that it is closed by ice for a shorter period than Leningrad ; also, with the facilities for transport, there grew up manufacturing of textiles, metals and wood. When Russia was cut off from this outlet to the Baltic Sea the activities of Riga were curtailed, but it still remains a port having a fair amount of commerce, and it has become the capital of Latvia with about 400,000 inhabitants.

A port of somewhat similar history and circumstances is Tallinn (Reval) on a small inlet near the entrance to the Gulf of Finland. It is, however, a smaller city than Riga, for it has only about 150,000 inhabitants ; it is now the capital of Estonia.

Another still smaller port is Liepāja (Libau) on the open coast of Latvia ; its artificial harbour served the Russians as a naval station because, not being in a river mouth at which ice would

accumulate, it could be kept open for vessels during the winter. In the interior is Wilno, in Poland, previously known as Vilna when it was the capital of Lithuania,

As the influence of past German dominion over the greater part of the east Baltic countries is seen in the cities, so it is to be traced also in the agriculture ; hence farming in the east Baltic lands was more advanced than in the farmed forest region farther east, partly because of the peoples who have occupied it, but partly also because of the physical conditions.

The West Russian Lowlands.—The States of Estonia and Latvia are separated from Russia by a natural frontier as well as by a political boundary, for southward from Lake Peipus is one of the ice-lobe hollows, with lakes, marshes and forests. West of this barrier settled the Ests and Letts ; east of it spread the Russians. This part of Russia, however, is one of the less favourable areas for settlement, and poor conditions extend eastward to include the neighbourhood of Lake Ilmen.

Southward the land rises very gradually to the water-parting leading over to the basin of the upper Dnieper, where again the country gradually descends to the Pripet Marshes—the greatest swamp-region of Europe. Near the River Dnieper the land has now been largely drained and utilized, but its tributary the Pripet still flows sluggishly through the vast marshes ; swamp-woods alternate with wet and sometimes flooded marsh-lands, and only here and there small sandy islands rise above the uninhabited lowlands.

Here, again, surface conditions have affected political boundaries, for this region, once a " no-man's land," separates Poland on the west from Russia on the east; moreover, while the White Russians occupied the region to the north-east, the Little Russians settled on the south-east, and consequently the boundary between White Russia and the Ukraine also runs through the marsh-land.

The North-West Russian Entry-land.—East of the head of the Gulf of Finland is another region which has generally poor resources in itself, but in this case is important as being for over two centuries the main entry into Russia. Here Peter the Great founded a new capital in the swamps at the mouth of the River Neva to be in touch with the western nations, from which the older capital, Moscow, could in those days be reached only with difficulty. In spite of the unpleasant and even unhealthy

site and in spite of the winter-closing of the port, Petersburg, as the city was first named, justified its creation.

Inland communications from the port were gradually improved, beginning with roads leading to Moscow and the other important towns of central Russia. Canals have been cut across the low water-partings to join the Neva to the Volga and the other great river systems of the country; the most important of these canals are those leading to the Volga and thence to Moscow, as shown on the regional map in Fig. 71. Railways have also been built across the swamps, and that constructed from St. Petersburg to Moscow appears on a map almost as a straight line.

Trading, shipbuilding and armament-making were the first economic developments at St. Petersburg, and when manufacturing was introduced into Russia, textile and other factories were established there. With its importance as a capital and residential city, St. Petersburg had a population of well over 2 millions before the fall of the Russian Empire.

After the revolution the seat of government was again transferred to the earlier capital, Moscow. The city on the Neva was renamed Petrograd, and with a temporary cutting-off of most of the trade between Russia and other countries, it suffered severely and the population diminished to about 1½ millions. Then came the third stage of its history : it was called Leningrad, and with the resumption of foreign trade and the new industrial developments in Russia it has again grown ; now, although its work is almost restricted to that of a port and a manufacturing centre, Leningrad has about three million inhabitants.

The Central Plateaus.—Near Lake Ilmen, the west Russian lowlands are overlooked by the scarp of the Valdai Heights, which, capped by part of an end-moraine, reach a height of over 1,100 feet. The Valdai Heights, lake-studded and forested, descend southwards to a region of broad, low plateau? ; towards the east these plateaus are drained by the Volga, its tributary the Oka, and a tributary of the latter stream, the Moskva, on which Moscow stands.

As a whole this low plateau region is now farm-land. Until recent years, rye was the main crop, but as methods of agriculture are being improved wheat, being a more valuable grain, is being increasingly sown. Industrial crops, too, are cultivated in greater variety and to a greater extent than formerly; flax

and hemp are of special importance. The rise of industries in the neighbouring regions has stimulated also the demand for vegetables and dairy produce.

The Moscow-Gorky Industrial Area.—From Moscow eastward to Gorky (formerly Nijni Novgorod) is a region marked by industrial development; it overlaps the Central Plateaus near Moscow and forms a great triangle stretching eastward between the upper Volga and Oka to Gorky at their confluence. The modern development arose here partly because of the existence of these two important cities of old Russia.

About seven centuries ago Moscow became the capital of what was then the relatively small State of Russia ; like many other cities it originated where an island made a convenient crossing-place on a river, and in Russia the rivers formed the easiest means of communication. As in the case of other capitals, too, the extension of the territory ruled by its princes led to its increase in importance, and to the river routes were added roads which radiated from it to all parts of the State.

In spite of the removal of the Government to St. Petersburg, Moscow, which was situated almost in the centre of Russia, remained the ecclesiastical capital of the country and in other ways kept its position as the centre of the national life and traditions. When the Russian power extended southward over the steppe-lands and eastward over Siberia, and when railways were built from Moscow to all parts of the dominions, the central position became more important and the city continued to grow in size. Finally, when the Soviet Government was put back to Moscow, and it became the seat of the highly centralized administration of the great State, it increased rapidly in importance and size and has now a population of about 4 millions within the boundaries of the city.

The ancient citadel, the Kremlin, with churches and palaces, surmounted by cupolas and enclosed by a battlemented-wall, has become the site of the government buildings. Both within and beyond the residential area of Moscow many great factories, making almost all kinds of commodities, have been built.

The region between the Oka and the Volga was the heart of the country of the Great Russians, and scattered about it were towns in which small-scale manufactures gradually grew up ; these were largely of textiles using at first home-grown wool and flax, and then cotton which was brought from Persia and the

eastern Mediterranean up the Volga to the great fair-ground at Nijni Novgorod. After the Russian industrial revolution, this manufacturing industry employed large-scale methods, extended its range to all kinds of enterprises, and utilized varied sources of mechanical power.

The so-called "Moscow coalfield," which lies a considerable distance south of that city, in the neighbourhood of Kaluga and Tula, yields mainly lignite, and as a result of the more efficient use of this fuel, both the demand for it and the amount produced from the field have increased greatly; coal and oil from other parts of Russia are also employed. The water-power of the Volga has been harnessed, and even peat from the bogs is burned in specially constructed furnaces for producing electric power. Iron is obtained from the neighbourhood of the Kaluga-Tula coalfield.

Within the limits of this industrial area, as shown on the regional map, are now about **100** manufacturing cities and towns; these include Gorky with 500,000 inhabitants and about half a dozen others (the positions of which are shown by circles on the map) which have populations between 100,000 and 250,000 people.

Yet even in this district the greater number of the people still depend upon agriculture, of the type referred to in connexion with the central plateaus. On the other hand, industries are carried on at more widely scattered places in other parts of the "farmed forest" region, as, for example, at the large town of Kazan on the Volga, where this river turns southward to the steppe-lands.

The Steppe-lands.—Over the great extent of this major region there are marked differences both in the physical geography and in the economic developments. The broadest distinction is that based upon climate, and it corresponds to the division into the northern or forest-steppe and the southern or true steppe.

The Forest-steppe.—As a whole, the region of the forest-steppe, with its varied and abundant vegetation growing upon the rich black-earth soil, is the most favourable for cultivation of all eastern Europe; consequently the natural wooded grass-land has now been transformed into a country of farms and settlements. Characteristic of this belt is mixed farming, with a balance between the growing of crops for human use and the

production of fodder for animals ; among the grain-crops there is also a balance between the cultivation of wheat and that of rye (refer back to Fig. 18).

The western section is mainly situated in the basins of the Dnieper and other rivers flowing to the Black Sea and in the basin of the upper Don ; as compared with the eastern section which is drained to the Volga, it is better watered and has a rather longer period of warmth ; hence the normal yield of the harvests is greater in the west than in the east. Moreover, industrial crops, among which sugar-beet, hemp and tobacco may be specially mentioned, are grown to a considerable extent in the west, and here various fruits add to the abundance of the products.

The farming has been mechanized and, particularly in the west, is carried on by intensive methods ; it therefore supports a population which is dense for a predominantly agricultural region, although the numbers necessarily decrease towards the east. There are numerous towns of medium size serving as centres of local trade, but not many large cities ; the chief are Kiev, on the Dnieper in the west, and Kuibyshev (Samara) on the Volga in the east.

The region has little mineral wealth, an exception being the iron ores which have recently been discovered in the centre of the belt near Kursk. In this district a metallurgical industry has been started ; elsewhere there is little manufacturing except in some of the towns where it is connected largely with the products of the farms or the needs of the farmers.

Politically, the western section of the combined forest and true steppe-lands region includes the greater part of the Republic of the Ukraine. In the extreme north-western corner, an area has been incorporated into Poland, and west of the broad and deep valley of the Dniester is Bessarabia, which has been assigned to Rumania. On the other side of the Ukraine, a part of the western section and all the eastern section of the European steppe-lands are in the " Russian Soviet Socialist Republic."

Kiev, the capital of the Ukraine, is situated on the northern margin of the forest-steppe and has a population of over half a million persons. It was an early centre of Russian development and is distinguished by many domes of ancient churches and monasteries. Its position has favoured its development as a seat both of administration and also of commerce, for it is where

roads skirting the Pripet Marshes (once greater than they are now) crossed the Dnieper, which was for long one of the main means of communication of Russia.

The site of the kernel of the city was the high right bank of the river, for the Dnieper here shows the characteristic common to many of the larger rivers of the steppe-lands. The right or western bank of these rivers is the "hill shore" which overlooks the stream at a considerable height, while the left is the "meadow shore" liable to flooding in the spring; from this low level the country rises gradually eastward, rather like a dip-slope, to the undulating plateau which continues for many miles till it ends in the scarp-like hill shore of the next great river.

The Southern Steppe-lands.—The term "true steppe" may be applied to this region to describe the natural vegetation, but it may give a wrong idea of the present conditions, for much of the country is now under the plough and many large industrial towns are scattered over the western part of the region.

The southern, as compared with the northern, steppe-lands have higher summer temperatures, with less and more irregular precipitation, particularly in the eastern part, where aridity is a serious difficulty. The west is predominantly a grain-growing region, a part of the "maize and wheat belt" of Europe, though other crops have their place in the rotations; among these the sugar-beet and barley are important and the soya-bean has been more recently introduced. Fruit and the vine are also cultivated.

In the districts immediately to the north of the Black Sea and to the north and the east of the Sea of Azov, the lack of moisture is dealt with by "dry-farming" methods like those employed in the Middle West of North America, while irrigation is used where water can be diverted from the streams; by such means the range of products is increased, and vines and water-melons and even rice and cotton are obtained in the naturally dry areas.

In the eastern part of the southern steppe, barley, millet and drought-resistant varieties of wheat are grown; over a good deal of the steppe-land, but especially in the east, sunflowers are cultivated mainly for the sake of oil contained in the seeds. In this drier country great changes were brought about after the Revolution by the formation of large State-farms, using modern methods in what were previously almost unutilized areas; here,

as in the west, planting of trees has been begun in order to serve as wind-breaks for the farm-lands.

Pastoral work is everywhere important in the southern steppes, and towards the south-east the keeping of sheep becomes the main occupation. With all the developments, there are still considerable areas where the land bears little, and except in the western part the population dependent upon agriculture is not great.

The Industrial South.—Mineral deposits and water-power are



FIG. 74.—VIEW OF THE DAM AT DNEPROSTROY.

[E.N.A.]

Note.—The belt of granite which outcrops across the course of the Dnieper not only causes rapids, but narrows the stream and provides a firm base for the dam. This ponds back the river, and gives a supply of water for the canal which circumvents the falls and for the power-station which adjoins them. The view shows the overflow from the barrage and suggests the widening of the river below this point.

the basis of great industrial and commercial developments in three districts north of the Black Sea and Sea of Azov.

The region within the great bend of the Dnieper utilizes the iron ore found over a considerable area where the granitic belt rises from below the younger rocks of the Russian Platform as explained in Chapter I; in the southern part of the area, by Nikopol, manganese is obtained. The granitic belt is also responsible for the rapids which have prevented navigation in the southward-flowing reach of the Dnieper, but which have offered an enormous source of power. Near the newly created town of Zaporozhe, at the rapid known as Dneprostroy, are great works which provide water for a canal connecting the

navigable upper and lower reaches of the river, and also furnish power to one of the greatest hydro-electric stations in the world. Based upon this power, the " Dnieper Combine " has a connected system of industrial plants in which are manufactured many metallurgical products, including iron and steel, aluminium and manganese. Some miles above this point is the large city of Dniepropetrovsk (Yekaterinoslav), of nearly half a million inhabitants, with varied commercial and industrial activities.

The centre of the iron-mining is at Krivoirog, and here metal working is carried on, for there is an exchange of ore and coal between this region and the Donetz coalfield. At the western side of the Dnieper industrial region is Kirovo (Zinovievsk).

The Donetz region yields coal, the production of which is about half the total production of the U.S.S.R, and stands second only to that of the Ruhr among the coalfields of Europe (including the British Isles); in recent years not only the actual annual output but also the estimate of the total reserves has been greatly increased. Some iron, salt, mercury and other minerals are also obtained in the district. Metallurgical works are established at several centres ; among these Voroshilovgrad (Lugansk) and Stalino (Stalin) are the largest, the latter having rapidly grown from a small iron-working centre (then named Yuzovska) to a town of over 300,000 inhabitants.

The third area of industrial activity is situated near the north shore of the Sea of Azov, where several towns take advantage of their facilities for transport by water, and of their proximity to supplies of metals and coal, for metallurgical and other works. Near the mouth of the Don is Rostov, where trading and varied manufactures support a population of over half a million ; farther west, among other centres are Taganrog and Mariupol. There is an exchange of coal and iron between Mariupol and Kerch, at the entrance to the Sea of Azov, for while Mariupol exports coal, Kerch sends out iron ore obtained near that town ; consequently at Kerch also there are iron and steel works.

Still other industrial developments have taken place in the southern steppe-lands, particularly at towns which have been for a relatively long period centres of local administration and commerce. Kharkov was one of the early centres of Russian dominion over the steppes, and has now become a city of nearly three-quarters of a million people. On the Don is Voronezh, and Stalingrad (Tsaritsyn) on the Volga has had a marked

growth and numbers about **400,000** inhabitants ; its importance will be greatly increased by the construction of the canal from the Volga at Stalingrad to the Don at Kalaeh, thus bringing the greatest Russian water-way into communication with the Black Sea.

The north-west of the Black Sea coast is the main entry and outlet for all southern Russia, though trade is hampered by the formation of sand-bars across the river-mouths and by the accumulation of ice at midwinter. In spite of these drawbacks, Nikolaiev on the Bug grew to have a considerable export of wheat when, before the Revolution, the great landlords devoted much of their land to the cultivation of grain to be sent abroad and thus to bring them wealth.

For much the same kind of trade Odessa was made a port with an artificial harbour safely away from the silt and ice of any river-mouth ; in recent years the development of the south of Russia has increased the variety and the amount of the commerce of Odessa, until it is now a city of over half a million inhabitants.

The "Mediterranean" Coasts.—In the Crimean Peninsula, the country becomes more arid and poorer in appearance towards the south, until it rises to the Yaila Mountains, whose heights are relatively well watered and bear woods both of deciduous and coniferous trees.

The southern coast, facing the Black Sea and protected from the north by the mountains, has much milder temperatures and a moderate rainfall in winter, while the summers are warm and dry ; it is therefore a region of the "Mediterranean" type, and resembles the Riviera of France and Italy in its scenery, its natural vegetation, its vineyards and orchards, and its use as a health and pleasure resort.

This region is continued along the north shore of the Black Sea, backed by the slopes of the western Caucasus, until it merges into the Transcaucasian area with still warmer summers.

The Caspian Lowland.—This arid region has been utilized in several ways. Agriculture is mainly limited to areas which can be irrigated by rivers coming from better-watered regions : viz. the deltas and lower courses of the Rivers Volga, Ural, Emba and Terek, and the coastal strip where streams descend from the Caucasus south of the River Terek. Cotton is grown in these areas, and a beginning has been made with wheat cultivation on the low, left bank of the Volga above Stalingrad.

The very aridity of the region and the saltiness of the soil have been made use of by the construction of large salt pans, into which water is drained and then evaporated, near the Volga.

Oilfields are developed at Emba and at Grozny ; the latter has grown to be a large settlement on the border of the arid depression and the southernmost part of the steppe-land.

