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IN SEARCH OF THE SOUL

AND THE MECHANISM OF THOUGHT, EMOTION, AND CONDUCT

A TREATISE IN TWO VOLUMES
CONTAINING
A BRIEF BUT COMPREHENSIVE HISTORY
OF THE PHILOSOPHICAL SPECULATIONS AND SCIENTIFIC RESEARCHES
FROM ANCIENT TIMES TO THE PRESENT DAY
AS WELL AS
AN ORIGINAL ATTEMPT
To Account for the Mind and Character of Man
AND ESTABLISH THE PRINCIPLES OF A SCIENCE OF ETHOLOGY

VOLUME I

THE HISTORY OF PHILOSOPHY AND SCIENCE from Ancient Times to the Present Day

BY

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PREFACE

THIS is not a mystical or speculative work, as a superficial glance at the title might lead some to suppose, but a strictly scientific treatise. For more than two thousand years philosophers and scientists were seeking for the soul, trying to discover its nature and seat within the body or brain. It was only with the dawn of the XIXth century and the advancement of science that the search was given up and psychologists and physiologists confined themselves to the study of the origin and nature of "mental activities" and their physical basis. It is in this wider sense—as comprising intellectual capacities, emotions, and instinctive impulses—indeed, all that appertains to the mind and character of man—that the term "soul" is used in this work when not otherwise indicated.

VOLUME I. contains the history—from ancient times to the present day—of the philosophical speculations and scientific researches to discover the nature of the soul, mind, and character dispositions of man, and their relation to the physical organisation; together with an account of the growth of human knowledge in general, and of such discoveries and inventions as affected human beliefs and widened the outlook of mankind. Part I. of this volume is introductory to the main purpose of the work, and contains the history of human thought and research up to the end of the XVIIIth century; Part II. contains the history of the XIXth century to date. The former will be more or less familiar, at least to experts; while the latter is to a large extent original and critical, and contains much hitherto unpublished or neglected material. Apart from the aims in view, Volume I. should prove valuable as a reference work for both physicians and psychologists.

VOLUME II. contains a re-statement of the problems involved and a mass of new facts and arguments based on some novel investigations. A distinction is drawn between psychology, which deals with the problems of the soul, consciousness, and the processes of the intellect, and ETHOLOGY (so named by John Stuart Mill), which deals with the natural history of the mental capacities and character dispositions of man; and an attempt is made to lay the foundation for **a science of character and conduct**, of interest and usefulness to all classes of mankind. The innate abilities, emotional tendencies, and instinctive impulses of man and animals are analysed, a task which has already been begun by several other authors, and the elements of these mental powers are traced to their probable cerebral origin. Next, the principles of this new science are shown in their practical application to various problems, especially to mental and moral education, and to the study and treatment of disordered mental manifestation.

But Volume II. deals not only with the material aspect of the mental characteristics of man; it furnishes also evidence—derived from the author's extensive personal experience in the application of suggestion treatment, and other forms of psychotherapy—of the purely spiritual power of mind, when directed to the re-education of character, the teaching of self-control and mental discipline, and the awakening of new ideals to conquer morbid tendencies; next, the results of some unusual experiments in hypnotism are shown, pointing to higher capacities being

inherent in man than have been hitherto admitted. This leads to the consideration of the nature of Life, Mind, Consciousness, and of the problems of the Soul and man's Religious Faith, in the light of present-day knowledge, and the examination of psychical research into Supernormal and Spirit Phenomena—the same problems which, as stated in Chapter I., engaged the attention of primitive man, and which are now shown, in the concluding chapter, notwithstanding over two thousand years' investigation and reflection, to be still far from solution.

It will be admitted that the task which the author has set himself to accomplish is a gigantic one, and it is inevitable—however carefully such a comprehensive treatise may have been prepared—that there will be some omissions and a number of mistakes. These, however, should not detract from the value of the work, which is not written dogmatically, but primarily with the object **to convey information and subject-matter for thought and inquiry,** and by the exposure of the failures of the past to initiate new and more successful methods of investigation. The work should appeal not only to physicians, psychologists, and the clergy, but to every educated man.

Medical Experts will be interested in (1) the history of the slowly accumulating knowledge of the structure and functions of the brain, from the most ancient records to the most recent experimental investigations ; (2) the account of the still unknown and highly interesting life and doctrines of that much maligned and misrepresented genius, the great naturalist and philosopher, FRANCIS JOSEPH GALL, and of the vast and extraordinary influence which he exercised on subsequent research and philosophical teaching—with most liberal quotations from his own works, to enable the reader to form his own opinion ; (3) the history of psychiatry and the treatment of the insane ; (4) the author's own attempt to add to the knowledge of the motor and sensory functions of the brain (derived from the results of experiments on animals), the knowledge of mental functions which Nature herself furnishes in circumscribed lesions of the brain from injury, the growth of tumours, and other causes. The mass of evidence collected throws new light on the uses of the brain and gives rise to a whole series of theories, which will, no doubt, be subjected to searching criticism ; but a proof of their probable correctness is already furnished by the large number of cases quoted in which surgical operation in certain forms of mental derangement led to recovery.

To *Psychologists* the work should appeal because the history of psychology is brought into relation with the progress of biology and brain research, and because of the elaborate treatment of the emotions and character dispositions of man, and the principles of the new science of Ethology, which gives a deeper insight into the mental constitution of man than has hitherto been obtained, and discloses the primary motives of conduct, a knowledge of which is of the utmost utility to human intercourse.

The *Clergy* will probably be interested in the historical and other evidence of the failure of science and philosophy to account for the chief problems of life and mind, in the records of their conflict with theology, and the result of the whole inquiry as it affects religious beliefs. Being a scientific treatise, religious doctrines are of course referred to only when necessary, and then with that respect which is due to them.

The work, as a whole, is written as much as possible in popular non-technical language, so that it may be understood and appreciated by the educated *Layman*, to whom the problems of the soul, mind, and character, and the history of the intellectual progress of mankind are not less fascinating than to the expert.

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PART I

THE HISTORY OF PHILOSOPHY AND SCIENCE from Ancient Times to the end of the XVIIIth Century

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SECTION I

CONCEPTIONS OF THE UNIVERSE AND THE SOUL from pre-historic times to the beginning of Christianity

CHAPTER I

PREHISTORIC RELIGIONS

THE history of the study of the soul presents three aspects: the theological, the metaphysical, and the scientific; but it must not be assumed that they were ever so distinct. Theology was often mixed with metaphysical speculations, metaphysics with either theology or science; and the scientific view was hardly ever altogether free from either theology or metaphysical speculation. Only the most ancient study of the soul was purely theological. With the advent of the Greek philosophers it became metaphysical. With the rise of Christianity theology again predominated, with a large admixture of metaphysical doctrine. It is only with the tremendous strides of science during the past three hundred years that the soul—and more particularly its attributes and activities and the mechanism of their manifestation—was studied more and more from a strictly scientific point of view, leaving theology and metaphysics to follow their own paths. In the course of recent years theological doctrines have been differently interpreted with the increase of knowledge, and metaphysical speculations gradually adapted to the results of scientific research, while it has had to be admitted that science, too, has its limitations.

Pre-historic man imagined that **in his dreams something left his body, and that this same something returned to his body before he awoke.** He noticed that in his dreams he appeared often to be far away, or other people seemed to come to him, and since he knew by experience that his body never moved, his perfectly natural explanation was that it was something which inhabited his body—a spirit, a natural shadowy image of himself—which could go out and return again. This spirit he at first identified with the breath of the body, since the dead man no longer breathes. It was also natural that he should think that this spirit does not die with the body, but lives on after quitting it; for, although a man may be dead and buried, his phantom-figure may continue to appear to the survivors in dreams and visions. **This spiritual entity in time was regarded as the soul,** dwelling in the body of

man and presiding over its functions. It was in no way absolutely attached to the organism, but had a life of its own, independent of its attachments. It had the power of separating itself, if it so willed, from the entire organisation.

In the early days of mankind, it is obvious that death would be, in the great majority of instances, violent and premature. Such death occurring in the vigour of manhood, when its bounding energies are most active, would almost of necessity lead to the conclusion that the unfinished life would be continued elsewhere, and thus probably originated the more or less general **expectation and belief in a future life.** Just as later, when man lived in civilised communities, he had to suffer so many injustices and unequal hardships, that he found comfort in the belief that a man's personality does not cease with the grave ; and such belief in immortality was probably fostered for the influence it had on the conduct of men.

When a man died, the surviving principle was supposed to remain confined in the grave beside the corpse ; hence the custom of elaborate burial ceremonies. Later, the mind of man rose to a conception less purely material, and the souls of the dead were imagined to congregate in places of their own, somewhere whence they can visit the living, especially at night time. Still later, the idea arose that this new existence must be influenced by the deeds of the previous life, for which it is either the reward or the punishment. Two soul places are then distinguishable. Others believed that the soul, for its purification, could enter other organisms not necessarily human. Thus **the spiritual part of man was believed to have a life of its own,** continuing to exist after the body had returned to its elements, and even affirmed to have previously existed before the period of its organic birth.