Commerce is centred at Astrakhan, where, at the mouth of the Volga, commodities are interchanged between the regions east and south of the Caspian Sea, especially the Transcaucasian Republics, and the regions served by the inland water-ways of central and eastern Russia. Fish, including the sturgeon from the roe of which caviare is made, are caught in the lower Volga and exported from Astrakhan.

The Caucasus and Transcaucasia.—The Caucasus Mountains are regarded as forming the boundary of Europe towards south-west Asia. They are a link in the chain of " Alpine " fold-mountains which continue from southern Europe through southern Asia, and in structure and relief they are more closely connected with the neighbouring highlands of Asia Minor than with those of Europe. For this reason we shall deal with their physical geography only so far as to note that the Caucasus Mountains consist of a series of forested and almost parallel ranges surmounted by volcanic cones, the highest of which, Elbruz, reaches an elevation of over 18,000 feet above sea-level; on the southern side they are separated from the highlands of Armenia by the broad valleys of the Rivers Rion and Kura, where the climate and vegetation may be described as sub-tropical.

Yet because the Transcaucasian Republics form part of the U.S.S.R, there is a close economic association between these regions and European Russia. Of great importance is the production of oil on the northern flanks of the Caucasus at Maikop as well at Grozny, on the southern side of the mountains near Tiflis, and especially at the eastern end near Baku. The enormous yield in this last area is in part used for local industries, which, together with commerce, have caused Baku to become the third largest conurbation in Russia, with a population of more than three-quarters of a million inhabitants. Much of the oil is either sent out from Baku to the Volga, or pumped by pipeline across Transcaucasia to Batum and thence distributed by

sea. Other minerals are furnished by the Caucasus for Russian consumption, and the valleys of the Rion and Kura, in part naturally well watered and in part irrigated, supply cotton, tea and tobacco.

Together with the southern part of Russian Turkestan, this region makes the U.S.S.R., an almost self-sufficient economic unit.

QUESTIONS

1. Discuss the statement that in eastern Europe climate is the controlling factor in the geography.

2. In what ways does the structure of European Russia influence its economic resources and activities ?

3. Compare and contrast the " Lake Shield " portion of the Boreal Forest Region with the eastern portion as far as, and including, the Ural Mountains.

4. Assess the advantages and disadvantages of the rivers of eastern Europe as means of communication.

5. Write a systematic account of the East Baltic area, situated to the west of a line drawn from the head of the Gulf of Finland southward as far as the Pripet Marshes.

6. To what extent, and in what ways, has the " Farmed Forest " region of Russia been transformed from its natural state ?

7. Explain the character of agricultural production in the Forest Steppe, and the conditions under which it is carried on.

8. Give an account of the industrial areas in the steppe region of Russia north of the Black Sea.

9. State and account for the economic developments in the Ural Mountains and their vicinity.

10. Compare and contrast the situation, growth and functions of Moscow and Leningrad.

11. Consider the respective commercial values of the four seabords of European Russia.

12. Explain the recent penetration of settlement and economic activity in the cold northern and the arid southern margins of eastern Europe.

PART III THE STATES

CHAPTER XVIII

TRUNK AND TRANSITIONAL EUROPE

T H E aim of the last part of this book is to show some of the more important ways in which the States of Europe are related to their geographical conditions.

Hence some idea must be given of the extent of the territory of each State ; also the geographical regions which comprise the territory must be noted in order that the resources of the State may be estimated, together with its ability to exchange a surplus production of some commodities for others which are needed.

Further, a State possesses territory, but is essentially a community of persons ; hence a study of its people must be a matter of primary importance—the number of the population, the nationality or nationalities which compose it, and in some cases their contrasting characteristics and the problems which result.

Also, attention must be drawn to some of the relations between the States as far as they have a geographical basis or geographical results ; as, for example, the positions of some of the political frontiers and their influence upon economic activities.

TRUNK EUROPE

Russia.—This is the largest of the States of Europe, for the European part of the " Union of Soviet Socialist Republics " occupies an area of nearly 1,900,000 square miles, and if the whole of the Ural region and Transcaucasia are included, the area is about 2,000,000 square miles, that is, about half the total area of the continent. The maps in Part I show that in this great extent of territory there is a diversity of structure and mineral resources, climate and soils, natural and cultivated vegetation **which is unequalled in any other State.**

Moreover, the Asiatic territories of the U.S.S.R, bring the total extent to over 8,000,000 square miles, about equal to that of the whole of North America. In this vast area the natural conditions are still more diverse than in the European portion, the range of production is increased, and the total resources at the disposal of the State are enormously augmented. Indeed, the U.S.S.R, lacks scarcely any natural resource to make it self-sufficient ; the one important exception is rubber, and in Russia, as elsewhere, synthetic methods of production may soon remedy this deficiency.

Yet the very extent of the territory presents a great difficulty, if not a serious weakness, in the efficient working of the State, both from the point of view of economic adjustments and also of political unity. Nature has hindered communication by rivers, as has already been shown, and the road and railway systems are as yet inadequate to the needs of the country ; aviation now gives rapid contacts, but the amount of traffic by air is, of course, limited.

With the variety of the resources the need for foreign trade is relatively small; also, commerce with other countries is hampered by the rather unfavourable situation of the ports of the Black Sea and the Gulf of Finland, and by the climatic conditions of the northern coasts. Hence Nature, political conditions and an urge towards self-sufficiency tend to keep the U.S.S.R, from such close commercial association with other States as is common among the countries of Europe.

By far the largest export is of wood and wood products ; then come oil, hides, skins and furs, and flax. These raw materials are exchanged for manufactured goods, especially of iron and steel, and for the means of developing the growing industries, i.e. machinery of many kinds. The trade is necessarily carried on with the already industrialized countries, mainly with the United States, Great Britain and Germany.

The map in Fig. 82 shows a more marked contrast in the density of the population in the different regions of Russia than in any other State in Europe ; while the north and the south-east have very few inhabitants, part of the forest-steppe region is one of the most densely populated parts of the continent.

At the present time the number of inhabitants of the European portion of the U.S.S.R, is well over 140 millions, and in addition about 7 millions live in Transcaucasia ; by contrast, the Asiatic

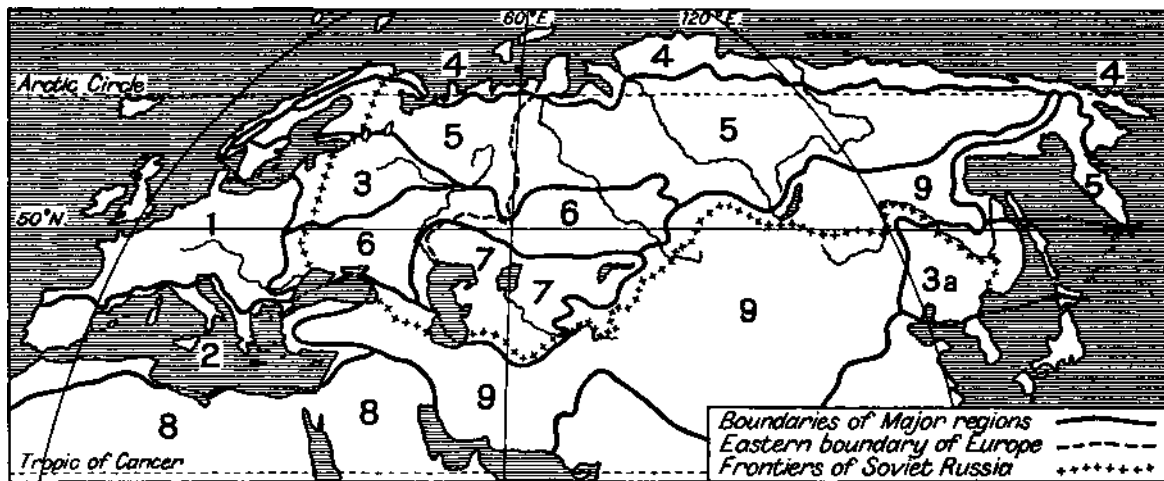


FIG. 75.—MAJOR REGIONS OF EUROPE AND NORTH-WESTERN ASIA.

Key to Regions: 1 = Temperate Europe; 2 = Mediterranean Region; 3 = Sub-boreal Farmed Forest; 3a = Sub-boreal Forest of Asia; 4 = Arctic, or Tundra; 5 = Boreal Forest; 6 = Steppe-lands; 7 = Caspian-Aral Depression; 8 = Hot Deserts; 9 = Highlands of Asia.

Note.—The map is drawn upon Mollweide's Equal-Area Projection; therefore the extent of Temperate Europe can be compared with that of the major regions which overlap Europe and Asia, and the area of Soviet Russia can be compared with that of Peninsular Europe.

The degree to which Russia is cut off from the rest of Asia by highlands should be observed.

territories, although so much greater in area, have a population of not many more than 30 million people. Thus the total number of Russian subjects is now about 180 millions, and it is increasing by about 3 millions each year; it must further be noted that the rate of increase is greater than that in any other European State.

In Asiatic Russia the people belong to a number of racial stocks, and speak many different languages, but in the European territory the population is less diverse. In spite of the differences between Great Russians, White Russians and Little Russians, and the more striking contrasts of the relatively few inhabitants of the far north-east and south-east, there is considerable uniformity among the population; it is more homogeneous than that of some much smaller European States. Also, in spite of differences of feeling, e.g. that of the Ukrainians, one can scarcely say that in European Russia there are clearly contrasted "nationalities" as the term was used in Chapter V,

Indeed, the creation, after the war of 1914—18, of new States formed from the hitherto subject nationalities removed a great weakness in the constitution of the old Russian Empire. Also the backwardness which in many ways characterized the people of Russia, resulting from the lack of close contact with Western civilization for many centuries, has now been removed by the recent institution of universal education.

The Communist form of economic organization which marks off the U.S.S.R. from the rest of Europe, and the consequent hostility which has existed between this State and some others, have tended to draw together the people of the different parts of Russia. The main problems of the State, apart from the hostility of certain foreign Powers, are bound up with maintaining a stable form of government and achieving economic success in one of the greatest experiments in the history of the world—the unifying of such a vast population and such a huge territory in a new organization of society.

TRANSITIONAL EUROPE

The States of this belt of the continent—between Trunk and Peninsular Europe—are not only transitional from the point of view of the physical geography, but were formed or had their territories increased when, after the revolution in

Russia, the boundaries of that country were withdrawn eastward from their previous extension towards the west.

Finland.—The Republic of Finland covers more than **130,000** square miles, and is therefore larger than the British Isles (about **120,000** square miles). Yet, as it is mainly composed of parts of the Tundra and Boreal Forest regions and only its southern strip is in the Farmed Forest region (see Fig. 71), the area of utilized land is relatively small; indeed, nearly three-quarters of the country is still forested, and there are great expanses of lake and swamp.

The forests are the great national asset of Finland, and from them come the timber and its products, such as cellulose and paper, which form the chief exports of the country.

The farming of the Bothnian and South Finland coastal belts supplies most of the second important group of exports—butter, cheese and eggs, and these, like the produce of the forests, are sent in greatest amount to Britain, Finland's chief customer. In return for these exports, Finland obtains many necessities, especially cereals, manufactured goods, raw materials and coal. With such limited home-production there is no possibility of self-sufficiency, nor is there any attempt at this in order to ensure independence in time of war, as Finland is relatively free from difficulties with other States. It is therefore the policy of the country to promote exchange with other lands; the Bothnian and south Finland coastal belts have active trade, and in these regions is concentrated a large proportion of the population. Although the State obtained a "corridor" to the ice-free Arctic Coast between Sweden and the U.S.S.R., only a long motor-road reaches that sea, and the small northern ports have little trade.

With its scanty natural resources, Finland has a population which is small compared with its extent, viz. about 4 millions.

The areas of relatively close population, which include the towns along the western and southern coasts, differ from the rest of Finland as regards the origin and language of their inhabitants, for here dwell the Swedish-speaking subjects of the Finnish State. They are the descendants of the settlers who came in when Finland was under Swedish rule during several centuries before it was taken by the Russians. They have retained their Swedish speech and culture, and form a "minority" of less than **10** per cent, of the population. Yet as by the constitution of

the State they have rights guaranteed to them, particularly that of having Swedish schools and the use of their language in the law courts, there is not the bitterness of feeling here that is found in some other States which include a national minority.

The Baltic States, (a) Estonia and Latvia.—These two States are alike in their physical geography, and also in their political conditions, although the Ests have racial and language affinities with the Finns, while the Letts are more closely related to the Lithuanians, as was explained in Chapter V.

These small republics have each an area of only about 20,000 square miles, and although they are in the Farmed Forest region, nearly one-quarter of the area is still uncleared.

Hence timber and wood products form a considerable part of their export trade ; their more southerly situation as compared with Finland, however, enables farming to be relatively more important, and much dairy produce and flax are sent abroad, particularly to Germany, with which country they largely trade. For their small industries they import raw materials or semi-manufactured goods, and in the main manufactured goods have to be obtained from abroad. Here, as in Finland, is no question of economic self-sufficiency : exchange is essential.

Estonia and Latvia are in the main agricultural countries, and the present state of their agriculture is largely influenced by their past relationships with other States. They have had independence only recently, and previously had been under the dominance of Germany, Sweden and Russia. From the eleventh and twelfth centuries there were German settlers, and in course of time these " Baits " came to own the greater part of the land, even after the country was ruled in turn by Sweden and Russia ; the Ests and Letts were generally merely serfs, and the German element in the population, though small numerically, was economically the most influential. When, after the 1917 Revolution, the Ests and Letts obtained political control, the great estates of the Baits were broken up and given, without compensation to the previous owners, as smallholdings to the native peasants. These, however, were without experience of farm management, and indeed many had little education of any kind ; they were also without capital for agricultural machinery and other equipment ; hence the early days of political freedom were a time of little production and frequent want.

The earlier history of Estonia and Latvia has left a legacy of

political difficulties in the existence of minorities,¹ for in their eastern portions are many Russians—about 10 per cent, of the total population of the States, and in the coastal districts live a much smaller number of Germans, while in the towns are many Jews. But the constitutions of the States give local councils power to ensure to the people of Russian and German descent self-government in such cultural affairs as education and the use of their own languages ; it is to be hoped that by these means internal harmony will be attained and external difficulties with the mother-countries of the minorities will be avoided.

Corresponding to the scanty resources, the States are but scantily populated ; the total inhabitants of Estonia number only about 1½ millions, and those of Latvia about 2 millions.

(b) Lithuania.—The republic of Lithuania has an area rather greater than that of Latvia. Its south-westerly position gives it rather better climatic conditions than the other parts of the Farmed Forest region, and accordingly it has a smaller proportion of forest and a larger proportion of agricultural lands. These differences express themselves in the nature of the export trade, in which meat and dairy produce are more important than flax and timber; in return, Lithuania obtains manufactured goods, some textile and other raw materials for small industries, and coal. The trade is largely with Britain.

Political and social conditions differ markedly from those of Latvia and Estonia, and again because of past history. Lithuania was not dominated, as the others were, by German settlers, but for several centuries was under Polish influence, and was actually joined to Poland before being annexed by the Russian Empire. Also, during the times of Russian rule, Russian trade passed through Lithuania to a relatively small extent as compared with Latvia.

Thus Lithuania lacked developments due to German and Russian influences, and even now the agriculture is of a more primitive type, and the level of education and of culture in general is lower, than in Latvia and Estonia.

Another consequence of the low degree of economic development is the small number of inhabitants—about 2½ millions—and the exceptionally small proportion of townspeople ; moreover, of

¹ These are not shown in Fig. 24, and not all of them in the back end-paper, although they speak the Russian or German languages, for the maps indicate only the languages most commonly spoken.

this urban population a large number are Jews who have very little in common with the Lithuanian peasants.

A special weakness of this State is the lack of anything like a definite limit to the area occupied by the Lithuanians, except along the boundary with Latvia. Lithuanians, Poles and Russians live intermingled in a broad zone which includes the eastern portion of Lithuania, the north-eastern projection of Poland and the north-western part of White Russia ; in this belt no lines could possibly be drawn which would avoid minorities of each nationality in the other two States.

During the first twenty years of the new republics, Lithuanians and Poles were at sharp variance over the establishment of a boundary. Lithuania claimed Wilno (Vilna) as its ancient capital, but Poland asserted that it was inhabited by a larger number of Poles and forcibly seized the city, together with the belt of country between it and the present frontier.

On the south-western margin of Lithuania is the disputed Memel Territory, north of the lowest reach of the River Memel. This was part of the German Empire, but while the port of Memel was mainly German, the greater part of the population of the territory as a whole was Lithuanian. The area was detached from Germany in 1919, and later was seized by Lithuania, who signed a convention to give to the Territory local self-government and in the port freedom for the commerce of other States. But the Lithuanians opposed the teaching of German in the Memel schools ; the use of their mother-tongue had been denied to Lithuanians when under Russian rule, and despite the convention they acted in the same manner to the Germans when they obtained power. Nevertheless, the German majority in Memel retained their national feeling, and after Germany had regained its political and military importance in Europe, and had incorporated Austria and part of Czechoslovakia, the Germans in Memel demanded their re-union with those of the Reich.

Poland.—The present republic corresponds broadly with the western portion of an earlier Poland, which by the middle of the eighteenth century had incorporated Lithuania and extended eastward far into Russian country (see Fig. 76). At the end of the eighteenth century, however, it suffered a partition between Germany, Austria and Russia, and the portions belonging to these three States before the war of 1914-18 are

also shown in Fig. 76. After that war, Poland was reconstituted with small changes in its western boundaries, but without the extension over the new States of Lithuania and Latvia or the republics of White Russia and the Ukraine. With a small addition in Silesia in 1938, Poland is one of the larger States of Europe, with an area of 150,000 square miles.

The front end-paper map shows that while Poland overlaps

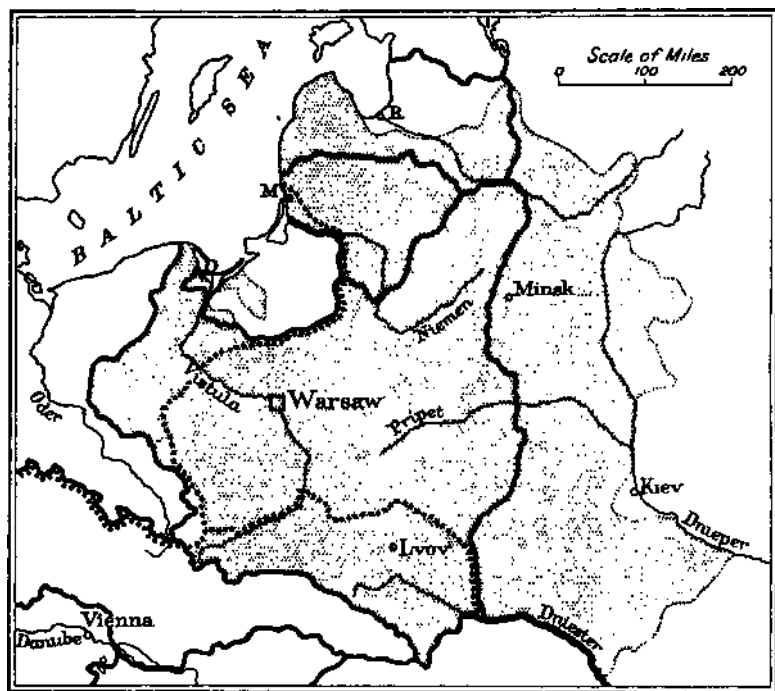


FIG. 76.—POLAND—OLD AND NEW.

Note.—The stippled area shows the great extent of Poland after it had incorporated Lithuania, and before it had been partitioned towards the end of the eighteenth century.

The dotted line shows how Poland was divided between Germany, Austria and Russia previous to 1917. The firm line shows the international boundaries in 1922.

eastward a part of the Farmed Forest region and even a small corner of the Steppe-lands region, the greater portion of its territory is in Temperate Europe. Here it forms part of the South-West Baltic Lowlands, including in the west fertile plains with valuable coal and ore deposits (see Chapter VII), which contrast favourably with the forests and marsh-lands on the eastern borders.

Hence Poland includes a marked variety of types of country

which yield a corresponding variety of resources, and enable it to develop a fairly well-balanced economy of mining and manufacturing, agriculture and forestry. It is thus enabled to export coal and miscellaneous manufactured goods, timber and dairy produce, and even some rye and barley, while its chief imports are raw materials for its textile industries, and metal goods and machinery.

Both from the economic and from the political standpoints a weakness of this State is its situation as regards its outlet to the Baltic Sea, viz. the " Polish Corridor " which runs between the main area of Germany and East Prussia. Here has been formed the one Polish port, Gdynia, though Polish trade passes also through Danzig.

With its varied resources and balanced development, Poland supports a population of about 35 million persons. As regards the distribution of this population, it may be seen that since in the south of the State are the most fertile lands and the mineral resources of coal, iron, zinc, salt and oil, a belt of densely occupied country extends from the steppe-lands into Silesia (see Fig. 82) ; there are also densely populated manufacturing areas in the centre around the capital, Warsaw, and Lodz. In the north-east, on the contrary, and especially in the swampy forests of the Pripet basin, there are relatively few inhabitants.

These facts as regards the density of the population must be related to those of the languages and nationalities included in the Polish State. Although in the east and north-east, over large areas there are Lithuanians and White Russians, these do not form a large proportion of the total population of Poland. More numerous are the Little Russians, or Ukrainians, known as Ruthenians where they extend into Poland and even into Czechoslovakia. The Ukrainians form between 14 per cent, and 18 per cent, of the population of Poland ; as in the case of other minority peoples in east-central Europe, it is difficult to get a trustworthy estimate of their numbers. It is more difficult still, and indeed impossible, to know to what extent their difference of language from that of the Poles indicates a difference of political feeling, and how many desire autonomy or union with the U.S.S.R. The frontier was actually determined after warfare between Poland and Russia, and it has been drawn farther eastward than the present-day distribution of the Polish people would warrant.

On the western side of Poland there are less obvious discrepancies between the State frontiers and the limits of language and nationality, but although not such large areas are concerned, the economic importance of the disputed country is great and the political problems involved are serious.

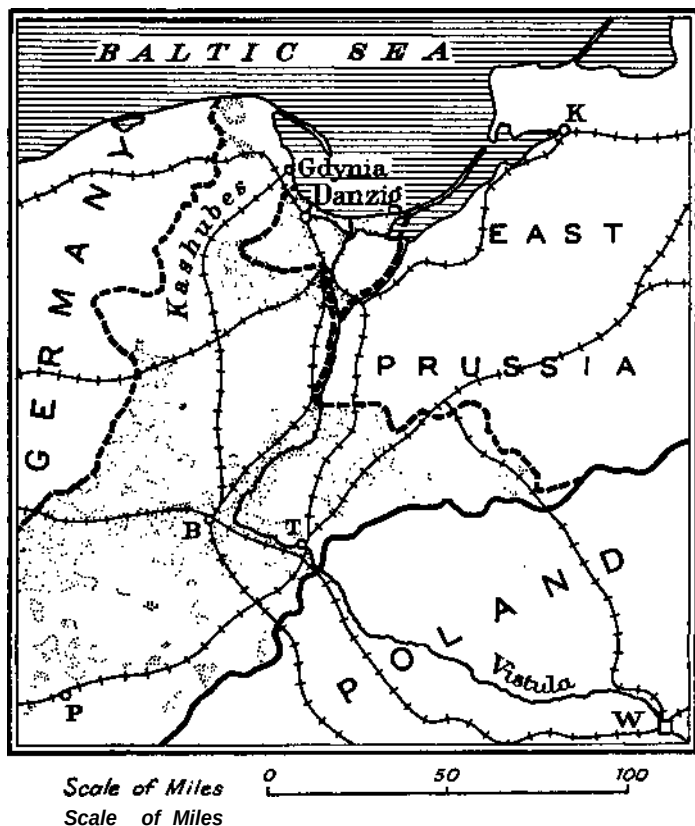


FIG. 77.—THE POLISH CORRIDOR AND DANZIG.

Note.—This sketch-map shows: (1) By the continuous line, the 1914 boundary of Germany. (2) By the broken lines, the limits of the Polish Corridor and of the adjacent territory of the "Free City of Danzig." (3) By the stippling, the areas within the Corridor and the "Free City" which were claimed as predominantly German-speaking in 1919. (4) The railways connecting Gdynia and Danzig with the interior, and those connecting Germany and East Prussia across the Corridor.

When the Treaty of Versailles was being drawn up at the close of the war of 1914-18, Poland claimed the lower Vistula region as an outlet to the Baltic Sea (see Fig. 77). As in so many territorial disputes, three kinds of argument were adduced, viz. historical, ethnographic and economic. The Poles claimed that

historically their State had extended to the Baltic before the partition ; that ethnographically the majority of the inhabitants in the area were of Polish nationality ; that economically Poland, having its main productive areas in the basin of the Vistula, needed the delta of that river and the adjacent port of Danzig as its means of communication with the outside world.

The Germans replied that for over a century all the lower Vistula region had been German ; that many of its inhabitants who spoke dialects akin to Polish, particularly groups known as Kashubes, were nevertheless not Polish in political sympathy ; that the economic developments of the region were due to German effort, and owned by German capital, and that Danzig was essentially a German city and port, with over 90 per cent, of its inhabitants of German nationality.

The treaty allotted to Poland a corridor narrower than had been claimed ; it detached Danzig from both States, and established a " Free City of Danzig " to include practically all the delta region, and to be placed under the protection of the League of Nations. By a subsequent treaty between Poland and the Free City, the latter became part of the Customs area of Poland.

The scheme did not work. There was constant friction between the Poles and the Germans in Danzig ; Poland created a port of its own at Gdynia and constructed railways leading directly from it through the corridor to the heart of the State, while Danzig came completely under the influence, although not under the sovereignty, of the Government of Germany.

At this stage Poland regards the corridor as Polish in population and essential to its existence in giving it access to the sea—not only for commercial purposes but also for military and naval needs, since Gdynia is the base of its recently created navy. On the other hand, Germany regards a considerable proportion of the population of the whole of the disputed territory as German ; it claims that nearly half a million Germans in the corridor and a rather smaller number in the " Free City " were torn from their mother State ; it considers as intolerable the amputation of East Prussia from the body of the German Reich. A settlement of the problem has yet to be reached.

As regards the southern frontier of East Prussia, a plebiscite was held to determine the wishes of the inhabitants, and it is interesting to note that here religious convictions were an important political factor ; a large number of Poles within the

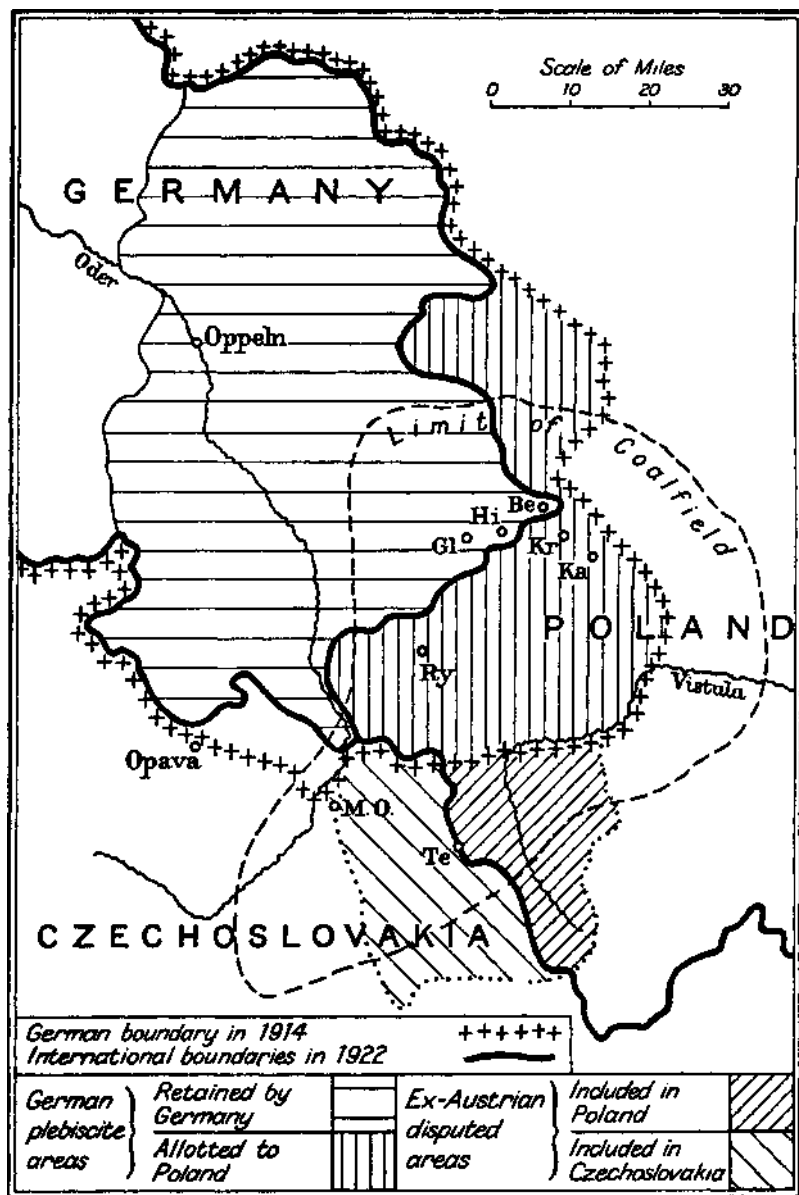


FIG. 78.—THE PARTITION OF UPPER SILESIA.

Note.—In the changes of 1938 (shown in Fig. 80), Germany regained the territory near Opava (Troppau) and acquired the south-western corner of the coalfield, while Poland obtained most of the disputed (shaded) area west of Teschen (Cieszyn). Czechoslovakia thus retained only a narrow strip of the coalfield, between these German and Polish portions, running northward to Moravská Ostrava (M.O.) which remained an outpost of Czechoslovakian territory.

area voted for its retention in German territory, because they were Protestant and did not desire to be transferred to a State which was in the main of the Catholic faith.

In respect of Upper Silesia (see Fig. 78), the framers of the Treaty of Versailles had to determine claims made by Poles and Germans based primarily on ethnographic grounds, for each claimed the majority of the population. Also, both Poland and Germany viewed the mineral resources of the Upper Silesian coalfield as essential to their economic well-being, and Germany had the further argument that the greater part of the coalfield had been developed by German capital, and organized by German industrialists and technical experts, even if a large proportion of the workers were Polish.

To attain a solution, a plebiscite was held in 1921, and the result showed that while most of the rural population and the small towns voted for Poland, the larger centres voted for Germany—apparently many Poles wished to keep their work undisturbed by political upheaval. Also, in the south-east portion there was a Polish majority and a German minority, while in the north-west portion there was a German majority and a Polish minority. Accordingly, areas in the south-east of the German territory were attached to Poland, as shown in Fig. 78.

Moreover, a small district in the extreme south-west, near Opava (Troppau), where there was a Czech-speaking population, was transferred to Czechoslovakia.

Farther south, a dispute arose between Poland and Czechoslovakia as to the mineral-bearing area in the ex-Austrian territory, and this was divided by a line passing through the district of Teschen (Cieszyn) as shown on the map. In 1938, however, Poland obtained from Czechoslovakia the western part, where there was a mixed population.

By the partition of German Upper Silesia, about 350,000 Germans were transferred to Poland, but there were still 570,000 Poles left in Germany. As regards the economic aspect, more than two-thirds of the production of coal, iron, zinc and lead in the region were in the area allotted to Poland. The district of most dense settlement and most complicated organization was cut across by the new frontier between Beuthen, Hindenburg and Gleiwitz on the one side, and Krolewska Huta and Katowice on the other—severing railways and the supplies of gas and

water, and separating the homes from the work-places of many thousands of people.

To minimize the economic and social dislocation, a convention between the two countries established a mixed commission, under neutral presidents appointed by the League of Nations, to regulate the economic and social working of the whole area for a period of fifteen years from 1922 to 1937. At the close of this period it was reported that by the permanent removal of people the minorities on each side of the frontier had been reduced. Difficulties and dissatisfaction, however, still existed.

In internal affairs Poland is faced with a difficulty in finding work and subsistence for its population, which is dense compared with the productivity of the land and with the amount of its industries. An outlet for an increase of numbers used to be found in emigration abroad, particularly to the United States, and in seasonal migration at harvest-time to neighbouring regions in Europe ; both these means of relief are now shut off by the political and economic conditions in the foreign countries concerned.

An improvement in agriculture in Poland is therefore being attempted, for the methods are often backward as compared with those of western Europe. Industries also are being assisted by the State to absorb more people. Yet the problem is serious, and it provides one reason why there is an agitation against the Jews, who form between 8 and 10 per cent, of the population, and are felt by many to be intruding aliens.

Rumania.—The kingdom of Rumania is the southernmost of the transitional States ; approximately half is in the Steppe - lands region and half in Temperate Europe. On about 114,000 square miles it supports 20 million people. It is in the main an agricultural country, and the most populous areas (apart from the few large towns) are clearly related to the geographical regions shown in Fig. 56.

The great barrier of the Moldavian Carpathians and Transylvanian Alps divides the State into two groups of productive areas.

(i) East of the Moldavian Carpathians are the steppe-lands known as Moldavia as far as the River Prut, and beyond this as Bessarabia as far as the Dniester, while south of the Transylvanian Alps are the hill-lands and plains of Walachia. In these regions live the greater part of the Rumanian people, and

from them come the petroleum which is the chief export of the State and most of the wheat and maize which are also sold abroad.

(ii) West of the highland barrier is the Transylvanian Basin, with both agriculture and forestry, and from this region comes much of the timber which ranks third in the list of exports. Beyond the West Transylvanian Highlands, Rumania extends into the fertile, cereal-producing Lower Hungarian Basin, with its southernmost portion including the Banat Lowland.

The regions which have been indicated as the most productive and most populated areas are also those of special importance from the political point of view, but before turning to this aspect of the geography of Rumania we must note that the exports of petroleum, cereals and wood products allow an import of textile goods and materials for textile manufacture, and of iron and steel goods and machinery for the developing industries. We must also note that oil is a resource of relatively short life, and it is calculated that Rumania can count upon its petroleum reserves for a very few years only. Because Germany has need of oil and cereals for its industries and industrial population, this State has the greatest share in the trade with Rumania, and the Danube is an important means of transport between the two countries.