From the fact that man in his dream-adventures uses his dress and weapons arose the belief that even these things have their shadowy duplicates or ghost souls, which can be carried away by the departing soul and used by it as the real objects were used by the living man. Moreover, **primitive man, having discovered in himself a double being, the one corporeal and the other spiritual, transferred the new notions regarding himself to objects without himself.** Whatever seemed to move or act spontaneously, like the winds and streams and echoes, the sun, moon, and planets, were felt as spiritual agencies, especially if a sound were connected with them. The sighing of the breeze, the moan of the wave upon the shore, the babbling of the brook, the roaring of the sea, and the pealing of the thunder were nothing less than sad, joyous, or angry living voices. Being surrounded by elements and forces of nature which he could neither comprehend nor control, primitive man saw spirits everywhere. They constituted his interpretation of nature for the time being. They were symbols of the unknown and mighty powers with which he was surrounded, and before which he stood unprotected, helpless and trembling. As destructive storms and the beneficent rain that makes the grass grow seem to descend from the sky, he pictured a Heaven-Father ; and as the earth makes the food grow and has other mysterious powers, he imagined an Earth-Mother. But he also fancied a Sun-God and a Moon-Goddess, and other divine personalities representing other great powers of nature. Similarly he thought the stars, mountains, forests, and rocks animated and haunted by spirits. Indeed, until accidents and experiments led to the discovery of laws of nature, **the causes of phenomena in nature were sought in the action of powerful but invisible beings.** It is easier for man to think of personal powers at work in the universe than of impersonal ones. Even when man has discovered the laws which govern the universe and creation, he still asks himself who made these laws. The natural was to primitive man the supernatural, as it still is to many of us. He therefore worshipped the sun, the moon, the stars, trees, rivers, springs, fire, winds, and even serpents, dogs, apes, and oxen ; and as he came to set up carved sticks and stones to represent these, he passed from nature-worship to fetish-worship.

Uncritical observation of the aspect of nature persuaded primitive man that the earth is an extended level surface which sustains the dome of the sky, a firmament dividing the waters above from the waters beneath ; that the heavenly bodies—the sun, the moon, the stars—pursue their way, moving from east to west, their insignificant size and motion round the motionless earth proclaiming their inferiority. Of the various organic forms surrounding man, none rival him in dignity, and he seems justified in concluding that everything has been created for his use—the sun for the purpose of giving him light by day, the moon and stars by night. Comparative theology shows us that this is the conception of nature universally adopted in the early phase of intellectual life. It is the belief of all nations in all parts of the world in the beginning of their civilisation : *geocentric*, for it makes the earth the centre of the universe ; *anthropocentric*, for it makes man the central object of the earth. And not only is this the conclusion spontaneously come to from inconsiderate glimpses of the world, it is also the philosophical basis of various religious revelations, vouchsafed to man from time to time.

Not being able to see beyond the sky, man assumed a region above it where the gods dwell, and whither those are going who in their earthly life made themselves worthy of such bliss. And thus he pictured to himself a heaven shut off from earth, with all its sins and cares, by the untroubled and impenetrable sky—a place of peace, of light and repose, but also a place of power. On the other hand, there are forces in nature, and there are visions in dreams, which caused him to be terror-stricken, which made him assume malignant spirits, whose habitation he thought was in the dark regions beneath the ground, far away from the realms of light—a region from which, through the volcano, smoke and burning sulphur are cast into this upper world—a place of everlasting fire and darkness, whose portals are in caves and solitudes of unutterable gloom. Placed between the boundaries of such opposing powers, he felt himself the sport of circumstances, sustained by beings who seek his happiness, and tempted by those who desire his destruction. Guided by such obvious thoughts and simple reasonings, he threw a longing look to the good beings who protect him, and sought to invoke their aid by entreaties and to propitiate their help by sacrifices.

It is only natural that primitive man should associate these conclusions with others, expecting that **in a future life good men would enjoy the society of good beings like himself, the evil being dismissed to the realm of darkness and despair.** And, as human experience teaches us that a final allotment can only be made by some superior power, he expected that He who was his creator would also be his judge, and that there was an appointed time and a bar at which the final destination of all who have lived should be ascertained, and eternal justice measure out its punishments and rewards.

Primitive man considered the gods like himself, only mightier than he, possessing qualities like his own qualities, and motives like his own motives ; hence he believed their favour could be courted and their wrath appeased by magic, the singing of praises, gifts and sacrifices. To ensure their presence at such ceremonies, special holy places were selected and temples and altars erected, where he could communicate with them ; and gradually a body of men, who study the will of God or the gods and who may mediate for him, were set apart. Some sacrifices were thank-offerings, given as an expression of gratitude for benefits received ; other sacrifices were offered to the gods as supplications for help desired.

Each tribe and each nation established its own set of gods, which partook of its own character and were the embodiment of its own peculiar form of life, under whose exclusive protection its members believed themselves to live ; and who stood ready to smite its enemies or to deliver its weaker neighbours into their hands. The legends of the gods were handed down from father to son, and became changed in course of time or else new meanings were invented. With advancing civilisation

the real origin of the gods was forgotten, their quality improved, the conceptions became more spiritual and their number diminished, until the monotheistic view became paramount.

Primitive religion had little or no connection with human welfare, apart from the action of supernatural beings. Its chief or only object was to guard the worshipper from injuries which came from the spirit world, or to procure him benefits from the same origin. It sacrificed human life and property on the imaginary propitiation of fictitious deities. Later on, religion was largely the outcome of mythical prophetic revelations. Individuals appeared with the capacity for the highest inspiration, and these become the prophets and inspired leaders of the race. Thus arose the **prophetic religions,** tending towards monotheism, as those of Zoroaster, Buddha, and Moses. Of another kind were the **ethnic religions,** arising out of a national tendency, such as those of Egypt, India, Greece, and Rome. All religious truths are largely based on myths. They were originally embodied or taught in poetry, the natural speech of religion, whose literal truth is unutterable, and whose loftiest teachings are as symbolic as the popular legend. **There is a similarity in the myths of all nations,** yet they possess distinctive features, in harmony with the distinctive character of the nations. It will be seen that in one respect all the sacred books of the East, where most religions sprang from, are alike. They are all full of sublime teaching and of precepts as lofty as any which European nations are in the habit of practising. This is a fact which many Christian missionaries are apt to forget.

Man's intellect, even in the most remote ages, must have been greatly superior to the understanding of animals ; for it led him to the discovery and utilisation of the secrets of nature. Whereas animals that build habitations for themselves or their young continue to do so in the same way for generation after generation, man progressed in knowledge, until at length he reached that stage which we call civilisation. Animals devour the food as they find it ; man's progress led to the management of fire and—the art of cooking his food. Whereas animals are provided with means of attack and defence, human beings are unprotected, but the progressive growth of their intellect led them to fashion weapons of attack and defence. By his intellect, prehistoric man attained command of his environment—that is, the capacity for making out of the inorganic, to some extent even out of the organic, world, instruments for the satisfaction of his wants, fire and clothes to keep him warm, a home to keep him dry, fishing rods and arrows to procure him food.

In his lowest—the savage—state, man probably subsisted on wild plants and animals, neither tilling the soil nor domesticating creatures for his food. He may be considered to have risen into the next, the barbaric state, when he took to agriculture. With the certain supply of food which could be stored till next harvest, settled village and town life was established, with immense results in the improvement of arts, knowledge, manners, and government. Lastly, civilised life may be taken as beginning with the art of writing, which by recording history, law, knowledge, and religion, for the service of ages to come, binds together the past and the future in an unbroken chain of intellectual and moral progress.

Primitive man believing himself surrounded by evil spirits, we need not wonder that **he attributed disease to demonic power,** which only a magician or witch doctor could expel. At a later stage, when disease was regarded as a punishment by an angry deity, the conceptions of sacrifice, propitiation, purification, fumigation, fasting, etc., made their appearance, and the doctor became identical with the priest. As knowledge advanced, there were joined with these measures others more rational, such as baths, massage, and dieting, besides various hypnotic and suggestive devices. This combination of medical and sacerdotal functions had a wide range and a long vogue.

Diseases of which the cause was not visible being attributed to magic or the operation of evil spirits, there arose from this general concept the notion that there were specific spirits which caused different diseases. Sometimes it was thought that

the disease was caused by possession—that is, by the occupation of the sick man's body by spirits of dead men or of demoniacal animals. This led to surgical practice consistent with such belief, for there is evidence that the skulls of epileptics were trephined to afford incarcerated evil spirits a chance of escape. In other cases treatment would be directed to combating the evil spirits by spells, angry deities by propitiatory rites and sacrifice, and maleficent magic by counter magic. Hence the witch doctors were looked upon not only as healers of disease, but as prophets having power to influence the elements, to ensure success in battle, and to foretell the future. With all this superstition it is not a little remarkable that amongst many races of very low civilisation natural causes of diseases were admitted, such as unhealthy winds, unsuitable food, over-exertion of body, even heredity and infection in some cases. The probability is that only those diseases were ascribed to demons for which no natural causes could be found and no remedies were known.