Turning to the political geography, we must observe that Rumania is a State of recent growth, for it was after the middle of the nineteenth century that Moldavia (then including Bessarabia) and Walachia united under the name of Rumania. Between Russia, which had occupied the steppe-lands, and Turkey, which still dominated the Balkan Peninsula, the State was in a precarious position ; Russia seized Bessarabia, but gave Rumania access to the mouth of the Danube by granting to it the Dobrogea, with its few inhabitants of very mixed origin.

Wars between the Balkan States in the early years of the twentieth century afforded Rumania opportunity of pushing the frontier south of the Dobrogea into north-eastern Bulgaria, with no justification from the ethnographic point of view.

Later, the war of 1914—1918 enabled it to extend westward across the Carpathian barrier and thus to include the Rumanians of the Transylvanian Basin and the West Transylvanian Highlands which had been part of Hungary. Yet this advance,

while redeeming a large Rumanian minority from Magyar rule, created a new Magyar minority, though smaller in actual numbers, under Rumanian sovereignty.

In the Transylvanian Basin and the small basins of the upper reaches of the Rivers Olt and Mures in the Carpathian Highlands, there is the very considerable group of Magyars known as Szeklers who have lived there for many centuries, and have retained their language and traditions ; moreover, in the same regions there are many German settlers. The opposition between Rumanians and non-Rumanians is increased by differences of religion, for the latter are Protestant or Roman Catholic, while the Rumanians belong mainly to the Orthodox Church.

Moreover, the frontier was pushed westward beyond the West Transylvanian Highlands, in which the Rumanians have a clear majority, into the Lower Hungarian Basin, where the population is varied. In the Banat Lowland area there is an even greater mixture in the population, including considerable numbers of German settlers.

A case for this westward shift of the frontier beyond the clearly Rumanian territory was based on the fact that the Rumanians of the West Transylvanian Highlands live in the more or less parallel valleys which lead westward down to the Danubian plains, but are separated from one another by mountain ridges ; hence communication between the valleys is effected by roads and railways which go down into the plains, and are there connected by others skirting the uplands. The boundary thus includes a belt of lowland regarded as essential by the Rumanians, though the railway centres are towns inhabited by a majority of Magyars. In the Banat the frontier has been placed even farther westward than the above case might warrant.

It should be remembered that when these frontiers of Rumania were recognized in the treaties which followed that of Versailles, it was not simply on grounds of " justice." In the settlements of this period, here as elsewhere, account was taken of the military strength of the claimants, and after the end of the main war, local conflicts broke out in several areas, and their issue was a factor in the final determination of the States.

After the break-up of the Russian Empire, Rumania reclaimed Bessarabia, between the Prut and the Dniester, which had for long been debatable land between Moldavia and Russia. For centuries conquest had swept eastward and westward across

this part of the steppes, followed by more peaceful settlements, with the result that while there is a Rumanian majority over much of Bessarabia there is almost everywhere an intermingling of people of several different nationalities ; in this region there are about half as many Ukrainians as Rumanians, a large number of Jews, Bulgars and German-speaking settlers.

Taking the whole of Rumania into account, probably nearly one-quarter of the population is composed of Magyar, Russian, Jewish, German and other minorities.

Rumania has also internal problems of land-tenure and land-utilization resulting from the "land-hunger" of the peasants and their recent freedom from the dominance of alien landlords. In this respect she is typical of the broad belt of east-central Europe including the Baltic States on the north and those of the Balkan Peninsula on the south.

QUESTIONS

1. Discuss the extent to which Russia may be self-sufficing, and explain the geographical causes of the facts you adduce.

2. In what ways, direct and indirect, do the position and extent of Finland affect its foreign trade ?

3. Compare and contrast the three States : Estonia, Latvia and Lithuania.

4. Explain what is meant by the Polish Corridor, and the circumstances under which it came into existence.

5. Give an account of the Upper Silesian coalfield from the physical, economic and political points of view.

6. Consider whether the physical geography (including the natural resources) of Rumania is favourable or unfavourable to its political unity.

7. Show how natural conditions affect communications (a) between the various parts of the U.S.S.R., and (b) between this State and the rest of Europe.

8. Examine the statement that in all essentials of its physical and human geography Poland is transitional between Peninsular and Trunk Europe.

9. State and account for the nature of the foreign commerce of Rumania.

CHAPTER XIX

PENINSULAR EUROPE — NORTHERN AND CENTRAL

The Scandinavian States.—As already stated, the Danes, Norwegians and Swedes are descended from much the same racial stock and speak very similar languages. In the Middle Ages, the kingdom of Denmark extended over the whole region, and it was only gradually that independent kingdoms were formed in Sweden and Norway.

Before the industrial revolution allowed other States to support greatly increased populations, the Scandinavian nations had a relatively more important standing in Europe. They rank among the most enterprising, best educated and most developed in social conditions of any of the peoples of the world.

If their geographical situation has left them rather away from the busiest commercial regions, it has given them a degree of political isolation which has spared them the difficulties which many of the States of Europe have in regard to their neighbours. In the war of 1914—18 they were able to remain neutral, and in general their political policy is to keep clear of foreign entanglements, and to gain in strength by consultation and possibly co-operation with one another.

Yet natural conditions are the cause of contrasts between the three States both in their individual resources and also in their geographical orientations, and consequently their relations with other countries.

Norway.—Although Norway has an area of 125,000 square miles, nearly three-quarters of the land must be regarded as entirely or almost unproductive.

The map and the description of the constituent regions of Norway in Chapter XVI show that the barren highlands occupy a central position in the productive south of the State, while flanking these are the uplands, which bear forests covering nearly a quarter of the total area ; thus the very small proportion of cultivated land (less than 4 per cent. of the whole) exists

as tiny scattered patches along the Atlantic Margins, or as wider stretches in the Oslo Lowlands on the other side of the country.

It is evident that agriculture can support only a small population, but there are available also the products of the forests, the fisheries of the extensive coasts, the abundant water-power of the margins of the highlands and the iron and copper ores of several districts.

The resources of Norway are therefore varied, if small in their total, and the possibilities of industrial use of power and raw materials are being developed. Hence there is a fairly well-balanced economy supporting a population of three millions.

Among the chief exports are timber and its products, fish, metals, and manufactured metal goods produced partly from native ores and partly from ores obtained from abroad.

Moreover, the maritime situation of the country has been utilized by a people famous for their seafaring qualities, and the Norwegians possess one of the largest merchant fleets of the world. The foreign credits obtained by carrying goods of other countries increase the power of the Norwegians to purchase the food-stuffs which they cannot grow for themselves and their animals, together with manufactured goods, and the machinery needed for their small industries.

This trade is carried on to the greatest amount with Britain, with which country the western outlook of Norway has favoured much association, and to a less extent with Germany and with the United States.

Situated in the far north of the continent and having as an immediate neighbour only Sweden, Norway has been able to avoid territorial complications with other States. For centuries its people have been associated with others in peaceful commerce, and many have gone as emigrants to America and other lands which can support the increase of population unable to find a satisfactory livelihood in Norway itself.

The ownership of the Spitsbergen archipelago and some small uninhabited islands in Arctic and Antarctic waters is a tribute to Norwegian maritime enterprise rather than a significant addition to the national resources.

Sweden.—On a territory of nearly 175,000 square miles, about 40 per cent, greater than that of Norway, Sweden has a population of nearly 6½ million persons—more than twice that of Norway. The main causes of the greater productivity of

Sweden are : the much smaller proportion of highland ; the almost equal division of most of the remaining area between the Boreal Forest and the Farmed Forest regions ; the fertile Scania district in Temperate Europe ; the great mineral resources of the Bergslagen and Norrland.

Hence both agricultural production and industrial development count for more in Sweden, and the population is less sparse, taking the country as a whole, than in Norway. Nevertheless, the national economy is of the same general type as that of the neighbouring State and the commerce has much the same character. The export of wood and its derivatives is very great, and so is that of iron ore ; metal goods and machinery are sent abroad, but there is a more than equivalent import of other commodities of the same group. The chief imports are of food-stuffs, textile raw materials and manufactured goods.

As in the case of Norway, the three countries with which most trade is done are Germany, the British Isles and the United States ; Germany, however, is the best customer, for, having lost much of its resources of iron ore after 1919 it needs a large proportion of the Swedish iron ore for its industries.

The only territorial complication of Sweden is that due to the previous occupation by the Swedes of the Aland Islands and south-western Finland. It may be hoped that the good relations between these States will not become difficult on this account ; indeed, the present tendency is towards closer association between Finland and the three other " Northern States."

Denmark.—Although Denmark has an area of less than 17,000 square miles, about one-tenth that of Sweden, it supports a population of nearly 4 millions, and this without the mineral and water-power resources of its neighbours. Apart from the relatively infertile western side of the Jutish Peninsula, Denmark occupies the greater part of the Baltic Entry Lands (see Fig. 33), and its territory thus consists mainly of fertile lowlands devoted to intensive dairy farming. The Danish people have taken full advantage of the opportunities nature has offered, and the density of population is great for a country lacking resources for any considerable industrial development.

The nature of the foreign trade clearly indicates the specialized form of economic activity, for the exports are to a preponderating amount butter and bacon, and then eggs, and live or

slaughtered cattle. The imports include grain for the people and animals, oil-seeds and other kinds of animal food, and coal and manufactured goods. As with the other Northern States, most of the trade is done with Great Britain, the chief purchaser of the dairy products, with Germany and with the United States.

The favourable commercial situation of Denmark at the entry of the Baltic now counts for less than in former times, as explained in Chapter VII, but it is noteworthy that Copenhagen is still the largest city of the Scandinavian States. The past history of Denmark is reflected also in its union with Iceland and its possession of Greenland and the Faroe Islands.

The land frontier with Germany is the chief source of political difficulty. Here is the debatable land of the isthmus of Slesvig (in Germany spelled Schleswig), which was annexed in 1864 by the German States of Prussia and Austria jointly, and later passed to Prussia; in the subsequent years many Danes were forced to move northwards from Schleswig into Denmark. In 1919 the Treaty of Versailles, at the request of the Danes, arranged for a plebiscite to be held separately in two zones, northern and southern; in the southern zone there was a four-fifths majority for Germany, and in the northern zone a three-fourths majority for Denmark. The frontier was accordingly drawn to the north of the boundary between the two zones, in such a way that in later local elections, on each side only a few thousand votes have been cast for candidates standing as representatives of the respective minorities. In several respects the Danish Government has shown a willingness not to offend the feelings of its more powerful neighbour, for example in granting to the small German minority education according to its own desires.

Germany.—To understand the present conditions of the German State, we must very briefly outline its development during the past century. As a result of the Napoleonic wars, a mediaeval German Empire fell to pieces, and about two score small German States were but loosely united until 1866. Then a struggle for their leadership caused a war between Prussia and Austria, in which the latter was defeated and remained outside the confederation. In 1870 Prussia led the other German States in a victorious war with France, and in 1871 the King of Prussia was proclaimed Emperor of a new Germany.

A few months later France was forced to cede to Germany the

whole of Alsace and the greater part of Lorraine, two provinces in the belt of debatable land adjoining the Rhine which had for centuries suffered the advance and retreat of the contending great Powers. Their respective historical claims to the region

are most complicated, but France conquered Alsace in the seventeenth century and Lorraine was definitely incorporated in the eighteenth century. As regards the people concerned, in 1871 the German speech was still predominant over most of Alsace and the eastern half of Lorraine, but the common aversion from German dominion was admitted even by the Prussian rulers, and on the defeat of Germany in 1918 local delegations asked for French reoccupation.

After Alsace-Lorraine had been brought under French administration, the majority of the German-speaking people insisted on keeping their language

and cultural traditions, and the French Government has succeeded in satisfying their wishes only by allowing them considerable freedom in organizing their local government.

Apart from the transfer of nearly 2 million people, first from one and then from the other State, France and Germany were greatly affected by the transfer of the economic resources of the areas, as shown in Fig. 79. Alsace includes a large section of

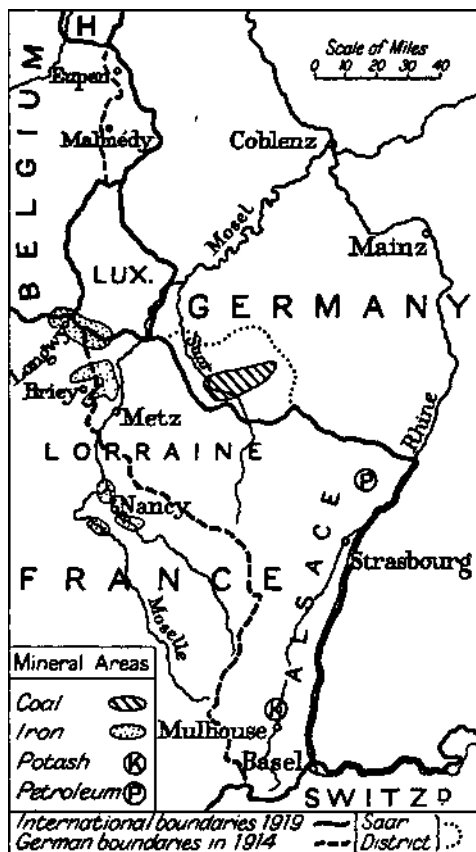


FIG. 79.—SOUTH-WESTERN BORDER-LANDS OF GERMANY.

the fertile Rhine Rift-valley, with mineral wealth in potash and petroleum, while in the part of Lorraine concerned occurs a considerable amount of the valuable minette iron ore referred to in Chapter X. The loss of these resources, to which were added those of Upper Silesia, was a serious blow to Germany.

The Saar district with its coalfield was, by the Treaty of Versailles, placed for a period of fifteen years under the administration of a Commission of the League of Nations ; in 1935 a plebiscite resulted in an overwhelming vote for its return to Germany.

Another change which resulted from the defeat of Germany was the transfer to Belgium of the small districts of Eupen and Malmedy. Belgium demanded the change in the frontier to aid in withstanding another invasion by Germany, if such were attempted. Before the transfer the inhabitants of the districts could vote against it, but few actually did so. Germany complained, however, that this was due to the conditions under which the voting took place.

The German colonial possessions were confiscated and allotted to States of the British Commonwealth, France, Belgium and Japan, to be administered under mandates from the League of Nations.

The military defeat of Germany caused a political revolution, and a republic was formed. A period of distress followed the years of warfare, and attempts by the victorious States to obtain what they regarded as just reparations from Germany added to the economic and political difficulties which faced its rulers both in connexion with other countries and at home.

In 1933 a " National Socialist " (" Nazi ") party obtained power, and the " Third Reich " was established. Feelings of intense patriotism dominated the country, the Versailles Treaty was denounced as unjust, many of the provisions were broken, and the armed power of Germany was re-established. Within the country economic activities were reorganized with a view of making the State self-sufficing, with particular reference to preparedness for war. A " Pan-German " movement developed with the aim of uniting to the Reich the Germans subject to other States, where this could be achieved, and in other cases to secure to German minorities as wide rights as possible ; similarly, the desire to regain lost territories, both European and

colonial, became a powerful factor in the foreign relations of Germany,

Meanwhile, the Austrian Republic, which had been proclaimed in 1918 and was left with but a fraction of the territories, population and economic resources of the old Austrian Empire, had encountered great economic and political trials. Its Government suffered several upheavals, and in 1938 was forcibly taken over by Germany; the Austrian State thus became one of the provinces of the Third Reich.

By this absorption Germany increased its area by more than 30,000 square miles and its population by nearly 7 million people, and secured forests, water-power and mineral resources (particularly the iron ore of Eisenerz), which are of great value towards achieving self-sufficiency.

Later in 1938 the north-western margins of Czechoslovakia, where the people were largely German-speaking, were annexed by Germany. The transfer will be discussed in a later section, and here it must suffice to note that it involved an area of more than 10,000 square miles and a population of about 3½ millions.

With these additions, the German Reich possesses an area of nearly 227,000 square miles, and therefore among European States is second only to Russia in its extent. It stretches from the North and Baltic Seas in the north almost to the Adriatic Sea in the south, and thus almost separates the mainland of the continent into two parts. It occupies a large proportion of what is commonly known as central Europe, although there is considerable difference of opinion as to the precise limits of central Europe. The front end-paper map shows that the German State may be regarded as composed of three main belts—lowland, upland and highland—representing three types of sub-regions of Temperate Europe.

(i) The North German Plains include parts of the northern group of "Developed Lowlands" (see Fig. 21), viz. parts of the North Sea Lowlands and the South-West Baltic Lands. Although the northern portions of these plains are not very productive, the inner margins of the North Sea Lowlands are among the most fertile areas of this section of Temperate Europe. Also, the Ruhr coalfield and the commercialized and industrial area adjoining the Rhine form one of the most densely populated districts, not only of Germany but of the whole world, while the significance of Hamburg as a port has already been indicated.

Similarly, the inner margins of the South-west Baltic Lands are productive agricultural, mining and industrial areas, and almost in the centre of the plains is the great conurbation of Berlin.

(ii) The uplands of Central Germany were explained in Chapter X to be varied in character—in parts wooded, in parts cultivated and pastoral, and in parts endowed with mineral wealth, which although now largely exhausted has given rise to industrial and commercial development; the Saxon Uplands in particular form part of the zone of dense population which extends obliquely across central Europe from the north-western Steppe-lands to the North Sea Lowlands (see Fig. 82).

Within this upland belt Germany possesses portions of two of the more southerly "Developed Lowlands," viz. much of the Rhine Rift-valley, and part of the western margins of the Middle Danubian Lowlands; these areas add considerably to the agricultural resources of the Reich. Much of the productive North Bohemian Trough in the "Bohemian Diamond" is also German territory.

(iii) The highlands of southern Germany occupy approximately one-third of the Alpine Minor Region of Temperate Europe. Much of their area has little economic advantage for the State, but they afford timber, minerals and water-power.

With this wide variety of resources, a balanced economy is possible; moreover, the drive for self-sufficiency (known as "autarkie," frequently translated "autarchy") has resulted among other things in the synthetic production of commodities in which the country is naturally lacking, e.g. a substitute for wool is made from beech-wood, oil and fats are obtained from coal, rubber from coal and lime, while agricultural production is increased by fertilizers produced by many methods, including the fixation of nitrogen from the atmosphere.

The policy of self-sufficiency, as far as geographical conditions make it possible, can be carried out in Germany more easily than in most countries, because the State has taken control of industries and trade to a considerable degree. While the ownership of the natural resources has been left in private hands, the Government determines the uses to which they are put, and capital and labour are directed to producing those commodities regarded as essential to the State. Moreover, the Government is not "democratic," i.e. based on the freely expressed choice of the electors and subject to criticism in Parliament and else-

where ; it is " totalitarian/' under the leadership of one man, virtually a dictator, without any opposition in Parliament and not open to criticism in the Press.

The Government also controls trade with other countries, and has specially directed it to the belt of States which stretches south-eastward through the Danubian lands and the Balkan Peninsula. As these lands are largely agricultural they can supplement the industrial production of Germany, and the range of commodities they can supply is increased by the fact that they extend beyond Temperate Europe into parts of the Mediterranean and Steppe-lands regions. Thus the German Reich has an increased variety of products at its disposal, and at the same time exercises a considerable economic influence over most of Central Europe.

The foreign trade, taken as a whole, indicates the importance of industry in the economic system of Germany, for the imports consist mainly of materials for manufacturing, viz. raw cotton, wool and iron ore ; petrol; wheat and butter which are needed in addition to the home produce. In return Germany exports coal, iron and steel goods, and many products of its chemical and other industries.

The high degree of industrial development in Germany has allowed the growth of a large population, and with nearly 80 million inhabitants the State is by far the most populous of any in Europe with the exception of Russia.

The problems of minorities, both of Germans outside the Reich and of non-Germans within it, are regarded as of great importance in Germany. We have already referred to those minorities in whichsomeof the neighbouring States are concerned, and in following sections we shall deal with the German-speaking peoples in Italy and Czechoslovakia. Here we must note in general that the ebb and flow in past centuries of the Teutonic peoples, in relation to Slavs on the east and Romance-speaking peoples on the west and south, have resulted in some millions of German-speaking peoples being outside the State ; on the other hand within Germany are included about a million people of foreign speech, mainly Poles and Czechs.

In 1937 a general agreement between Poland and Germany was made, each guaranteeing in its own territory certain rights to the minority of the other State, viz. to use its mother tongue, to have its own schools, to assemble together for cultural and

social relations, to practise its own religion and to have equal economic rights with the majority—provided always that the minority should be completely loyal to the State to which it owed allegiance. The agreement, however, appears not to have been successful, for in the following year a memorandum was presented to the German Government on behalf of the Poles in Germany claiming that they still suffered from unjust discrimination.

There is also the problem of the Jews, commonly called " non-Aryan " in Germany. Of these, it was estimated that at the establishment of the Third Reich in 1933 there were about half a million, but in a few years the number had been reduced very greatly ; this was the result of a policy of extreme nationalism which forced Jews out of industry, trade and professions, excluded them as far as possible from association with other German citizens and left them little alternative than to try, sometimes unsuccessfully, to find refuge in some other country.

Czechoslovakia.—This republic came into existence in 1918 after the break-up of the Austro-Hungarian Monarchy. As constituted by the Peace Treaties of the years immediately following, it comprised three areas (see Fig. 80). (i) In the west were the Czech provinces of Bohemia, Moravia and Silesia, which extended over most of the geographical region of the " Bohemian Diamond " and parts of its upland margins and over part of the Moravian Corridor, (ii) In the centre was Slovakia, including most of the North-West Carpathian region and parts of the Upper and Lower Hungarian Lowlands and of the Ipel valley, (iii) In the east was Ruthenia, now called Carpatho-Ukraine, comprising the southern slopes of the Forest Carpathians and part of the adjoining Tisza valley. How these three areas came to be united into one State must first be explained.

For many centuries the Czechs have lived in Bohemia, and the independent Czech kingdom of Bohemia came under Austrian dominion only in the seventeenth century. The Austrians attempted to make the Czechs German-speaking, but in the nineteenth century a nationalist Czech movement revived the use of their Slav language and literature and attempted to obtain self-government. Meanwhile, their kinsmen the Slovaks had come under the power of the Magyars of Hungary, by whom they were more oppressed than were the Czechs by the Austrians;

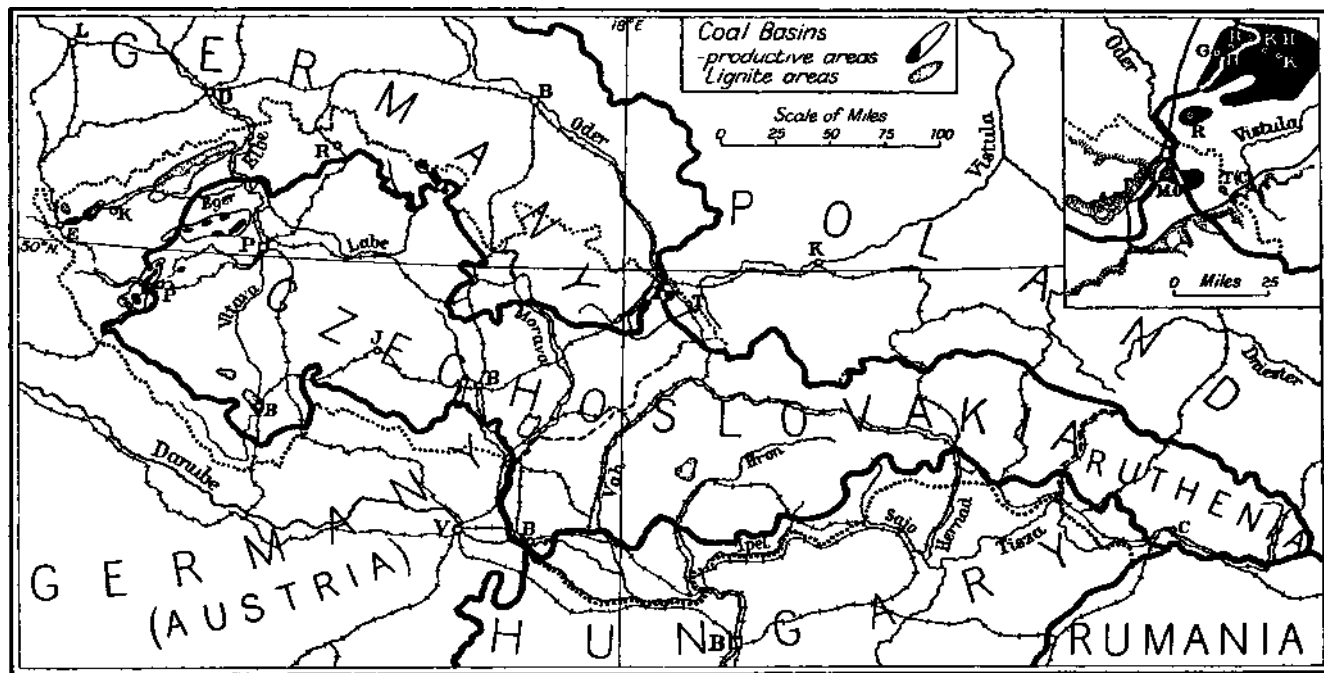


FIG. 80.—BOUNDARY CHANGES IN CZECHOSLOVAKIA.

Note.—The international boundaries at the end of 1938 are shown by the continuous thick lines; those up to September 1938 by dotted lines. Among the results of the changes may be seen : the loss of lignite and coal deposits in Bohemia and Silesia; the extension of Gorman territory from Silesia and Austria so as almost to cut off Bohemia; the interruption of railway communications between the various parts of Czechoslovakia, especially where the loss of the Tisza lowland isolates the valley-routes in Slovakia and Buthenia; the frontier position of the capitals, Prague, Bratslava and Hust (Hust).

The inset map shows the partition of the Upper Silesian coalfield (productive areas in solid black) and of the Moravian Gap between Germany, Poland and Czechoslovakia.

their Slovak language was not taught in any schools and was merely a peasants' dialect.

After the Austro-Hungarian Monarchy was weakened in the war of 1914-18, the Czechs seized the opportunity of regaining their independence and were joined by representatives of Slovakia to form a Czechoslovak State.

The third group of people who voluntarily joined in the formation of the State are the relatively small number of Ruthenians or Ukrainians. They are shut off from the Ukrainians of the U.S.S.R., by the barrier of the high Carpathian watershed, and by the Ukrainian-inhabited areas of Galician Poland and the adjoining part of Rumania. The Ruthenians agreed to form part of Czechoslovakia on condition of a considerable measure of self-government. The new State, however, included lands inhabited also by German-speaking Austrians and Magyar-speaking Hungarians. The Czechs claimed the historic lands of Bohemia and Moravia as their territory, and thus obtained those provinces of Austria without change of boundaries and without reference to the wishes of the Austrians, now frequently referred to as Sudeten Germans. These numbered over 3 millions, and became a national minority within Czechoslovakia. They lived mainly around the margins of the Czech lands and in these districts formed the actual majority of the population, while a much smaller number lived among the Czechs in the interior of the country. They were incorporated into the new State against their will, and were afterwards dissatisfied with the share they were given in the government and also with some of the social and economic conditions under which they lived. Yet they had not such serious grievances as most other minorities, and in this respect the Czechs could claim a better record than most of the "under-dogs" who suddenly became "top-dogs" by the political upheavals.

When the German Reich annexed Austria, the Sudeten German complaints were increased, political feelings ran high, and at the end of 1938, under threat of war Germany occupied the districts shown in Fig. 80. These included rather more than the areas which before 1918 had a predominantly German-speaking population, and as a result more than half a million Czechs in these border-lands became subject to Germany, while about a quarter of a million Sudeten Germans remained scattered in the interior of Czechoslovakia.

Czechoslovakia thus lost to Germany much of the productive North Bohemian Trough and a part of the coal deposits of other districts. Moreover, in Silesia most of the important coalfield which had become Czechoslovakian in 1920 was now taken by Poland on the ground that there was here a Polish majority, though the area actually transferred included more Czechs than Poles. Thus the industrial districts in northern Bohemia and in this part of Silesia were divided in 1938 with as little regard to their geographical or economic unity as occurred nearly twenty years before in 1920 when Upper Silesia was divided between Germany and Poland. It is possible, however, that an agreement between Czechoslovakia and Germany may allow easy road and rail communications, and an interchange of goods, to continue between the territories of the two States.

In Slovakia most of the Slovaks lived in the valleys of the rivers which flowed southward from the north-west Carpathians to the Danube and Tisza, and in order to connect their exits from the mountains a belt of lowland adjoining the Danube and Ipel and another by the Tisza were at first included in Czechoslovakia. Yet although the Slovaks had the meeting-places of their communications and exchanged their products in the markets of this lowland area, the majority of the lowlanders were Magyars. (One may note the similarity of the Hungarian loss of this lowland belt at the exit of the Slovakian valleys with that of the corresponding belt at the exit of the Transylvanian valleys.) Also, the Danubian port of Bratislava was joined to Slovakia to give facilities for communication by river.

A very similar situation existed farther east in Ruthenia. The Ruthenians lived in the valleys which opened southward to the Upper Tisza, and originally Czechoslovakia included most of the lowland by the river and the railway which followed its course and connected the routes coming down from the valleys ; here again the lowlands had a largely Magyar population.

In 1938 Hungary followed the example of Germany and obtained from Czechoslovakia all the areas, and slightly more, which had a Magyar majority in 1918. Thus both in Slovakia and Ruthenia the easiest means of communication across difficult country were lost, and to connect these parts to the rest of Czechoslovakia traffic must use either mountain routes or the

railways in Hungarian territory. Bratislava, however, with its mixed population was retained by Czechoslovakia, and at this point direct railway communication from the Czech lands and the west of Slovakia can reach the Danube.

In regard to the populations concerned in the territorial changes of the Slovakian country, whereas in the old Magyar Kingdom of Hungary the Slovaks formed a minority of nearly 2½ millions, the Czechoslovakian State in 1918 included about three-quarters of a million Magyars, and after the re-drawing of the boundary in 1938 over a quarter of a million Slovaks were taken back into Hungary. This swing of the pendulum, with minorities first on one side and then on the other, but each time to a less extent, is typical of what has happened in several instances as a result of the break-up of the Austro-Hungarian, Russian and Turkish dominions. The analogy is not perfect, for the pendulum could seldom be brought to rest simply by revisions of frontiers, owing to the mingling of populations on both sides of almost any boundary.

After the changes of 1938, Czechoslovakia had an area of about 38,000 square miles and a total population of about 10 millions, and a new constitution gave a large degree of autonomy to each of its three constituent peoples. The Czechs of Bohemia and Moravia number about 7 millions, and in their lands are the capital, Prague, all the larger towns with the exception of Bratislava, nearly all the industrial and commercial activities of the country and the widest stretches of agricultural and pastoral land. The Slovaks number about 2 millions and their country, largely highland, is relatively scantily populated; the only considerable town in Slovakia is Bratislava, and while there are some minerals, the forests and pastures are the main resources. The Ruthenians, whose difference from the Czechs and Slovaks was emphasized by the change of the name of their country to Carpatho-Ukraine, are only about half a million in number; they depend upon forestry and pastoral work, and their capital is but a small town, Chust (Hust). The only significant minorities in Czechoslovakia consist of about a quarter of a million Germans in the west, and a smaller number of Jews mainly in the east.

If Czechoslovakia could be regarded as an economic unit it might be said to have a balanced economy. But its shape is so attenuated and its internal difficulties of communication are so

great, **that** to a considerable extent its constituent areas can trade more easily with the adjoining countries than with each other. Hence its commercial relations with neighbouring States, and especially its close connexion with Germany, are of **the** greatest importance to Czechoslovakia.

Hungary.—After the abdication of the King of Hungary in **1918**, the country suffered internal warfare and foreign invasion, and finally the State assumed the anomalous form of a monarchy without a monarch, the elected head of the Government being styled "Regent."

By the treaty of 1920, which divided about two-thirds of the territory of the earlier kingdom between Czechoslovakia, Rumania and Yugoslavia, Hungary was left with an area of less than 36,000 square miles, but the regaining of lowland from Czechoslovakia in 1938 raised the total area to about **40,000** square miles. Since the marginal lands which were lost included the highlands, with their forests and mineral resources, the remaining area consists mainly of parts of the upper and lower Hungarian Plains. This is agricultural and pastoral country, but between the lowlands are the Middle Danubian Uplands (refer back to Chapter **XII**), which yield a small amount of timber, coal and ores.

The result of the truncation was, broadly speaking, to reverse in Hungary the evolution of a balanced economy which it is the aim of most States to achieve. This unbalancing necessarily brought economic trouble, and the dislocation was accentuated by the way in which the new frontiers were drawn, dividing up the Danubian river system into fragments and separating market-towns and railway junctions from the country districts they served.

The one-sided character of the natural resources of the State is shown by the foreign trade. The exports consist mainly of wheat and flour, and of animals and poultry and their products. In exchange, Hungary has to import almost all its textiles or textile materials, a great deal of the metals and metal goods it requires, timber, coal and oil. The trade is carried on largely with its industrial neighbour, Germany.

The military, political and economic upsets which marked the beginning of the new State were succeeded by a persistent **demand by** Hungary for a "revision" of the peace treaties. **In preceding** sections it has been shown how, on the east and north,

Rumania and Czechoslovakia extended into districts which the Magyars claimed to be rightfully theirs on ethnographic grounds. Similarly, on the south, Yugoslavia has advanced from the earlier frontier along the line of the Sava and Danube, far into the heart of the plains : while between the Rivers Sava and the Drava the people are mainly Yugoslavs, in the north-eastern part of the transferred territory the Magyars form a considerable proportion of the inhabitants. It is claimed that, altogether, over 2 million Magyars have been left outside Hungary.

Within the present boundaries dwells a population of about 10 millions, including about 400,000 Slovaks, and also as many German-speaking people—the descendants of settlers who occupied considerable areas scattered on each side of the Danube, from the neighbourhood of Bratislava downstream in Hungarian and Yugoslav territory.