Madness, in early antiquity, was regarded as due to divine influence, but later it was looked upon as due to an evil spirit sent as a divine punishment for neglect of carrying out God's instructions, as is put very clearly in the case of Saul, King of Israel (1097-1058 B.C.). The records of Egypt, Persia, Assyria, and Greece all supply evidence of the same sort. The treatment seems to have consisted of magic, incantations, prayers, sacrifices, and of exorcisms, sometimes of a violent sort. But in the case of Saul the evil spirit was often dislodged by the music of David's harp. He seems to have suffered from what is now called manic-depressive insanity, a form of mental derangement in which mania, melancholia, and lucidity follow one another at periods.

THE BABYLONIANS

The most ancient civilisation is believed to be that of the *Sumerian race*, about 4000 B.C., before the advent of the Babylonians and Assyrians, their Semitic conquerors. In any case Mesopotamia was the starting-point of Oriental civilisation, of which the Babylonians and Assyrians were undoubtedly the principal founders. They borrowed from the Sumerians the elements of morals, learning, and the arts, and brought them to perfection.

The Babylonians were skilled in mathematics and astronomy, originated the decimal system of notation, weights and measures, made the divisions of time into twelve months in the year, seven days in the week, sixty minutes and seconds in the hour and minute respectively, and divided the circle, as we do, in 360 degrees. They invented the cuneiform inscriptions, reading from left to right; they knew much about military tactics and the art of war, and were variously skilled in music, architecture, pottery, glass-blowing, weaving, and carpet-making.

The great gods of Babylonia belonged to the elements and the heavenly bodies. We find at first different cities and districts worshipping different gods: one, the god of the sea; another, the god of the earth; another, the god of heaven, regarded above heaven, and above all created things. In addition, the sun and the moon are worshipped everywhere, each city having its own sun-god and moon-god; the latter being the older and greater being. The home of the sun-god is Eden. There was also a wind-god. The stars were also worshipped; and the temples were built so that their principal axes should point in a definite direction and form an astronomical guide.

The city of Babylon had its own prevailing god, the great god *Merodach*, the greatest of all, the mediator, who raises the dead to life, and combats the great dragon and the powers of evil. He was first worshipped as the sun-god, and later as BAAL, the Lord, the conception of whom grew more and more spiritual. He was the god of war, he healed the sick, brought relief, gave life, and received the soul in his blessed dwelling above. But the ancient belief in spirits—and their worship—persisted at the same time.

The Babylonian religion presents many similarities with the Jewish account of the creation of the world : the creation out of chaos, the orderly evolution of the cosmos, the creation of man in the image of god or the gods, the temptation and fall, and the flood. The raw material is the same, but the spirit in which the materials are worked up is totally different. The Jewish tradition may be derived from the Babylonian, as many authorities have believed, or both may be derived from the same source. Since the Babylonian is so much older than the Jewish, the first assumption is probably correct. One great distinction is that the Babylonian traditions form a complete mythology ; whereas the Jewish Scriptures are more like " primitive philosophies of nature and religion " clothed in spontaneous poetry.

The Babylonians held that the intellect has its seat in the heart, the liver serving as the central organ for the blood, which they considered to be the true life principle. They divided this fluid into two kinds—a blood of the daytime (bright arterial) and that of the night (dark venous). Diseases, usually personified as demons, were looked upon as something that entered the body from without and that consequently had to be expelled.

With the extinction of Babylon as an independent country, the Persian religion predominated.

THE EGYPTIANS

The ancient Egyptians, of whose civilisation there exist records extending back to about 3500 B.C., were a nation skilled in agriculture and in constructive art. Their religion, their reckoning, their measuring, all appear the results of long and gradual growth.

The earliest king of all Egypt must have ascended the throne about 8,500 years ago, when the Egyptians were already skilled in the art of glass-blowing, the smelting and working of metals, weaving, pottery, brick-making, boat-building, rope-making, preparing leather, writing, painting, and sculpture. From Egypt came our recognition of lunar months, our names for the principal stars, the twelve signs of the Zodiac, etc. The Egyptians seem also to have known of the isolation of the earth in space, through which it sailed like the sun and stars.

The ancient Egyptian religion appears to have grown early into **pure monotheism.** It declared that God is the only One, whose life is Truth, that he has made all things, and that he alone has not been made. There is one Supreme God " who had no beginning and would have no end," a perpetual Creator, pouring life and beauty into all visible things. It was held that not only has God never appeared upon earth in the human form, but that such was altogether an impossibility, since he is the animating principle of the entire universe, visible nature being only a manifestation of him. Adoration of the heavenly bodies—the sun, the moon, the stars—was combined with that of the deified attributes of God. The great and venerable divinities were personifications of such attributes, and were arranged in various *trinities.* While it was unlawful to represent God except by his attributes, these trinities and their persons offered abundant means of idolatrous worship for the vulgar. It was admitted that there had been terrestrial manifestations of these divine attributes for the salvation of man. The inscriptions on the older monuments emphasise justice, mercy, love of right, hate of wrong, kindness to the poor, reverence for parents. But as in later periods religion degenerated, so did the high moral ideas disappear from the monuments. Only the learned, thoughtful, initiated, the chosen and secret circles of the priests continued to believe in that God whom so many prayers and inscriptions represented as having existed in all past ages and as to exist in all future ; the masses of the nation had fallen into the lowest form of idolatry.

When HERODOTUS (484-424 B.C.) visited Egypt in the Vth century B.C., or when DIODORUS (*c.* 60 B.C.) wrote of it about the time of Christ, or PLUTARCH (40-120 A.D.) gathered the legend of Osiris from Egyptian sources within seventy or eighty years after, the Egyptian religion was a thing of the remote past, at a greater distance from Herodotus or Plutarch than these are from us. The ancient faith had degenerated into extreme polytheism, or idol worship, except among those initiated in its "mysteries," and there was only a tradition or vague impression among other peoples of the purity and grandeur of the belief of the early Egyptians.

The Egyptian mythology reproduces two leading ideas: the belief in the triumph of light—the god RA—over darkness; and of life—the god OSIRIS—over death. Osiris slain by his brother and reigning in the kingdom of the dead, lives again on earth in his son HEROS. Each man, at his death, becomes identified with Osiris. As the soul of the god shines in Orion in the sky, so that of the departed lives likewise among the stars.

Under the first six dynasties, besides OSIRIS and RA (the sun-god who conducts the souls of the dead to the underworld), PTAH of Memphis, the artificer, judge of the upper and underworld, was chiefly worshipped, as the deity who effected the union of the two divisions of the kingdom under one sceptre. Then the three gods were blended together in a higher and invisible god. Under the Middle Empire (XIth to XIVth dynasties) Upper Egypt rose in importance, and its gods were elevated to the highest rank. The future life was regarded only as the continuation of the present, without reference to the doctrine of retribution. AMUN-RA of Thebes became the chief god under the Hyksos rulers, when the doctrine of immortality, now under the control of the dogma of retribution, became the centre of religion. The souls of the wicked are now tortured or become immovable for millions of years. The pictures of heaven, on the other hand, are such as would be most grateful to a dweller in that hot climate—deep shades of over-branching sycamores, cool waters, the fresh north wind, and fruitful fields, forever watered, and rich in never-ceasing harvests. Magic and the power of the priests rose, and the high priest of Thebes seized the sovereign power. The last period is when Lower Egypt threw off the yoke of the priest kings of Thebes. Then followed the Ptolemies.

The ancient Egyptians made most precise assertions with regard to the constitution of **the human soul** and its future destinies. They imagined that man contained within him a divine ray, constituting the spiritual soul and acting upon the body through the agency of a peculiar fluid-like compound, which they analysed into several different elements—the ego, conscious will-power, unconscious will-power—these elements serving as agents for the various faculties of the soul. These elements, according to the interpretation of other authorities were: the divine spirit, the spiritual soul or intellect, the astral body, the agent of passions and desires, the vitality, the physical body, etc.

The ancient Egyptians, in each one of their acts, seemed to be looking forward toward the final end: so much so, indeed, that **the present life was for them scarcely more than a preparation for the existence beyond the grave,** when the soul should at last be freed from the yoke of matter. **In the life hereafter, all that death takes from a man is restored to him.** Soul and genius and shadow reunite with the purified body; the powers of thought and action are restored. A man is made happy by attaining all that he can be expected to want; he has life again, but a better life. The dead man can undergo any *transformation* that the Ka, the spiritual self, desires. The object of this transformation of the soul after death seems to have been development—not punishment, nor purification as in the transmigration systems, as, for example, in Brahmanism. The soul, it is taught, must complete its education, to be in sympathy with the Divine Mind in his whole work of creation.