Hungary forms part of the east-central belt of Europe in which Jews are relatively numerous, and in this State they number nearly half a million.

QUESTIONS

1. To what extent do the political boundaries correspond with geographical differences between the three Scandinavian States ?

2. "Norway looks west; Sweden looks east." In what respects is this statement applicable (a) to the physical, and (b) the commercial, geography of these countries ?

3. Compare the economic contributions to the German State made by its three constituent belts—lowland, upland and highland.

4. Examine the importance to Germany of the Mittelland and Rhine-Main-Danube canals.

5. How far is Czechoslovakia a unit as regards (a) its physical conditions and (b) its constituent peoples ?

6. What consequences follow from the fact that Hungary includes little more than parts of the Danubian Lowlands ?

7. Contrast and account for the respective numbers of Norwegians and Swedes.

8. Write an essay on "The Geographical and Ethnic Frontiers of Hungary."

9. Denmark, with a rather smaller area than Estonia, has more than three times its population. To what extent would you attribute this difference to physical and human causes respectively ?

PENINSULAR EUROPE—SOUTHERN AND WESTERN

The Balkan States.—Political conditions in the Balkan Peninsula are closely related to the four great developments which have occurred here during the past hundred years. The first was the struggle for freedom which the Balkan peoples waged against their Turkish rulers—a struggle aided by the Russian advance south-westward across the steppe-lands and against the Turkish Empire. The second was the consequent shrinkage of Turkish dominion and the gradual extension of the territories of the emergent Balkan States. The third was the attempt of Austria, associated with Hungary, to push eastwards, backed by Germany which wanted to obtain a dominating influence over the trade routes leading through the Balkan Peninsula and Asia Minor, by the Baghdad Railway, to the East. This Austro-German thrust was checked, and indeed reversed, by the war of 1914-18. Then the fourth development occurred, namely the attempt of Italy to obtain a hold in the Dalmatian and Albanian areas, and thus to control the lands on both sides of the Adriatic Sea.

The present political map shows how the four groups of forces—Balkan, Turkish, German and Italian—have come to rest, perhaps only temporarily, in south-eastern Europe.

Before considering each of the present States separately, we must note that during the years 1908 to 1913 great changes took place. The Turks were driven back from their last domains in what is now Yugoslavia and from the country north of the *JEgean* Sea. As a result, the Austro-Hungarian Monarchy annexed Bosnia and another district situated west of Serbia and Montenegro; these lands had been held by Turkey, but were inhabited by Serbs and Croats. Also, Albania was established as an independent State, and the other three Balkan nations—Serbs, Bulgarians and Greeks—quarrelled and fought among themselves for the eastern part of what had been Turkish territory. Thus by 1914 the States had been formed as shown in Fig. 26.

In that year, at Sarajevo, in the district recently annexed by Austria-Hungary, the heir to the Dual Monarchy was assassinated by a Bosnian. Austria accused the Serbian Government of being concerned in the murder and made demands for control in Serbian affairs ; with Germany backing Austria and with Russia backing Serbia, this situation led to the outbreak of the war of 1914-18, in which many other nations joined.

Some of the results of that war in other parts of Europe have already been stated, and we will now deal with the Balkan States as they emerged from the cataclysm.

Yugoslavia.—In 1918 the old Serbia became the nucleus of a far larger State ; it was joined by Montenegro, a small State where other Serbs had maintained their independence against all comers in the fastnesses of the " Black Mountain." Also, the new State was extended northward across the Danube and the Sava, where Serbs and Croats had lived under Hungarian rule. To the west, in Dalmatia, Bosnia and Croatia lived Croats who were in some parts intermingled with Serbs, and these also came into the new State. Finally, in the north-west of the Balkan Peninsula and the adjoining part of the East Alpine Foothills, the Slovenes of Austria threw in their lot with the other South Slavs.

Thus Yugoslavia has a territory extending over 95,000 square miles. Of this area, by far the greater portion drains to the Danube, and because of this fact and because of the nature of the Karst Plateaus of the west, it may be said that physically Yugoslavia turns its back to the Adriatic.

Apart from the small productive areas of the Dalmatian Coast-land and the Karst Plateaus, the greatest resources of the country are in the lower parts of the " Croatian-Serbian Mountain and Valley Region " and in the Danubian lowlands. The mineral deposits of the uplands are being increasingly worked, especially copper and, to a less extent, lead and zinc, but they have not as yet led to much industrial development; there is still a good deal of forest land, though much has lost its value or lacks proper management; hence the chief wealth of the State is in its agricultural and pastoral resources.

Yugoslavia accordingly exports surplus products from its farming, viz. maize and wheat, and from its live-stock, viz. swine, cattle, meat and eggs, together with timber and ores. It has to obtain in exchange manufactured goods, with

machinery and coal and also some food-stuffs. Like other countries with a similar type of economy in east-central Europe, a large part of its trade is with Germany.

Although Yugoslavia has a long coastline on the Adriatic, communication through the greater part of the mountain barrier is difficult, as has already been explained; hence the importance which the Government of Yugoslavia attached to retaining an outlet at Susak when Fiume was lost to the Italians. Another outlet is by the Danube to the Black Sea, but this is a roundabout route for most of the trade. A third way is to the *Ægean* Sea; to facilitate commerce by this route Yugoslavia has obtained a "Free Zone" in the Greek port of Salonika.

The total population of Yugoslavia is about 15½ millions, of whom about 8 millions are Serbs, 3½ millions Croats and about 1½ millions Slovenes; the remainder of the population is made up of minorities of several nationalities.

Numerically, the Serbs predominate among the Yugoslavs; they predominate also politically, for their king became the ruler of the combined State, and the Government has remained to a large extent in the hands of the Serbian statesmen. Many of the Croats desire that their people should have a greater share in the administration or that their part of the kingdom should have a greater degree of autonomy. The Slovenes, who have been greatly concerned in the Italian advance in their north-western border area, do not want autonomy at the cost of weakening the strength of Yugoslavia.

One of the great problems at the present time is to achieve a unity satisfactory to the three groups who still possess some feelings of separate nationality, and have in their languages the differences indicated in Chapter V. Another contrast within the State is in respect of religion, for the Orthodox, Roman Catholic and Mohammedan faiths are all professed by considerable numbers, and are held so strongly as to make them an important factor in national affairs.

Besides the three main groups of Yugoslavs, there are the inhabitants of that part of Macedonia which forms the south-eastern corner of the State. After Macedonia had been wrested from Turkish rule in 1912, Bulgaria, Serbia and Greece all contested for its ownership. Bulgaria claimed that the majority of the inhabitants of Macedonia were Bulgarians, and certainly they spoke a Bulgarian dialect, but ultimately the two other

States seized and shared the territory. Hence in this south-eastern corner of Yugoslavia is a minority population of about half a million people who are referred to by the non-committal name of "Macedonian Slavs." In the end-paper map they are shown by overlapping the markings for Yugoslavs and Bulgarians.

To the north of these people are another minority group, also numbering about half a million: they are Albanians living beyond the north-eastern frontier of Albania. They are strongly distinguished from the Slavs around them by their appearance, their speech, their Mohammedan religion and their keen consciousness of Albanian nationality.

Reference has already been made to the mingled population of the Danubian Plains in the north-east of Yugoslavia: here are half a million Magyars and about half a million German-speaking people.

Together with a relatively small number of Rumanians, the minority populations of Yugoslavia amount to about one-fifth of the total. Thus, with the traditional enmities and past conflicts between the Balkan peoples, there are here possibilities of future difficulties among the States of the Peninsula.

Finally, there is the question of the north-western boundary area (see Figure 81). This was in part Austrian, in part Hungarian, territory in 1914, although inhabited mainly by Slovenes and Croats, and here the two Powers had developed the ports of Trieste and Fiume respectively as explained earlier. After the war, Yugoslavia claimed the area in which Slovenes and Croats were the predominating peoples, but Italy claimed all that it now possesses, and even more territory towards the south-east in Dalmatia. The main reasons for the claim of Italy were that she desired complete control of the Adriatic Sea, and that a number of the settlements along the Dalmatian coast were Italian in population and culture, having been founded by Venetian traders in past centuries; there was indeed an Italian majority in the cities of Trieste, Fiume (excluding the suburb Susak) and Zara.

After a very troublous period the present frontier was determined. By this settlement Italy has obtained territory, in the Istrian Peninsula and to the north of Trieste, which includes a Slovene-Croat minority estimated at about 400,000 persons;

also the city of Zara and several islands off the Dalmatian coast which may serve as military bases.

It may be noted that in the southern part of the Klagenfurt Basin, the majority of the population are of Slovene origin and speech, but in a plebiscite held in 1920 they elected to remain in Austria, and therefore are now in the German Reich.

Bulgaria.—During a long struggle for independence against the Turks, Bulgaria extended its boundaries step by step, until in 1913 it had gained one frontage to the Black Sea and another to the *Ægean* Sea (refer back to Fig. 26). In that same year, however, it was defeated in a war between the Balkan States for the lands recently gained from Turkey, and later it joined the losing side in the war of 1914-18 and again came into conflict with its neighbours. As a result it lost territory in the west to Serbia, in the north-east to Rumania and its outlet to the *Ægean* Sea was taken by Greece.

After this, Bulgarian relations with the other Balkan States were very difficult, and it still suffers from the resultant disadvantages of poor communications, for both the Danube and the Maritsa turn from Bulgaria before they reach the sea.

The area of the State is now about 40,000 square miles, and consists in the main of the highland regions of the Balkan and Rodopi Mountains, and parts of the areas which are grouped as the "Drier South-eastern Lowlands" of Temperate Europe (marked "10" in Fig. 21). The highland regions have some forests and pasture-lands and small mineral resources; the lower areas are in part naturally corn-lands, but in part need irrigation and then give a more valuable return.

The lowlands supply the main exports—tobacco, wheat and maize, eggs and attar of roses; these products are sent largely to Germany in exchange for varied manufactured goods.

The population of the State is about 6½ millions. Because of the ceded territories on three sides, the Bulgarians claim that many of their nation remain in the adjacent States even after an exchange of minorities has taken place with Greece and Turkey. On the other hand, the mingling of peoples in the Balkan regions is so complex that in Bulgaria there are still small Rumanian and Greek minorities, and the greatest minority, amounting to about 10 per cent. of the total population, is formed of Turks who still live in the lands where their forefathers were once masters.

Turkey.—Only a very small portion of the Turkish republic is in Europe ; this fragment has an area of less than **10,000** square miles, and most of its population of about 1£ million persons live in or near Istanbul, of which an account was given in Chapter XIII.

Greece.—It has already been pointed out that the territory of the Kingdom of Greece, which has an area of about 50,000 square miles, almost coincides with the Mediterranean sub-region called the " Greek Region " (refer back to p. 223, where the types of country included in the State are specified).

The general character of the economy is reflected in the nature of the foreign trade. The greater part of the exports consists of tobacco, currants and raisins, and olive-oil; the fact that the chief import is of manufactured goods shows that the growing industries are far from meeting the needs of the country, while the purchase of wheat and flour (much from North America) is witness to the lack of extensive lowlands. As in the case of the other countries of south-eastern Europe, Germany is the State with which most trade is done, though Britain takes a great part of the currants.

The population of Greece is over 7 millions. Until recent years the maritime and trading activities of the Greek people, fostered by the geographical conditions, had resulted in a considerable scattering of Greeks, not only over the adjacent islands, but also in coastal lands of Asia Minor, as well as in smaller colonies around the eastern end of the Mediterranean Sea.

The Greek settlements on the Ægean coasts of Asia Minor led the Greek Government to claim a part of this mainland after the defeat of Turkey in the 1914-1918 war. But this claim involved Greece in still another conflict, following those in the Balkan Peninsula, and a national revival in Turkey enabled that Power to drive both the Greek troops and more than a million Greek inhabitants from Asia Minor.

A commission of the League of Nations organised a settlement of many of these refugees in the Macedonian and Thracian areas which had passed from Turkish to Greek sovereignty, and an emigration of nearly half a million Turks from this area. Already there had been an exchange of Greek and Bulgarian minorities, and in consequence the population of the present Greek territory north of the iEgean Sea shows a much greater uniformity than previously existed in the same area.

But even now there remains a number of "Macedonian Slavs" in northern Greece, while near the boundary between Greece and Albania there are minorities on both sides.

Albania.—This small kingdom has an area of about 11,000 square miles, and comprises the two contrasted areas, lowland and highland, whose characteristics have been indicated in Chapter XIII. The development of the resources, although increased in recent years, is still in a backward condition. The minerals are little worked, the forestry is scarcely worth the name and the farming is carried on in a primitive manner; indeed, to a considerable extent the family is an economic unit which produces little beyond its immediate needs.

Consequently the commerce is not great. The country exports a surplus from its pastoral work—cattle, hides and cheese, wool and eggs—and crude petroleum; payment for these commodities is made in a wide variety of goods.

Albania obtained its independence after the defeat of the Turks in 1912, and for several years the new State suffered a precarious existence, due both to the enmities and jealousies of neighbouring Powers and also to internal dissensions.

The position of Albania exposes it to the risk of outside interference, for on the one hand the "Albanian Gap" (refer back to p. 220) would give Yugoslavia a very useful commercial outlet to the Adriatic, and on the other hand the proximity of Albania to the "heel" of Italy makes it of strategic importance to this Power, which desires control of the Adriatic. For this reason Italy has acquired considerable influence in the State, by supplying financial assistance, by contributing to its economic development (the Albanian oil is of special value to Italy) and by a close political association.

The population of Albania, somewhat over 1 million persons, has not been an easy one to weld together, for the region now comprising the State was till recently inhabited by a number of tribes and smaller village communities, often in a state of vendetta warfare. Moreover, there were two groups, north and south, speaking very different Albanian dialects, and only lately have attempts been made to devise and popularize a common written language. Further, while in the central part of the country the people are Mohammedan, in the south the Greek Orthodox Church has many adherents, and in the north the Roman Catholic faith has been adopted by a large number of the

population. Education is still very backward, and the people have had no previous experience in self-government.

When it is recalled that there are also the minority problems already referred to, it will be realized that political conditions, both within and without, are very difficult.

Italy.—It was as recently as the latter part of the nineteenth century that the kingdom of Italy was formed by the union of a number of political units, some redeemed from foreign rule. Now the State includes territory on the mainland and the large adjacent islands of Sicily and Sardinia, with a total area of 120,000 square miles. It has also acquired a number of smaller islands, which are like stepping-stones towards the Balkan Peninsula, towards Asia Minor (the Dodecanese of the uEgean Sea), and towards North Africa ; in North Africa there are the great dependencies of Libya and Italian East Africa.

The regions comprising the State have been described in Chapters XI and XIV ; we need now only point out the great range of resources supplied by the Alpine lands in the north, the North Italian Plain with its fertility and industrial developments, and Peninsular and Insular Italy where the Mediterranean climate gives a different group of productions. Italy, like Germany, has a policy of making itself self-sufficient as far as possible, and in this respect its main lack, apart from tropical productions, is a shortage of minerals. In Italy, again as in Germany, the production of commodities and economic life in general are controlled by the State, and there is a totalitarian form of government.

A comparison between the imports and exports brings out the broad character of its economy. The generally dense population of the country, especially in the north, requires the import of food in the form of cereals and animals, while this is offset by the export of other forms of food, particularly fruit from the south. Raw cotton and wool have to be purchased, but manufactures of cotton and also of silk and artificial silk are sold. Various metals are imported, while motor vehicles are exported. Oil has to be obtained from abroad.

More trade is done with Germany than with any other one country, but a review of Italy's needs and surpluses shows that commerce with other lands is also of importance.

The population of Italy is about 44 millions. Earlier, emigration was considerable, especially to America ; as it has

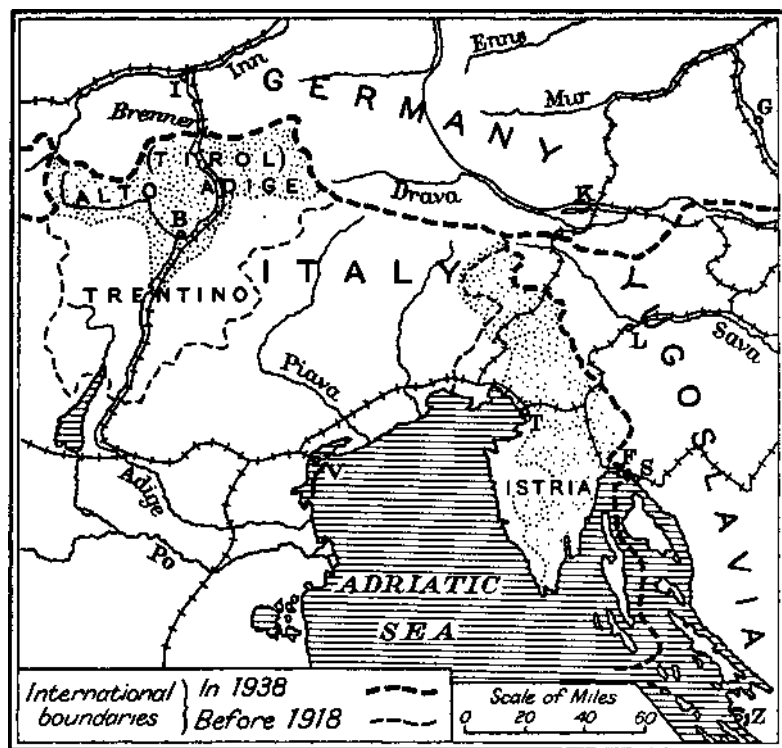


FIG. 81.—NORTH-EAST BORDER-LANDS OF ITALY.

Note.—The stippled areas show those predominantly German-speaking in the Alto Adige (Southern Tirol), and Yugoslav-speaking in Istria and north of Trieste. Observe how the boundary cuts the railway communication between Fiume-Susak and Ljubljana in the north of Yugoslavia.

now been checked, the problem of supporting this large population is one of the reasons for the recent great developments in the utilization of the land and its resources.

The Yugoslav minority of the north-east border-land has been indicated ; a German minority in the basin of the Adige must be explained. Before 1918 the Austrian province of the South Tirol extended southward across the Alpine region in a triangle which almost reached the North Italian Plain (see Fig. 81), and the apex of this triangle, approximately south of Bozen or Bolzano, was inhabited by Italians. When Austria collapsed, Italy regained this Italian area of the Trentino and, in order to secure a strong military position, pushed the frontier northward to the Alpine water-parting and reached the Brenner Pass. Thus about a quarter of a million German-speaking Austrians

of the Tirol were incorporated in the Italian State, the name of the northern area was changed to "Alto Adige," Italian became the official language and the only one taught in the schools, and in this and other ways attempts were made to "Italianize" the district.

Within the city of Rome the Pope has the independent sovereignty of the Holy See in the "Vatican City," which has a population of about 1,000 persons and covers about 100 acres; it is the tiny vestige of the once extensive Papal States in Italy.

Switzerland.—This State originated, nearly 600 years ago, in a defensive union of three small Alpine districts and it is now a confederation of twenty-two cantons, largely autonomous.

It has a total area of 16,000 square miles, extending over parts of two upland regions, the Jura and the Alpine Foreland, and over part of the Alpine Highlands, as described in Chapters X and XI. The relative importance of these regions in the Swiss State has already been indicated, and the degree to which the varied resources give a balanced economy can be estimated.

As regards the foreign trade, the main facts are that while food, in the form of cereals and fruit, has to be imported, there is a surplus of dairy produce which is sent away; minerals, among which iron is important, have to be brought in, but products of the metallurgical industries, and particularly machinery, clocks and watches, are exported in return; there is also a varied exchange of other manufactured commodities, e.g. goods of silk and artificial silk are exported to Britain, and Britain sends back cotton and woollen yarns and fabrics.

The population of Switzerland numbers over 4 millions, and its distribution shows a striking contrast between the industrialized and densely populated cantons of the Rhone-Rhine Plateau and those of the Alpine region.

It may be emphasized that Switzerland is unique in being a State which, on the one hand, comprises but a single nationality and has no problems of minorities either within or without its borders, while on the other hand this nationality is composed of peoples among whom four languages are spoken and two religions are professed. Switzerland is thus a happy example of political unity being created out of diversity. Moreover, in its foreign relations it is most fortunate that its neutrality and the inviolability of its frontiers have been guaranteed by the greater Powers of Europe for more than 100 years.

Spain.—With an area of 190,000 square miles, the republic of Spain comprises about five-sixths of the Iberian Peninsula. The regions which constitute this State have already been described in Chapter XV, and now it need only be recalled that they showed marked contrasts, both between the marginal lands and the relatively poorly endowed centre, and also between these marginal lands themselves—for example, the northern mountain regions with their minerals and the east coast lowlands with their agricultural and horticultural productivity.

With the exception of these marginal regions, Spain is a country whose resources are by no means great and also are little developed; the mining has not given rise to industries and agriculture is on the whole distinctly backward. Moreover, the physical features hamper communications, and are therefore one factor in hindering economic co-operation between the regions and in retarding the general advance of the country.

The coastal districts, with their varied production, tend to trade with other countries by sea rather than with other parts of the State, and their respective products are shown in the chief exports, viz. fruit and early vegetables, wine, iron, copper and other ores, or metals in a crude form. The imports, too, indicate the general lack of industrial development, for they are largely of manufactured goods, together with coal, with which the Iberian Peninsula is ill supplied.

- With the poor resources, and the poor utilization of large regions, the population of Spain is small in relation to its area, for it is only about 25 million people; in this respect, the State is to be likened to those of the Balkan Peninsula, but contrasted with Italy.

The people show marked contrasts from one part to another, e.g. in the density of the population in some coastal lands and its sparsity in the interior regions. In Chapter V the differences of language were indicated, and the peoples of the Basque lands and Catalonia, and even many Galicians, claim to be of different nationalities as compared with those of the greater part of Spain. These differences were important factors in the outbreak of the Civil War in 1936; another factor was the almost feudal state of society over the greater part of Spain, as shown, for instance, in the existence of large estates in which the peasantry live under conditions which have disappeared in most of western Europe. But the lack of coherence between the

marginal areas—the northern mountain regions, Catalonia and the south-eastern coast-lands—was shown in the progress of the Civil War, in which the people of these areas were isolated from one another and attacked separately by the forces which operated from the central parts of the Peninsula.

The social backwardness of much of Spain is shown by the relatively large proportion of the people, ranging from about 30 per cent, to over 80 per cent, in certain provinces, who cannot read and write, while the system of land tenure has been in part responsible for the inefficiency of agricultural production in the central regions.

Compared with the rest of Peninsular Europe, Spain has failed to keep the position it had a few centuries ago, as is illustrated by the loss of its once extensive overseas possessions, now represented only by relatively small dependencies in or near northern and western Africa.

Portugal.—The Republic of Portugal, as compared with Spain, has about one-fifth the area, viz. 35,000 square miles, but on the whole is better endowed as regards its natural conditions, for it escapes the aridity and the great elevations which handicap the central parts of the plateau, while both internal and external communications are easy. Its resources have already been indicated, but with the exception of the northern and southern sections of the Portuguese Coast-lands (see Fig. 64) they have not been utilized as thoroughly as possible, and nearly half the land is classified as "unproductive." As in Spain, social conditions are relatively backward, judged by western European standards, and despite compulsory education nearly one-third of the people are still unable to read or write.

The surplus production of Portugal allows an export of wine, sardines and cork, and in return the country obtains maize, cotton and cotton goods, coal and dried cod—fish being imported from northern Europe into several of the Roman Catholic countries of southern Europe as food for fast-days. More trade is carried on with Britain than with any other country.

The State of Portugal numbers about $7\frac{1}{2}$ million persons, the average density of the population is therefore greater than that of Spain.

Portugal, like Spain, is situated beyond the area affected by the territorial changes of recent years. In past centuries the

position of both countries was a great factor in allowing them to acquire a colonial Empire. It might be thought that Portugal has been more fortunate than Spain in retaining considerable overseas dependencies in Africa and some smaller ones in the Far East, but it appears that their possession has been an economic loss rather than a gain, for they have required subsidies as well as the cost of administration from the State.

France.—Like the Iberian Peninsula, France borders both the Mediterranean Sea and the Atlantic Ocean, but France has taken greater advantage of its position than have Spain and Portugal; it has shared both in the ancient civilization of the Mediterranean lands and in the later developments of the nations around the Atlantic Ocean and the North Sea.

With a land frontier to the central countries of Europe and with easy access by sea to those of the north and the south, its conditions are perhaps more typical of Peninsular Europe than are those of any other State.

Within its area of 212,000 square miles, France includes several regions of varied character, as shown in Fig. 39. Besides the Mediterranean region, it has areas representative of all the types of Temperate Europe—the Atlantic Margins, the Developed Lowlands, the Wooded Uplands and the Alpine Highlands. Consequently it has a wide range of agricultural and pastoral productions, varied mineral wealth and water-power, and with these resources it has a balanced economy. Its development has reached a high degree of achievement. In agriculture the naturally less fertile areas have been artificially improved; also the yields have, in general, been increased by a system of land-tenure in which a large proportion of the land has for some generations been cultivated by the actual owners of the soil. In industries, the French, by their technical knowledge and skill, have fully utilized the natural opportunities, and the relatively small supply of fuel for manufacturing is supplemented by an import of coal, as well as by the employment of water-power.

The foreign trade shows that France may be reckoned among the industrial States, for of the exports the largest group consists of manufactured goods, while the imports consist very largely of raw materials and food-stuffs. Among the chief commodities sent abroad are chemical products and textiles of cotton and silk; minette iron ore, and iron and steel in an un-

finished condition are exported ; also much wine is sold abroad. The largest import is of coal and coke ; raw cotton, wool and oil-seeds follow ; among the foods, cereals rank high and, perhaps rather surprisingly, Wine, for while the more expensive kinds are exported, large quantities are bought from Algeria.

It is with Algeria and the other French colonies and dependencies that the greatest total amount of commerce is done ; the other countries with which France carries on much trade are its neighbours—Britain, Germany and Belgium—and the United States.

The overseas territories of France are very great; they comprise about one-third of Africa, extending from Algeria and Tunis to French Equatorial Africa, together with Madagascar, Indo-China and other tropical areas. These lands have a total population much greater than that of France itself, and considerable natural wealth ; it is a part of French policy to develop both their material resources and their man-power to supplement those in Europe.

This policy appears to the French the more necessary as the population of France is nearly stationary at about 42 millions, and is tending to decrease. From the point of view of national defence the man-power of France is realized to be now far less than that of Germany, and from the economic point of view, in order to obtain labour, particularly for industries and mines, the State has allowed a considerable amount of immigration. There are more than 2 million foreigners resident in France, mainly Italian, Spanish, Belgian and Polish workmen ; these do not, of course, create a minority problem, as they are voluntary immigrants seeking work which it was difficult to find in their own countries.

Belgium.—The Kingdom of Belgium is one of the smallest States of Europe, occupying less than 12,000 square miles. Nevertheless, it has a considerable variety of physical conditions and natural resources.

About one-third of the State forms the north-western corner of the Central Uplands of Europe, and two-thirds are in the North Sea Lowlands region. Here, as shown in Fig. 80, Belgium has a share in all the types of country which make this region of such importance from the economic standpoint; behind the narrow dune-belt are the reclaimed sea marsh-lands and the river valleys in which the great port of Antwerp has

grown up; even the Campine geest-land has the concealed coalfield, while on the southern margin of the relatively broad belt of fertile plains is the group of exposed coalfields which have so greatly aided the development of the country. The economic life of the small State is indeed broad-based, and although the proportion of the people engaged in industry is as high as in any country of Europe, equalling that in Great Britain, the agricultural production is also great.

As might be expected, the foreign commerce is important, and it shows the common characteristics of an industrialized State, viz. a surplus of manufactured goods, and a need to import raw materials and food-stuffs. Apart from the import of commodities of these latter groups from the United States, the trade is to a considerable extent bound up with the exchange of manufactured or semi-manufactured goods with the neighbouring countries, including, of course, the British Isles.

The population amounts to about $8\frac{1}{2}$ millions; this means an average density of over 700 to the square mile, higher than that of any other State, and is to be explained by the small proportion of land which is quite or almost unproductive, and by the high degree of utilization of the remainder.

The two main languages spoken in Belgium were referred to in Chapter V. The Teutonic languages and culture have spread westward over nearly all the North Sea Lowlands region, including Flanders, the northern part of Belgium, and even over the small corner of the marsh-lands which extends into French territory; the Flemish people thus resemble in several respects their neighbours the Dutch. The area of the Romance language-group, on the other hand, extends eastward from France across the southern part of Belgium, and the Walloon people show similarities, not only in speech, but also in ideas, with the French people.

The Flemings live in the part of the country where trade and agriculture flourished in past centuries; the Walloons are the people of the coalfields and the industrial districts of later growth, and also they include most of the governing class of the capital.

Because of the several differences, an amalgamation of the two peoples into one nationality has not been easy, and there is indeed a group of "Flemish nationalists." On the other hand, in the war of 1914-18, the German occupation of Belgium tended

to weld the people together—as so often happens in face of a common danger.

The plains of Belgium, as contrasted with the uplands to the south, offer an easy route for armies marching between the French and the German lands ; moreover, the coast of Belgium approaches so near to that of England that it has been a matter of concern to Britain that Belgian territory should not be in the possession of a powerful State. Hence Belgium has again and again been a scene of conflict in which these three neighbouring Powers have been involved.

The predominant policies of the Belgian State are therefore to promote its internal unity, and to observe a neutrality in

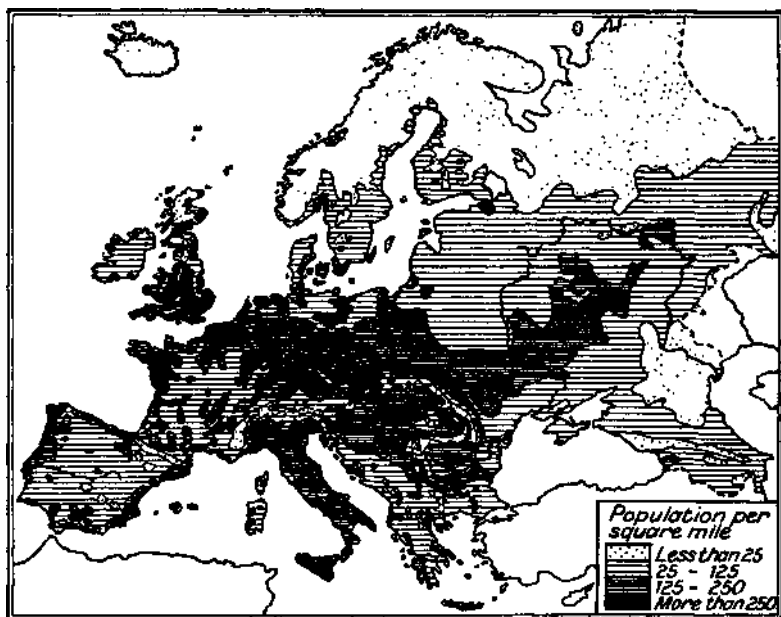


FIG. 82.—DENSITY OF POPULATION IN EUROPE.

foreign affairs which will maintain its territorial integrity.

Belgium has acquired in equatorial Africa the huge territory of the Belgian Congo, which covers nearly a million square miles, has a native population of about 10 millions, and is extraordinarily rich in mineral resources.

Luxembourg.—The Grand Duchy of Luxembourg is a small independent State of about 1,000 square miles. In 1921 it

agreed by treaty to an economic union with Belgium, by which Luxembourg adopted the Belgian currency, and the Customs barrier between the two States was abolished. The map in Fig. 89 shows that in the north Luxembourg forms part of the Rhine Plateau, and in the south it is in the region of the West Rhine Scarp-lands ; in this latter area is its chief agricultural production, and also the iron-ore deposits which are of such value to the State. The population numbers about 300,000.

The Netherlands.—The kingdom of the Netherlands, commonly known as Holland, has a territory of about 13,000 square miles. It is situated entirely in the North Sea Lowlands, and a review of the constituent regions as shown in Fig. 80 might suggest that Nature has not given very favourable conditions for the formation of an important State.

Behind the broken line of dunes are the marshes lying below sea-level, and behind these are river marshes and infertile geest, with only a small area of the fertile plains and a small fragment of the belt of coalfields where the kingdom projects southward by Maastricht.

Yet by the various methods described in Chapter VI, the increasing knowledge and the untiring energy of the Dutch people have changed the greater part of the marshes and much of the geest into productive farm-land, and taken advantage of the interpenetration of land and sea to make themselves one of the foremost nations of the world in maritime enterprise and commercial importance.

In this latter respect Holland owes much, of course, to the fact that it is situated at the estuary of the great river of industrial Germany, and during the last few generations the increase of commerce in Holland has been to a considerable extent due to its taking advantage of the economic growth of its greater neighbour, by improving its water-ways and providing efficient ports.

In the preceding centuries Holland had shared in the discovery and exploitation of lands across the oceans and had also built up a navy, though when its naval power was destroyed it lost much of its overseas possessions. Nevertheless, it has retained the Dutch East Indies; here a population of over 60 millions is organized to obtain tropical produce and mineral wealth which add considerably to the commerce and even, by supplying raw materials, to the industries of the Netherlands at the present time. There are also the smaller

" Netherlands West Indies," consisting of Dutch Guiana and the Curacao Islands,

The lack of minerals in Holland is a handicap as regards manufacturing, and the main bases of the national economy are its commerce and pastoral work. As in the case of Norway, the maritime services provide credits with other States, an "invisible export," and the pastoral industry affords the largest group of the visible exports, among which butter, cheese, eggs, bacon and skins are the predominant commodities. There is also a re-export of tin, rice and other tropical produce from the Dutch East Indies. The imports consist of many kinds of manufactured goods, grain as food for men and animals, timber and oil.

Since on its small area the State consists of nearly 9 million people, Holland has a density of population second only to Belgium; moreover, the rate of increase of the Dutch people is greater than that of any other in western or central Europe, with the exceptions of Portugal and Eire.