The oldest Egyptian book is the **Book of the Dead,** a collection of texts, prayers, invocations, and protecting spells, intended by their magic power to secure the victory for the soul on its journey through Amenti to the abodes of eternity. The care of the dead is the first duty of the living, and a man must marry in order to have offspring who will pay him the necessary attention after his death. The graves the ancient Egyptians called eternal habitations. They consequently took small pains in building their houses, while they constructed their tombs upon the most lavish scale. The idea that the disembodied soul continues to inhabit the immediate vicinity of the physical body led them to embalm their dead in order to preserve the corpse as far as possible, so that the soul might not be constrained to abandon it entirely, and might, if it were not destroyed, re-animate it upon the judgment-day. Embalming was practised as early as 2000 B.C.

It has also to be mentioned as a characteristic of the ancient Egyptians that they regarded their kings as deities upon earth, and that they paid homage to certain animals, among which the *sacred bulls* occupied the most prominent place. In early times the deities were represented partly in human and partly in animal form.

The Egyptians seemed to consider every earthly event as providential and therefore sacred, so they recorded everything. They covered the walls of their temples and tombs with pictures and carved inscriptions. They also wrote down the details of their lives on innumerable rolls made of papyrus.

The Egyptian records show **the healing art to have been entirely in the hands of the priests, who had a monopoly of learning and taught medicine in the schools** existing in connection with the temples, among the most celebrated being those of Memphis and Thebes. Botany and chemistry made considerable progress, but the knowledge of the structure and functions of the different parts of the human body was very imperfect and remained unchanged for many centuries. Egyptian medicine seems to have remained spiritualistic to a late date. The object of diagnosis was to discover the nature and name of the evil spirit causing the disease. Treatment consisted in prayers and incantations, but in part also of rational procedure and the use of drugs. About the XIIth century B.C. a State official was appointed who exercised a close supervision of all matters relating to public hygiene. He exercised ethical control over all physicians, who had to bind themselves by oath to observe certain laws in their relations with the public. Herbalists were under police supervision, and the proprietors of public baths were forbidden to admit sick persons into their establishments. Altogether, in matters relating to **personal hygiene and sanitation,** the ancient Egyptians often displayed a remarkable degree of common sense. They took care, for example, to prevent the entrance of decomposing materials into the soil and the ground water; baths, gymnastic exercises, and diet were studied and prescribed. At a later period they adopted the custom of drinking only water that had been either boiled or filtered. Surgery, too, reached a degree of knowledge and skill well in advance of that reached by any of their contemporaries. Their knowledge exerted a powerful influence upon the beginning of medicine in Greece and upon the social hygiene of the Jewish people. (See also Chapter IV.)

THE JEWISH RELIGION

The ancient Jews were remarkably free from the habit of mind which led almost all other nations to personify the most startling phenomena of nature as living beings. **Their fancy was applied almost exclusively to the glorification of their own national history and the one supreme God.** They believed themselves to be his exclusively chosen people. It was only with the prophets that Jehovah became God of all the nations, though he revealed himself to them only. It was only in their Babylonian captivity (600 B.C.,) that the Jews adopted the Persian doctrine of good and evil spirits.

It is sometimes asserted that Moses (1571-1451 B. C.) borrowed his monotheism

and the Jewish ritual from Egypt, because he was learned in all the wisdom of the Egyptians. The sacred books of Egypt taught the unity and spirituality of God, the immortality of the soul, and a future judgment, besides a morality of justice and mercy. The Jewish priesthood was in some respects like that of Egypt, and the two rituals had some analogy with each other. But the resemblances are on the surface, the differences are radical. The doctrine of the divine unity was a secret doctrine in Egypt, but it was made by Moses the public faith of the nation. The polytheistic idolatry, which constituted the public worship of the Egyptians, Moses made a crime. And the doctrine of a future life, which played so large a part in Egyptian faith, is nowhere distinctly taught in the Books of Moses.

The earlier form of the Jewish religion is an uncompromising monotheism, in which **all evil as well as good is ascribed to the agency of one Almighty Being.** The physical and moral evil alike come direct from God, the one source of all existence and the one cause of all events. All plague, fire, famine; all passions, sickness, untimely deaths; in short, all calamities are ascribed, not as afterwards to the malignity of evil spirits, but to the direct volition of the Mighty Maker, who has power over the clay to make one vessel to honour and another to dishonour. Everywhere, indeed, in the Old Testament, angels—God's subordinates—are at work fulfilling the behests of Jehovah.

Jehovah is not only the God who has done great things for the children of Israel as a chosen and peculiar people, but he is the God of the whole earth and the whole universe of created things. He is a personal being possessed of that which we know to ourselves as Will—one who works for ever, and works unceasingly in the maintenance and government of the system which we see. He is a living and personal God who is the author of nature as a whole, and of man in particular as the only one of his creatures, so far as known to us, who is capable of having towards him the conscious relations of knowledge and of love. The belief in the omnipotence of God was absolute, but so was the belief that omnipotence itself was not arbitrary in the exercise of its powers, but worked always through intelligible and moral laws, those of truth, justice, and mercy. The true sacrifices to God are those of the heart and conduct. God insists on love and devotion.

The Jews had no sculpture and no painting, and the nature of their thoughts of God, as well as the commands of their religion, forbade their making graven images of Him. They heard rather than saw God.

According to the earlier view in the Old Testament man consists of two elements: soul and body. The soul joins the body only in the fully developed fœtus and comes from the heavenly spheres. The Jews held that **life, whether of man or animals, was an emission or breath from the spirit of God.** But they do not intimate of brutes, as they do of men, that they have surviving shades. Life was regarded as a blessing by them, death as the one evil. "A living dog is better than a dead lion." The soul is the seat of feeling and desire, and, in a secondary degree, of the intelligence, and is identified with the personality.

Under the teachings of the Prophets and the development of monotheism the spirit began to be distinguished from the soul; and while the soul remained as the vital principle of the body and as the seat of all the mental activities, it was not conceived as surviving the death of the body. In death the soul—which is the personal factor in man and is simply the supreme function of the quickened body—is extinguished and only the spirit survives. But since the spirit is only the impersonal force of life common to man and brutes, it returns to God, the Fount of all life, and thus **all personal existence ceases after death.** In the Jewish religion God rewards the good and punishes the wicked, but this retributive justice is limited to the present life.

The soul leaves the body at death to pass to the dark underworld of the souls of

the dead—Sheol. The state of disembodied souls is deep quietude. Freed from bondage, pain, toil, and care, they repose in silence. Sheol was the abode of *all* dead persons, without moral distinction. The nation, not the individual, was uppermost. It was only after the Babylonian captivity that personal immortality found expression. Men who held communion with God during life protested against being cut off in the next, and gradually Sheol became the abode of the wicked only, while the abode of the righteous, which was reached by escaping from Sheol, came to be called Paradise. Sheol became thus an intermediate state. Still, all the descriptions of the next world are left vague. Only one thing is certain : *there is no ever-lasting damnation.* There is only a temporary punishment for the worst sinners. No human being is excluded from the world to come. The general Rabbinic belief was that both Paradise and Hell were in the underworld separated only " by a distance no greater than the width of a thread." Only later, with the increase of geographical knowledge, which destroyed the old Eden, they changed the location of Paradise to the sky.

There is no utterance of Moses to indicate any sort of future life for man. Even when the Messiah was expected, there was to be no resurrection, in the present sense, but rather a new creation : the righteous shall enjoy a bodily resurrection upon the earth to honour and happiness, but the wicked shall be left below in darkness and death. In the canonic books of the Old Dispensation there is not a single genuine text, claiming to come from God, which teaches explicitly any doctrine whatever of a life beyond the grave. That doctrine as it existed among the Jews was no part of their pure religion, but was a part of their philosophy. It did not, as they held it, imply anything like our present idea of the immortality of the soul reaping in the spiritual world what it has sowed in the physical. It simply declared the existence of human ghosts amidst unbroken gloom and stillness in the cavernous depth of the earth, without reward, without punishment, without employment, scarcely with consciousness. Even when the Jews modified their own belief and accepted the doctrine of the life hereafter, it never became so pronounced among them as among other races and nations.

It is not until the Second Book of the *Maccabees*, probably 120 B C., that there is any indication of resurrection. Even at the time of Christ there was the Jewish sect, the *Sadducees*, who openly denied the existence of any disembodied souls, avowing that men utterly perished in the grave. Another sect, ascetic and philosophical, were the *Essenes*, who agreed with the speculations of Philo rejecting the notion of the resurrection of the body and maintaining the inherent immortality of the soul. But by far the most numerous sect were the *Pharisees*, eclectic, traditional, and formalist. They believed that the souls of the faithful would live again by transmigration into new bodies, and many of them held that the sinners were doomed to a place of confinement beneath.

The **medical teaching** in the Talmud (IVth to Vth century A.D.) is absolutely devoid of anatomical knowledge. Dissection was unknown in those times ; even to touch a corpse was thought unclean ; consequently the most extraordinary anatomical statements were made.

That the soul was spread throughout the body was the general notion ; but Rabbi BEN AKIBA (-135 A.D.) located it in the nose, and Rabbi ELIESER in the abdomen. Based on the biblical pronouncement that God tests heart and kidneys, these organs were held to be the instruments of intelligence. Of the circulation they knew only that the veins contained blood.

The heart plays in biblical, as well as in most heathen psychological systems, the chief part. There is, however, this difference, that in the Old Testament the heart is not merely looked upon as the most important vital organ, but as the organ of thought, volition, and as the seat of all emotions. The head and the brain scarcely find a place in the Old Testament. According to DELITZSCH, the head, as the seat of the intellect, occurs only in *Daniel :* " The dream and the visions of my head are these " ; " Daniel had a dream and vision of his head " ; and " the visions of my head troubled me." In the Talmud, however, according to NEUBURGER,

the seat of reason was assumed to be in the "marrow of the skull." According to one Jewish physician, ABAGE, the brain contains the centre for the sexual function (Cholin, 45, 2). It was also known that paralysis of the lower extremities was a sequence to the injury of the spinal cord.

The medicine of the Hebrews embraced a sanitary code of the highest sagacity, especially in public hygiene. The Book of Leviticus is largely made up of rules concerning matters of public health. All magic was treated with contempt by the Jews, and there were no occult practices in the healing of the sick. It is God alone who is the healer. But though disease may have been thought to be a direct result of the wrath of God, still it was recognised that unwholesome food and unclean dwellings would surely bring down that wrath upon the transgressors. Many of the prohibitions were followed by the Egyptian priesthood, but in Israel they were enforced on the whole nation. Unclean animals, like the pigs, are shunned as unwholesome in Egypt to this day. The Jews were not permitted to consume as food animals which had died a natural death or were torn by wild beasts. The inspection of all animals used as food was a most important sanitary precaution. Especially sanitary were the rules concerning menstruation in women and all their sexual functions and diseases. Prophilactic and eugenic were also the measures for the prevention of conception in delicate, diseased, and nursing mothers, so as to procure, as far as possible, only healthy offspring. Personal hygiene was practised; for example, gargling after meals with salt water for the disinfection of the mouth, and the drinking of water after every meal.

As regards treatment, suggestion was practised by the laying on of hands and stroking the skin, as well as sympathetic persuasion; and many wonder-cures were thus achieved, presumably on functional cases, such as making blind men see and lame people walk. Gymnastic exercises, massage, purgation, cold-water cure, and other forms of hydrotherapy, and venesection were practised. Special decoctions of the juices of medicinal plants were given for special diseases. Their dietary laws laid down in the Pentateuch, and enforced by specific regulations in the Talmud, are well known; and they had special diets in disorders of digestion, and gave goat's milk for lung troubles.

THE HINDUS

The Vedas, which are the Hindu Scriptures, are asserted to have been revealed by Brahma. They constitute the basis of an extensive literature. They are based on an acknowledgment of a universal spirit pervading all things: the God above all gods, who created the earth, the heavens, and the waters—the material as well as the cause of the universe, "the clay as well as the potter." There is but one real Being in the Universe, the Universal Spirit or Brahma, who is outside nature and within nature and one with nature; of whom all our individual souls are parts; from whom they have emerged, and into whom they will return. **The world is an emanation of Brahma and a part of him.** It is kept in a visible state by his energy, and would instantly disappear if that energy were for a moment withdrawn. Even as it is, it is undergoing unceasing transformations, every thing being in a transitory condition. In these perpetual movements the present can scarcely be said to have any existence, for as the past is ending, the future has begun. Time and the things of earth are of no account—**only Eternity is true.** Living for eternity, the Hindus cared little for the events of time, and had no historical records.

According to ANDREW LANG, the early Hindus knew the myth of the marriage of heaven and earth, with the consequent birth of the gods; they had the story of the deluge, and various myths of the conflict of the gods. When the hymns of the Rigveda were written (about 1500 B.C.) attention was drawn away from the more superstitious and childish elements of religion. These hymns were polytheistic in appearance, but pantheistic in substance. The great powers of nature were alternately deified and made supreme and worshipped as the heavens, the air, the

fire, or any other manifestation; but it was always the Supreme Being, with the same infinite attributes, who was worshipped. There were no immoral stories of the gods, no idols, no dark descriptions of hell, no demons to be guarded against, no bad deities, and as yet no castes.

The ancient Vedic religion passed on into *Brahmanism*, which was the worship of a triad: the Creator; Siva, the destroyer; and Vishnu, the restorer—in which the circle of change was completed. Brahma is an intellectual deity, a great spirit, the "Mahan Atma," the innermost essence of all things, unaffected by all changes. Brahmanism was faith in pure spirit. Its worship was contemplation and adoration. Later came more idolatry and polytheism, but they formed no essential part of it, and came by a natural reaction from an extreme spiritualism. It was the worship of spirit, spirit as seen in all nature. The Vedic hymns, prayers, epics, philosophy, were all intensely spiritual. The joy of a Hindu in the beginning was worship; and his joy to-day is worship. The world is really nothing but an apparent or illusory world; and the true wisdom, the only salvation consists in knowing this, and in living a life in accordance with this knowledge. The energy which in other faiths is devoted to a moral struggle is here poured into the ascetic discipline by which the individual looks to escape altogether from the world as it is.

According to the Vedanta view, a human being consists of two parts, the body and the soul. The body is a highly complex material object formed by the combination of a large number of constituents, and is used and controlled by the human soul embodied in it. The spiritual side of the soul is all in all, and the material side with which it is bound, is degraded to a mere illusion or appearance. **The soul is a portion or particle of that all-pervading principle, the Universal Intellect or Soul of the World,** detached for a while from its primitive source, and placed in connection with the bodily frame, but destined by an inevitable necessity sooner or later to be restored and rejoined.

The human soul has for its self Brahma in *unmodified* form. There is no other finite being in this world which has the unmodified Brahma for its self, and which, like the human soul, is by nature conscious and self-conscious. But the human soul is also, like Brahma, eternal and all-pervading or infinite. Man, therefore, according to the Vedanta, is Brahma in a sense in which no other thing or being in this world is Brahma. Though, however, the human soul is thus essentially superior to all other things in this world, and is in a special sense Brahma, still it is inferior to Brahma. For it is mostly ignorant, simple, weak, and subject to pain and misery; while Brahma is omniscient, omnipotent, and absolutely free from sin, pain, or misery. And it is to indicate this inferiority of the human soul that the Vedanta calls the former a part or reflection of the latter.

According to the Vedanta, every man is or becomes what he makes himself, *i.e.*, he has complete freedom to determine his destiny. Human beings naturally differ from one another, not only in respect of their bodily attributes, but also in respect of their intellectual, moral, and spiritual capacities—the difference being due to their previous lives. Since a multitude of moral considerations assure us of the existence of evil in the world, and since it is not possible for so holy a thing as the spirit of man to be exposed thereto without undergoing contamination, it comes to pass that an unfitness may be contracted for its rejoining the infinitely pure essence from which it was derived, and thus arises the necessity of its undergoing a course of purification. And as the life of man is often too short to afford the needful opportunity, and indeed, its events, in many instances, tend rather to increase than to diminish the stain, the season of purification is prolonged by perpetuating a connection of the sinful spirit with other forms, and permitting its transmigration to other bodies, in which, by the penance it undergoes, and the trials to which it is exposed, its iniquity may be washed away, and satisfactory preparation be made for its absorption in the ocean of infinite purity. This doctrine of the **transmigration**

of the soul led necessarily to a profound respect for life under every form, human and animal, and was an incentive to virtue, a deterrent from vice.

In the **Vedanta,** the Supreme Soul is the pure essence of immortal existence, without intelligence, self-consciousness, or will. To account, therefore, for the mortality and evanescence of all created things five veils were put before the Supreme Soul, in which were reflected goodness or purity as pure white, passion and activity as red, and ignorance and darkness as black, the fourth veil representing vitality, and the fifth the material body. It is from these different veils that the Vedanta philosophy accounts for nature, and for the great variety of affection, and condition of body and mind.

In the **Sankhya** system, the material side, instead of being reduced as in the Vedanta to a series of illusory veils, is made up, on the contrary, of a series of real substances corresponding to these veils in number and function. The Supreme Soul, instead of being all in all as in the Vedanta, is reduced in the Sankhya to the position of a mere onlooker, absolutely impassive, unaffected by anything occurring in nature or in the mind or body of man. Whereas the Vedanta system is monistic, the Sankhya philosophy is dualistic, with Nature and Soul as the terms of the antithesis. The Sankhya system holds the conquest of desire to be the way of salvation from bondage to matter. It denies a soul supreme over all, such as the World-Soul of the Upanishads, whose character, as God, is regarded as incomprehensible. The Sankhya philosophy is a regular system of metaphysics, to be studied as one would study algebra. It has been called atheistic ; but it is rather agnostic. While it asserts the external existence of souls, it denies that the existence of the Supreme Soul is capable of dialectic proof. One branch of this system—the Yoga—distinctly acknowledges the Supreme Being, and declares that by ascetic exercises and mortification of the flesh one can come into union with God, and be yoked to him.