Conclusion.—We may now put together some of the main facts of the political and economic geography of Europe and make some broad generalizations.

Politico-Economic Systems.—Three areas in Europe show three politico-economic systems whose developments, still in progress, are of the greatest importance in the modern world. One system is that of Russia in eastern Europe. Here the U.S.S.R. have a communist form of government under which the State both owns the natural resources with the material equipment for exploiting them, and also controls the exploitation by directing the work of farms, mines, factories, communications and commerce. With its Asiatic territories Russia is almost self-sufficing and has relatively little commerce with the rest of Europe.

The second system appears in central Europe, where Germany and Italy have totalitarian forms of government. These States allow individuals or companies to remain the legal owners of the resources and means of production, but to a very large extent control and direct their activities. The geographical extent of these States does not allow them to achieve their aim of self-sufficiency; hence they have made close associations with other States of central Europe and also desire overseas territories to supplement their resources and to give them political power.

The third system is that of the States which may, by contrast with those of eastern Europe and central Europe, be particularly associated with western and northern Europe, including the British Isles. The Governments are politically of the democratic type; economically, in the main they allow private ownership of natural resources and equipment, and also exercise relatively little control over industry and commerce. As none of the countries possesses all its requirements, these States are to a considerable extent dependent upon trade with each other and with other parts of the world. Because of their economic needs and their maritime situation most of them have acquired overseas possessions.

No hard and fast line can be drawn between the three politico-economic systems, nor can Europe be sharply divided according to the States which have adopted them. Nevertheless, the broad contrasts exist, and even tend to prevent political and economic association between the respective groups; hence the existence and distribution of these systems are important factors in the human geography of the continent.

The Geographical Basis of Political Problems.—In the last three chapters we have examined some of the problems of present-day Europe, and a review may now show that they are due to the interplay of three sets of factors—physical, ethnographic and political. The physical geography of a region determines the existence of particular natural resources. The ethnographic factors are due to the existence in a region of one or more groups of people with characteristic culture and capabilities of utilizing the resources. The interplay of these physical and ethnographic factors results in the creation of complicated economic arrangements, and under some conditions the economic activities might proceed peaceably with advantage to all concerned.

The political factors are bound up with the association of the peoples into States and the relations between the States. Here again the associations within and between the States might increase the efficiency and the material welfare of mankind. Unfortunately, however, there are normally among peoples elements of disagreement and hostility, due to many causes; hence within the States, and more particularly between them, arise rivalries, fears and occasionally actual conflicts. These rivalries, fears and conflicts are frequently connected with the desire to own territories with some special natural advantages

or to include some particular ethnographic group; hence the attempts to extend or retain territories, and to re-draw or keep inviolate the political boundaries.

Thus the problems we have discussed depend on the distribution of the physical, ethnographic and political factors, and to give an understanding of their nature and interaction may be one contribution of Geography to human welfare.

Europe and the Other Continents.—Although Europe is the smallest, it is one of the most important of the continents. As Europe has no definite boundary with Asia, its area cannot be exactly stated, but this may be taken as nearly 4 million square miles ; it therefore occupies about one-fourteenth of the land-surface of the globe. Yet its natural resources are so great and have been so developed that this continent supports about 540 million people—more than a quarter of the world's population.

Throughout this book, many references have been made to the connexions between Europe and other parts of the world, e.g. the climatic influences of the great wind-systems ; the way in which geographical regions overlap the continents; the movements of peoples into Europe from Asia and Africa and also from Europe to all parts of the world ; the acquisition of overseas territories by European States ; the network of trade relations with all the habitable globe. In these and other ways the geography of this continent forms but part of a great world-pattern, and to show the pattern as a whole will be the object of the concluding volume of this series : *The Regions of the World*.

QUESTIONS

1. State the distribution of the peoples included in Yugoslavia, and note what you consider their significant characteristics from the political point of view.

2. In what ways can Greece be regarded as a unit, and in what respects can its unity be regarded as an advantage and a disadvantage respectively ?

3. How far is the economic life of Italy bound up with its situation as a " Mediterranean " State ?

4. In what respects does Switzerland present an example of unity created out of diversity ?

5. Discuss the suggestion that France is more typical of Peninsular Europe than any other State.

6. In what respects do the people and land of Flanders differ from those of the Walloon part of Belgium ?

NOTES OF RECENT CHANGES

Czecho-Slovakia.—In the middle of March, 1939, dissension arose within the State between the President of Czecho-Slovakia and the Prime Minister of the Slovakian portion ; the latter was dismissed from office and appealed to the Government of Germany. That Government immediately intervened, sent troops into Moravia and destroyed the political existence of Czecho-Slovakia : the Reich decreed a " Protectorate " over each of the two main portions, Bohemia-Moravia and Slovakia, while Hungary took the opportunity to occupy the whole of the Ruthenian territory of Carpatho-Ukraine.

This forcible dissolution of Czecho-Slovakia modified the conditions of Germany and Hungary in several ways, the chief of which are summarised in the following paragraphs.

Germany.—The " Protectorate of Bohemia and Moravia " includes about a quarter of a million German-speaking people who become German citizens, and about 7 million Czechs who are nominally subjects of the Protectorate. By the proclamation defining the status of the territory, it is said to be " autonomous and self-administering," but it must " exercise the prerogatives which fall to it within the framework of the Protectorate in accordance with the political, military and economic importance of the Reich " ; moreover, the governor of the Protectorate, whose seat is to be Prague, is appointed directly by the head of the German State. Bohemia-Moravia is to be within the customs territory of the Reich, and in practice it will form an integral part of the economic system of Germany. Both German and Czech are official languages in the Protectorate.

A different status was assigned to Slovakia, which has between 2 and 3 million inhabitants. A treaty provided for the " political independence of the Slovak State," and the integrity of its territory will be protected by Germany, which will fortify and occupy part of the country, while the military forces in the rest of the land must be organised in co-operation with the German army ; also the Slovak Government must " conduct its foreign policy in close agreement with the German Government." This treaty does not require complete economic subjection, but there can be no doubt but that in practice the resources of Slovakia will be utilised for the needs of the Reich.

With the addition of both Protectorates, the German State now has under its control a population of nearly 90 million people and an area of over **260,000** square miles. This area, apart from East Prussia in **the** north-east, forms a compact block occupying much of Central **Europe**, with Slovakia projecting like a spear-head towards the south-

east. Germany has a firmer hold on the Danube and controls the port of Bratislava. Also a canal is planned to give water-communication between the Oder and the Danube. Thus the commercial relationships with south-eastern Europe will be made still closer.

The mineral resources and industrial activities of Bohemia and Moravia will be added to, and co-ordinated with, those of the Reich, and the German lack of cereals will be to some extent relieved by the agricultural lands both of this Protectorate and of Slovakia, while the Carpathian forests will supply a very considerable amount of much-needed timber. In Slovakia are also lignite and other mineral deposits which, though not great, can be further utilised. The recent extensions of territory will therefore greatly aid the policy of the self-sufficiency of the Reich.

From the political point of view, it should be noted that in the Protectorate of Bohemia and Moravia the dominion of Germany has gone far beyond that of the pre-1914 German Empire, and in Slovakia it has extended over what was part of the Kingdom of Hungary. At the same time, these extensions have entirely departed from the idea of making the Reich identical with the German-speaking lands ; it includes a Czech minority far exceeding that of the Sudeten-Germans previously in Czecho-Slovakia, and the Slovaks are virtually under the government of the Reich.

Hungary.—By the occupation of Carpatho-Ukraine, the area of Hungary has been increased to a total of about 44,000 square miles, and its population to about 11 millions. By extending its territory to the crest of the Carpathians the State has, in this direction, reached the former limit of the old Kingdom of Hungary, regained important timber resources, and incorporated an additional minority population of over half a million Ruthenians, i.e. Ukrainians.

Hungary now has a common frontier with Poland, and in the adjoining Polish territory the population is also Ukrainian. As the rest of the Ukrainian people live in the neighbouring districts of Rumania and in the Ukraine Republic of the U.S.S.R., any attempt to create a unified Ukraine independent of Russia would concern the four States of Hungary, Poland, Rumania and the U.S.S.R., though to different degrees.

Memel.—In the latter part of March, 1939, Lithuania yielded to the German demand for the return of Memel to the Reich, and an agreement between the two States provided for a " free zone " in the port for Lithuanian commerce.

Albania.—By the union of Albania with Italy in April, 1939, the resources of Albania were made completely available to Italy ; also this State now holds both sides of the Strait of Otranto and therefore has effective control of the Adriatic Sea.

APPENDIX I

TIME SEQUENCE OF GEOLOGICAL PERIODS AND EARTH-MOVEMENTS REFERRED TO IN THE TEXT

	Periods.	Earth- movements.
Quaternary	Recent Pleistocene (Ice Age)	
Cainozoic, or Tertiary	Pliocene Miocene Oligocene 1 Eocene	Alpine
	Cretaceous	
Mesozoic, or Secondary	Jurassic	Lower Upper Middle Lias Keuper Muschelkalk Bunter
	Triassic	
	Permian	Hercynian
	Carboniferous	
Palaeozoic	Devonian	Caledonian
	Silurian	
	Ordovician	
	Cambrian	
Archaean	Pre-Cambrian	Charnian

LIST OF BOOKS

- P. Camena d'Almeida : *Etats de la Baltique ; Russie* (Colin, 1932).
 P. Vidal de la Blache : *Tableau de la Geographie de la France* (Lavissee, 1900).
 I. Bowman : *The New World: Problems in Political Geography* [all continents] (Harrap, 1928).
 G. Braun : *Die Nordischen Staaten* (Hirt, 1924).
 G. Braun : *Nord Europa* (Deuticke, 1926).
 G. Braun : *Deutschland* (Borntraeger, 1926-36).
 V. Chataigneau et J. Sion : *Pays Balkaniques* (Colin, 1934).
 G. A. J. Cole : *The Growth of Europe* [Geological] (Thornton Butterworth, 1914).
 L. W. Collet : *The Structure of the Alps* (London, 1936).
 • J. Cvijic : *La Peninsule Balkanique* (Colin, 1918).
 A. Demangeon : *Belgique ; Pays-Bas ; Luxembourg* (Colin, 1927).
 W. G. East : *An Historical Geography of Europe* (Methuen, 1935).
 M. Epstein (Editor) : *Statesman's Year Book* (Macmillan, Annual).
 H. J. Fleure : *The Peoples of Europe* (Oxford Press, 1922).
 J. Fluh : *Geographie der Schweiz* (Zollikofer, 1930-36).
 W. Gerbing (Editor) : *Das Erdbild der Gegenwart*—7. *Die Lander Europas* (List & von Bressendorf, 1926).
 R. Gradmann : *Siiddeutschland* (Engelhorn, 1931).
 H. F. K. Gunther : *Racial Elements of European History* (Methuen, 1927).
 M. Haltenburger : *Die Baltischen Lander* (Deuticke, 1929).
 A. Hettner : *Russland* (Teubner, 1921).
 A. Hettner : *Europa* (Teubner, 1925).
 J. S. Huxley and A. C. Haddon : *We Europeans* (Cape, 1935).
 O. Jonasson : *Agricultural Regions of Europe* [in "Economic Geography"] (Clark University, 1925 and 1926).
 W. G. Kendrew : *The Climates of the Continents* (Oxford Press, 1937).
 W. Koppen : *Die Klimate der Erde* (de Gruyter, 1923).
 H. Leiter and R. Sieger (Editors) : *Geographie des Welthandels*—*Band I, Europa* (Seidel, 1926).
 F. Matchatshek : *Landerkunde von Mitteleuropa* (Deuticke, 1925).
 F. Matchatshek : *Landeskunde der Sudeten-und West-Karpathen-Länder* (Engelhorn, 1927).
 E. de Martonne : *Les Regions Geographiques de la France* (Flammarion, 1921).
 E. de Martonne : *Les Alpes* (Colin, 1926).
 E. de Martonne : *Europe Centrale* (Colin, 1931).
 O. Maull : *Landerkunde von Sudeuropa* (Deuticke, 1929).

- O. Maull: *Deutschland* (Bibliographisches Institut, Leipzig, 1983).
N. Mikhaylov : *Soviet Geography* (Methuen, 1935).
M. I. Newbiggin : *Geographical Aspects of Balkan Problems* (Constable, 1915).
M. I. Newbiggin : *Southern Europe* (Methuen, 1932).
H. Ormsby : *France* (Methuen, 1931).
A. Philippson : *Europa* (Bibliographisches Institut, Leipzig, 1928).
G. W. Robinson : *Soils* (Murby, 1936).
E. von Seydlitz'sche Geographie : *Band I—Deutschland; Band II—Europa* (Hirt, 1925 and 1931).
J. Sion: *Italic* (Colin, 1934).
M. Sorre : *Espagne ; Portugal* (Colin, 1934).
W. Tuckermann: *Länderkunde der Niederlande und Belgiens* (Deuticke, 1931).
S. van Valkenburg and E. Huntington : *Europe* (Wiley, 1935).
E. G. Woods : *The Baltic Region* (Methuen, 1932).
M. Zimmerman : *Etats Scandinaves* (Colin, 1933).

There are numerous articles on detailed subjects, published in the journals of the geographical societies of Britain, the United States, and continental countries ; also publications are issued annually, or at intervals, by British and other governments, giving current information, particularly on economic matters.

Atlases illustrating the geography of their respective States have been published by, or under the auspices of, several governments, e.g. Czechoslovakia, Finland, France, Germany, Poland, Rumania and Russia.

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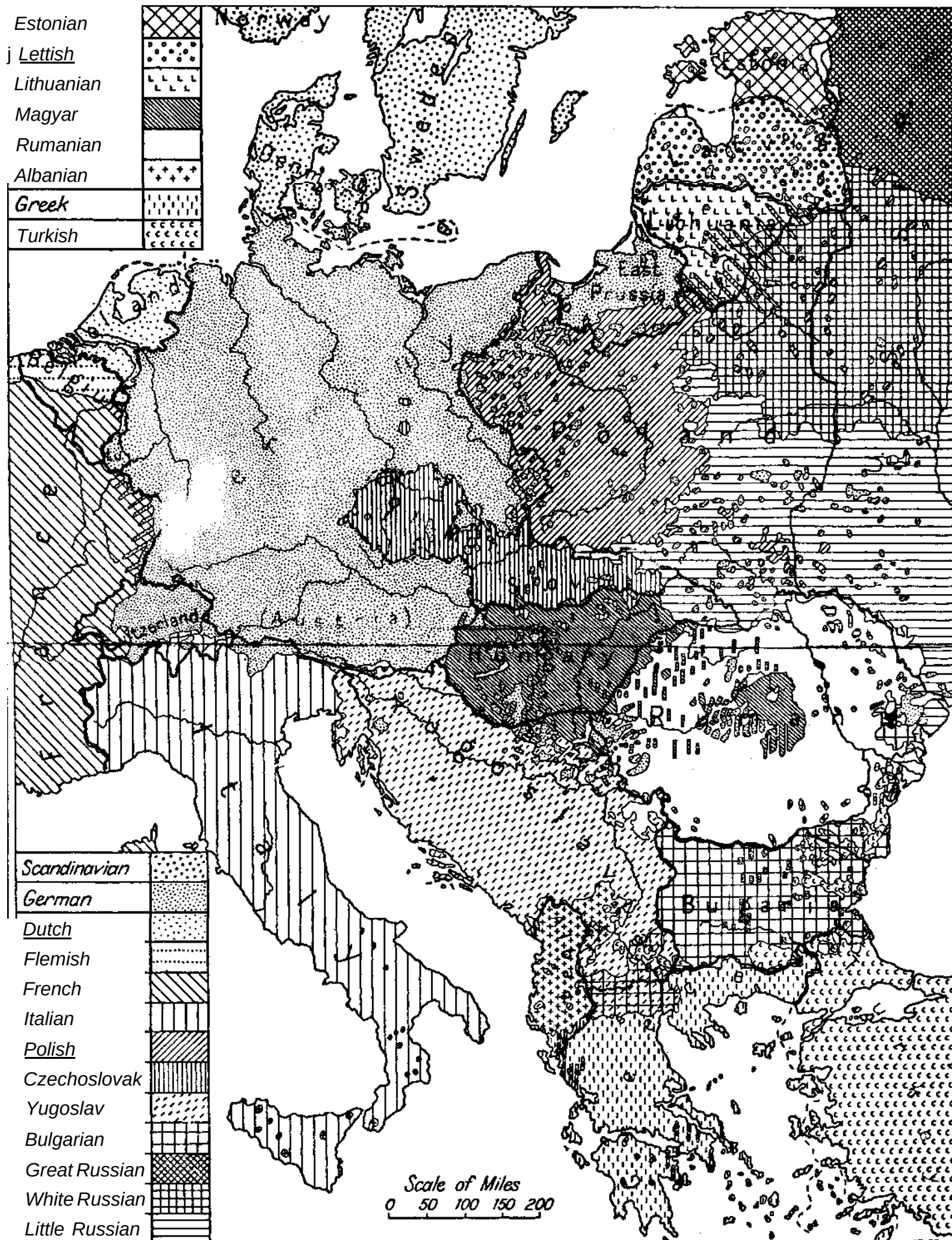
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