In the **Vaiseshika,** the world is made up of an infinite number of atoms of five different kinds : fire, air, earth, water, and—mind. The aggregates of these five different kinds of atoms make up the infinite variety and complexity of the world and of human life. The material side is everything, and the soul, in its turn, is reduced to a mere after-product or effect. There are again the same veils, but they are composed of infinite aggregates of atoms, in different forms and stages of combination and complexity. The Supreme Soul, as in the other Hindu systems, is infinite, eternal ; without self-consciousness, intelligence, or will ; without pain, or pleasure, or motion, or any other quality whatever except mere extension. And as for the individual souls of men, they are represented as each diffused through the infinite space like ether, taking their colour, complexion, and quality from the particular combination of atoms, bodily and mental, to which at some point of their vast extent they adhere ; taking a spiritual impress from its material counterpart—good and evil, pleasure and pain, merit and demerit. In this way the souls of men pass from incarnation to incarnation, gathering merit or demerit as they go along, from the particular combinations of bodily and mental atoms with which during their earthly pilgrimage they are bound up, and transmitting them accumulated and intact to the next ; until at last, purified from all grossness, and with colour, quality, and complexion now indistinguishable from that of the Universal Soul in which they all alike float, they become merged and absorbed in it ; and so escape at last from that weary round of incarnation to which they appeared to be doomed.

There are three other systems, subsidiary, the **Nyaya,** the **Yoga,** and **Mimansa,** which accept the current beliefs of the orthodox in reference to the Supreme Soul and the knowledge contained in the other, the world-systems. They are more purely ethical systems, and concern themselves rather with the kind of conduct, or attitude of soul, necessary to obtain salvation.

From such theological dogmas a religious system obviously springs having for its object the hastening of the purification of the soul, that it may more quickly enter on absolute happiness, which is only to be found in **absolute rest.**

The Vedanta makes sleep a higher condition than waking. In sleep the self is set free not so much from the body as from the limits of consciousness which constitutes existence. Deep dreamless sleep therefore is an approximation to the best state. In it the soul is set free to rest in itself; the next degree is rest in the eternal consciousness. Later systems recognise a state of self-absorption, which is not identical with deep sleep, but can be attained through meditation in full wakefulness.

All the Brahmanic sects unite in thinking that liberation from the net of births is to be obtained and the goal of their wishes to be reached by one means only, and that is—knowledge, real wisdom, and adequate sight of the truth. Without this knowledge there is no possible emancipation; but there are three ways of seeking the needed knowledge. Some strive by direct intellectual abstraction and effort, by metaphysical speculation, to grasp the true principles of being. Others try, by voluntary penance and self-abnegation to accumulate such a degree of merit. And still others devote themselves to the worship of some chosen deity, by ritual acts and fervid contemplation, to obtain by his favour the needed wisdom.

According to the Vedanta, taking refuge in Brahma is the only efficient means of attaining the goal of man's life, and consists in **complete self-surrender** to Brahma, without any reserve whatsoever, in respect of the body, intellect, feeling, and will. The self-surrender of will consists in totally abstaining from any act which is positively bad or sinful, which is directly or indirectly selfish; and in always most willingly doing every act that is in conformity with the will of Brahma simply and solely because it is Brahma's will that we should do it. The surrender to Brahma of feeling consists in making Brahma the highest object of our love and loving other beings as our very self, so that our love of them will contribute to our love of Brahma; and in feeling satisfaction and delight, not as the result of selfishly pursuing any object or doing any thing that is not in conformity with Brahma's will, but in the consciousness that we have done or tried our best to do what, according to the will of Brahma, we ought to have done. The surrender to Brahma of intellect consists in pursuing, by every means, whatever knowledge is necessary in order that will and feeling may be surrendered to Brahma in the sense explained. The surrender of the body consists in taking care of it in such a way that it may best contribute to the surrender to Brahma of will, feeling, and intellect, *i.e.*, of the whole soul.

In the early Sanscrit documents *medicine* is entirely theurgic, and treatment consists in the usual spells and incantations against the demons of disease or their human agents, the witches and wizards.

The pharmacopœia of the ancient Hindus is very rich in vegetable drugs, but mineral substances were also used both externally and internally. They maintained superiority in (rough) operative surgery above the physicians of neighbouring Oriental countries for a long time.

The practice of medicine at first was in the hands of the priests; then it extended to members of other castes. Thus in time a medical class was organised. The means of acquiring medical knowledge were the study of medical writings, the personal teaching of the instructor, and association with other doctors. Pupils fit for the study of medicine were those who came from a family of doctors or associated with doctors. At the end of the course of studies the candidate had to address a petition to the King asking him to grant authority to practise independently. This seems to be the first trace of anything resembling a legal qualification.

The early medical researches of the Hindus were recorded in the Ayurveda (600 B.C.), much of which survives in the writings of Charaka and Susruta of much later date. The acquirements, medical and surgical, chronicled by these authors were perpetuated, practically unchanged, by oral tradition, until the invasion of India by Western nations introduced the doctrines and methods of rational and

progressive medical science. (See " Hindu Achievements in Exact Science," by B. K. Sarkar, London, 1918.)

BUDDHISM

arose about 500 B.C., its founder being SIDDHARTA, known later as GOTAMA (520-440 B.C.), the word BUDDHA being Sanscrit for " the enlightened."

Tradition declares Mohmaia, an immaculate virgin, to have conceived Gotama through divine influence ; thus he was of the nature of God and man conjoined. In the sacred books he is represented as a king, who having laid aside the ensigns of royalty, withdrew himself into a solitary place and gave himself up to the study and practice of virtue. His merits procured for him at the age of thirty the gift of divine wisdom. This consists in seeing into the thoughts of all living beings, in the foreknowledge of all future events, however distant they may be ; in the knowledge of the merits and demerits of all men ; in the power of working miracles ; and in a tender love toward all things living.

Buddhism spread widely in India, Tibet, China, and Japan. Its fundamental principle is that there is **a supreme power,** a self-existent and plastic principle, in the universe, **but no Supreme Being,** no self-existent, eternal, personal God. There can have been no Creator, for matter is eternal, and since it possesses a property of inherent organisation, even if the universe should perish, this quality would quickly restore it, and carry it on to new regenerations and new decays without any external agency. It also is endowed with intelligence and consciousness.

Later, Buddhism became monotheistic, recognising one Supreme Being, lord of heaven and earth, above the gods, and men. This doctrine of Adi-Buddha is a belief which began in the tenth century, and does not belong to primitive Buddhism. God is not admitted to be a person, because a person belongs to time and space, has a beginning and an end, and is thus defective. The true God must be absolute, perfect, and eternal. As a matter of fact, Buddha himself, the finite Buddha, is generally worshipped as the Supreme Being, and, in the opinion of some, was so from the beginning, as the shrines from the rock-cut temples testify. He was regarded as the supreme ruler of the universe, though not its creator, since it existed before Buddha himself began to be.

Buddhism rejects inquiry into first causes as being unphilosophical, and considers that phenomena alone can be dealt with by our finite minds. Its trinity is the Past (imagined with the hands folded), the Present, and the Future (the latter two with their right hands extended in token of activity). The Buddhist's conception of God is such that he cannot expect absorption. He has no religion, but only a ceremonial. He necessarily denies the intermediate interposition of any such agency as *Providence*, maintaining that the system of nature, once arising, must proceed irresistibly according to the laws which brought it into being. He denies the existence of *chance*, saying that that which we call chance is nothing but the effect of an unknown, unavoidable cause. As to the external world, we cannot tell how far it is a phantasm, how far a reality, for our senses possess no trustworthy criterion of truth. He never prays, he merely contemplates.

The doctrine of Karma denies the existence of any soul whatever, whether human or divine. There is no such thing as individuality or personality. The *ego* is altogether a nonentity. The vital flame is handed down from one generation to another ; it is communicated from one animated form to another. The doctrine of Karma, while denying the existence of the soul, still asserts that the effects on a man's self of his speech and action, or, in other words, his character, are indestructible and cannot die, and are as inevitable and as sure to appear as the effects of violations of, or conformity to, the laws of nature. Karma, or the law of merit and demerit,

governs all existence. It is the reason for the varieties in human fortunes, for differences of condition and character. As a man sows, so he reaps, or shall reap hereafter. As he has sowed in former states of existence so he reaps in this world. **Each individual must work out for himself his own salvation,** remembering that death is not necessarily a deliverance from worldly ills, but may be only a passage to new miseries; but some time it must come to an end. That end is *Nirwana*, the end of successive existences, that state which has no relation to matter, or space, or time. It is the supreme end: nonentity. The attaining of this is the object to which we ought to aspire, and for that purpose the character must be purged of self-interest, cravings and vanities—not by penance and prayers, not by asceticism and self-mortification—but by turning the mind away from its own self to the happiness and welfare of others. That is to say, the mind should be so disciplined and trained as to keep the lower motives overshadowed and subdued by the higher. Buddhism was to teach men how to escape the miseries of life by the destruction of desire. Among these desires is the wish for continued existence. This also must be destroyed. The object being to produce perfect peace by the destruction of all desire, the remedy must be found in knowledge, which is the Buddhist way of salvation. Buddha tried and found mortification insufficient. His great discovery was that salvation came through knowledge, knowledge of the laws of being. This cannot come by reasoning or philosophy, but by an interior insight.

Originally Buddhism was simple, ethical, rational, benevolent and humane in the highest degree. It did away with priestly tyranny, with the institution of castes, with polygamy, condemned slavery, and declared woman man's equal. All bloodshed, whether with the knife of the priest or the sword of the conqueror, was rigidly forbidden. For the first time in the history of mankind, the awakening of the spiritual life of the individual was substituted for religion by body corporate. It called all men, without any distinction of quality or position, in its fold, opening to all the way of salvation, which it taught to be obtainable by purity of conduct. "There is but one law for all: severe punishment for crime, and great reward for virtue." To love even our enemies; to offer our lives for animals; to abstain even from defensive warfare; to gain the greatest of victories by conquering oneself; to avoid all vices; to practise humility and mildness; to be obedient to superiors; to cherish and respect parents, old age, learning, virtuous and holy men; to provide food, shelter, and comfort for men and animals—such are some of the moral duties of Buddhists. No religion is despised by them; hence they never waged war against dissenters.

Buddhism was a reaction against the sacerdotalism and ritualism of Brahmanism. It rejected the whole system of caste and salvation by a priesthood. It taught, as Luther taught, salvation by faith. It made all men equal before God. Its ritual came later, after its early energy of faith had begun to decay. For as spiritualism goes out, forms come in.

Some see resemblances between Buddhism and mediæval Christianity. We find, in both, monks living in monasteries, mendicant orders taking the three vows of poverty, chastity, and obedience, going about begging, with bare feet, shaven crowns, and a rope round the body. We find bells, images, and holy water, a service in a dead language, choirs, priests, processions and incense, abbots, monks and nuns, the worship of saints and angels, confession, fasts and purgatory, reverence for a divine mother and child, relic worship, pilgrimages to the shrines of saints, and even a pope in each, with his triple tiara.

PERSIAN RELIGION

ZOROASTER, or Zarathustra, probably 1200 B.C., was the founder, or at least the reformer, of the Magian religion, and one of the greatest teachers of the East.

The beliefs recorded in the Zend-Avesta, the sacred books, approximate to the Indian theories. The Zoroastrian system recognises **one God, omnipotent, invisible, without form,** the Creator, Ruler, and Preserver of the Universe, and the last Judge. **The worship of idols is held in abomination** ; but a reverence for fire and the sun is inculcated, as they are emblems of the glory of the Supreme Deity. **This life-giving Sun-god was regarded as the source of all earthly existence.** It is he that each morning brings back new life and activity to a world that lay buried in the silence of the night. It is he that every spring calls up the dead vegetation out of its cold grave in the joyful Easter of nature. It is he that bestows on the sons of men the genial warmth and health and food which saves them from perishing. The assertion of one Supreme Being is, however, qualified by the recognition of an opposing principle, this dualism resulting probably from the consciousness of inner conflict in the individual soul. Ahura Mazda, or *Ormuzd,* the "Lord All-knowing," the spirit of all knowledge, the creator of righteousness, spreads light and is the principle of good ; and *Ahriman,* the demon of darkness, is the principle of evil. The former made a resplendent and happy world ; the latter made deformity, discord, impurity and gloom. The Supreme Being was worshipped by one symbol—fire—which is pure and purifies all things. The priest chanted the litany thus : "I invoke and celebrate Ahura Mazda, brilliant, greatest, best. All-perfect, all-powerful, all-wise, all-beautiful, only source of knowledge and happiness ; he has granted us, he has formed us, he sustains us."

The **fate of the soul** depends upon its character. "Heaven was destined for man upon condition that he was humble of heart, obedient to the law, and pure in thought, word and deed." But "by believing the lies of Ahriman they became sinners, and their souls must remain in the nether kingdom until the resurrection of their bodies."

The good soul remains three nights seated by the head of the dead man ; on the morning of the fourth day it seems to be in a place of fairest plants and scents, inhaling sweet-scented wind ; there comes to it a maiden of exceeding great beauty, which is the man's conscience. Then the soul takes its way, first to the Good-Thought Paradise, then to the Good-Word Paradise, and so finally to endless Light. The fate of the evil soul is the reverse, ending in eternal darkness.

No other faith seems so close to that of the Old and New Testaments as that of Zoroaster in the **simplicity of its worship** (without temples, without altars) and abhorrence of idolatry, as well as in the purity of its ethical system, with its earnest insistence on "pure thoughts, pure words, pure deeds" as the essentials of religion. Prayer, obedience, industry, honesty, hospitality, alms-deeds, chastity, and truthfulness are enjoined ; and envy, hatred, quarrelling, anger, revenge, and polygamy are strictly forbidden.

Herodotus tells us that the Persians regarded lying as the worst possible offence, and next to it falling into debt, since the debtor is tempted to tell lies. The Persian religion was essentially moral, not by a struggle for right against wrong, but by simple obedience to the natural law.

There are some resemblances to the Christian beliefs. Thus : To Zarathustra shall one day be born at the end of time a son supernaturally begotten. A virgin-mother shall give him birth. This Saviour shall come from the distant East, the fountain and abode of light. He shall act as mediator between his Father, the supreme God, and his creatures, whom he compassionates in their miseries and heals of their diseases. One of the sects of the Magi, the priests of Persia, believed in a revelation made by God to the first man, called Gayomart by the Parsees.

The treatment of the sick consisted, from the Zoroastrian standpoint, in the casting out of the demons of disease by prayers and spells, in purification, and

laying on of the hands of the priests. Witchcraft, as practised by the Babylonians, was prohibited.

MITHRAISM

Persia was the original home of the worship of Mithra, who was regarded as an emanation of Ahura Mazda (Ormuzd) 300 B.C. Mithra was held to be the mediator between God and man, who ensured the happiness of mankind by a sacrifice. His worship comprised baptism, communion and fasts. His adherents were called brethren, and among the Mithraic clergy there were men and women vowed to celibacy. The Mithraic moral code was severe. The worship spread to India, and under Pompeius was introduced into Rome and became popular under Trajan and Domitian. This Western Mithraism, with its expiation of sin, its eschatology and sacraments, became the **great rival of Christianity** and was a complex religion in which the worship of a God of light was united with Chaldean magic, Egyptian rituals, and Greek theories of transmigration.

The fundamental belief of Mithraism was immortality. This implies a severance of soul from body ; for the body is mortal. From that follows the idea of spiritual purity. The soul is regarded as one, but yet in life often divided against itself. It requires both a process and an agency to restore the desired unity, and these are found in ritual and in a mediator who can bring about the reconciliation of the imperfect with perfection. The mediator is a spiritual power, Mithra, standing between man and the highest spirit.

The significant feature of this doctrine is the emphasis laid on the idea of spiritual as opposed to material values. There is at last a recognition of the fact that **God must be a Spirit and must be worshipped in spirit.** The doctrine was not far from the idea of a material union with the Highest Being, expressed in the ritual by admitting the devotee to a sacrament in which the elements, bread with water and wine, were the means by which the nature of God was transferred to the individual. From obscure origins a progressive refinement led to the idea of union with the dead through taking part in a sacrificial feast, and later to a less crude ritual whose object was a sense of unity with the God awakened by symbolic " elements." Finally, Mithraism diverged from the Indian line of development by absorbing an astrological ritual. The soul, instead of merely realising higher degrees of purity, was represented as ascending the path that leads to the sun or descending from the sun to a corporeal life.

CHINESE RELIGION

Authentic records of Chinese history extend back to 2357 B.C., while the Chinese philosophy originated with FUH-HE, who lived about 3327 B.C. He originated the Chinese writing.

In the old Chinese Empire, about the twelfth century B.C., we find a purified and organised worship of spirits, with a predominant fetishist tendency. The sole objects of worship are the spirits, which are divided into heavenly, earthly, and human, and are closely connected with the objects of nature. Heaven is called the supreme emperor, and all spirits are his servants, so that there are no essentially evil spirits, which belief notes a decided advance. There was no priestly caste. Worship was entirely a civil function.

The Chinese believed that **the disembodied entity mingled with the souls of his forefathers, and formed with them a collective soul representative of the family.** This soul remained in the closest possible union with its offshoots, enjoying terrestrial life, and owed its very existence to their uninterrupted offerings ; hence deprivation of burial has always been viewed in China as the height of misfortune, and seeing that all happiness beyond the tomb hinges upon the perpetuation of the family, the

paramount question is to leave sons behind. The father of the family is sovereign lord of man and property; at the same time he is responsible for the acts of all his forefathers. This **ancestor worship** was the typical characteristic of the Chinese social system.

KUNG-FU-TSZE or Confucius (551-479 B.C.), who is said to have originated this ancestor-worship, was a great philosopher and edited the whole of the ancient literature of China which has come down to posterity. The religious doctrine of Confucius is ethical naturalism, founded on the State religion of the Tshow, and recorded in a Scripture of the twelfth century. He held that the actions of men help to determine their destiny. To prayer he ascribed no great value, and he did not believe in direct revelation. He is still to the Chinese the unquestioned Master. His teaching served chiefly social ends. He refrained from laying down any metaphysical theory as to the nature of the human soul. Indeed, he warns his disciples to avoid philosophical speculations, which vex the spirit and disturb social order.

LAO-TSZE (604-517 B.C.), the founder of Tâo—which has been interpreted as primordial reason, and Teh, as the creative activity—was a contemporary of Confucius. It was he who introduced lofty metaphysical speculations into China analogous to those promulgated about the same time by Pythagoras in Greece and Sakyamuni in India. His doctrine led to mystic reflection and contemplative life. To withdraw entirely into himself and free himself from the constraints of sense is the method to exercise a blessed power. To gain long life and immortality by means of self-chastisement and prayer, as well as by the use of certain charms, is the highest endeavour. Lâo-Tsze distinguished opposite elements in the human soul, one spiritual and the other semi-material. The spiritual or intellectual soul, divine in its essence, can move anywhere and does not perish. It is an emanation of Tâo, to which it returns after death. It is united to the semi-material, sentient, or vital soul, and between them they animate the human body. Lâo-Tsze makes no explicit statement as to the survival of consciousness, but he teaches metempsychosis, which implies personal responsibility beyond the grave.

The Chinese religion knows no revelation, no miracles, no divine interferences. The worship of the "spirits" is a primary religious duty for the Chinaman. They form a collective body; they are all good, scarcely any evil spirits. **There is no heaven, no hell.** Therefore the sacrifices are not of the nature of propitiation, but expressions of gratitude and devotion. There is no self-humiliation and confession; but only thanksgivings and petitions. There is no special class to attend to religion; it is the natural duty of each man. The worship of ancestors is assigned to the private individual. It is the continuance of the family rather than of the person that is thought of.

SHEN NUNG (2733-2697 B.C.) is generally regarded as the founder of medicine in China; but the oldest work on this subject, still preserved and in use, entitled *Nei-King*, originated with the Emperor HWANG-TI (2698-2599 B.C.). The anatomical knowledge of the Chinese was very limited. Dissections were not allowed, owing to the worship of ancestors and the Buddhistic religious conception that every man should appear in the other world as he was on earth. Therefore no mutilation of the body was permitted. For this reason also, next to nothing was known in China of the brain and nervous system. The brain was supposed to occupy only part of the cranial cavity and to serve as instrument for the five senses. Surgery, too, was very backward. Pharmacology, however, was well advanced, and contained more remedies than that of any other race.

THE ANCIENT MEXICAN (AZTEC) RELIGION

The religious state of ancient Mexico was similar to that of Europe and Asia. The worship was an imposing ceremonial. The common people had a mythology of many gods, but **the higher classes were strictly Unitarian, acknowledging one**

almighty, invisible Creator. Of the popular deities, the god of war was the chief. He was born of a virgin and conceived by mysterious conception. The priests heard confession and gave absolution. They administered a rite of baptism to infants for the purpose of washing away their sins, and taught that there are rewards and punishments in a life to come—a paradise for the good, a hell of darkness for the wicked. It was the received doctrine that men do not sin of their own free will, but because they are impelled thereto by planetary influences. The Mexicans made awful sacrifices to their gods of their captives. Yet this frightful system was bound up with an ascetic sexual morality and an emphatic humanitarian doctrine. The priests lived in strict celibacy; and they educated children with the greatest vigilance in their temple schools and higher colleges. They taught the people to be peaceful, to bear injuries with meekness, to rely on God's mercy and not on their own merits, and exhorted men to feed the poor. A vast amount of land was annexed to the magnificent temples for the support of the priesthood; so much so as to impoverish the empire.

At the conquest, the Mexican calendar was in a better condition than the Spanish. They had sun-dials for determining the hour, and also instruments to determine the solstices and equinoxes. They had ascertained the globular form of the earth and the obliquity of the ecliptic. Their agriculture was superior to that of Europe. There was nothing in the Old World to compare with their menageries and botanical gardens. Their writing was on cotton or skins, or on papyrus. Immense collections of their literature were burnt by the first Archbishop of Mexico.

ANCIENT PERU

In Peru, where the civilisation was higher and the priesthood less powerful, the sacrificial system was less burdensome and less terrible. The Peruvian religion ostensibly consisted of a worship of the Sun; but the higher classes, when Peru was discovered, had already become emancipated from such material association, and **recognised the existence of an almighty, invisible God.** The Peruvians expected the resurrection of the body and the continuance of the soul in a future life. It was their belief that in the world to come our occupations will resemble those we have followed here. They taught that the reprobates were sentenced to a hell situated in the centre of the earth, where they would endure centuries of toil and anguish. Their paradise was away in the blue dome of heaven. There the spirits of the worthy would lead a life of tranquil luxury. Like the Egyptians, the Peruvians practised embalming.

THE EARLY GREEKS

In the legendary tales of their early poets—Orpheus (XIVth century B.C.), Homer (962-927 B.C.), Hesiod (859-824 B.C.)—we find the Greeks worshipping the personified powers and objects of nature. **The world is peopled by gods, goddesses, and heroes.** These divine beings ruled over the earth, the sea, and the underworld; they presided over every aspect, not only of human life, but of all external nature. Hence not only were the dwellings of men under their protection, but mountains, valleys, meadows, groves and springs were animated by their presence: and the storm, the sunshine, shipwreck, plague, blight, sickness, victory, defeat—**every phenomenon was due to the direct intervention of supernatural powers.** The warrior marching to the field of battle commended himself to the God who would protect his own. The husbandman ploughed his field trusting that the goddess who had taught men how to plough and sow would grant a plenteous harvest. Without the blessing of the gods no seaman could hope for a lucky voyage, the poet's inspiration to song

and solemn ode was a divine gift, and so was the skill of the plastic artist. Apart from the favour of the Immortals the pleasures of the social feast and sport would not exist, therefore a prayer and libation of wine always began the banquet.

The Greeks had no revealer, no sacred book, no theology. The poets were the theologians; they presented a naturalism so gross and crude that it proved an easy prey to the critical shafts of developing reflection. The Greek gods were not only human, but terribly human—capricious—occupied with loves and hatreds, feastings and jests, wars, contrivances, jealousies and deceptions. They were divine men and women, living only a little way off, on the summit of Olympos. They were in no sense supernatural, and interfered but seldom in human affairs.

The gods, as well as men, were **developments from chaos.** Zeus, who presided over the other gods at Olympos, was not the creator of the world, though he was the supreme ruler, whose power was unlimited. Connected with him was Athena, the personified "wisdom," and Apollo, his son, the revealer of his counsel. The divine will was made known by personal revelation, by miracles and signs, or by inspiration and dreams, but most clearly of all by works. At Delphi was the famous oracle, without whose consultation no important undertaking was commenced. The gods would deliver messages and give oracular answers as to the prospects of undertakings through persons inspired by the divine spirit—persons in a trance, hysterical and epileptic persons; just as in modern times many people believe that a "medium" can tell their future and transmit messages from the dead. About the VIth century B.C., the influence exercised for three hundred years by Delphi began to decline, the oracle failed, and began to be despised. But the national religion still survived.

There was no organised priesthood; consequently there were no hard and fast religious dogmas. There were only rites—external acts—which entered into the life of the citizen. There was an attempt at religious organisation in the mysteries of Orpheus and the Pythagorean brotherhood, which led to nothing.

The idea of the Orphic and similar mysteries, to which admission was granted only after rites of purification, when the truths were revealed by signs and symbols, seems to have been the uniting of men and women for secret worship, and for the hearing of certain great truths symbolically taught, which had been handed down by Egyptian priests and others among the initiated. Thus were carried down the beliefs in the unity of God, the immortality of the soul, and a coming moral judgment, from Egyptian thinkers through these secret associations to the early and later Greeks. In Æschylos, Zeus is all-causing, all-sufficing, all-mighty, all-seeing, all-accomplishing, Lord of Lords, most holy of holies, the great father of gods and men.

PINDAR (522-443 B.C.), who was initiated into the Eleusinian mysteries, made his songs the vehicle of the most elevated religious thought. Comedy and tragedy developed through him, and Æschylos and Sophocles, and became the means of bringing forth in living forms to general view the kernel of religious truth hidden in the mythologic shell. The spirit promoted by poetry was fostered also by sculpture. Statues were designed to furnish a purer idea of the deities. Ultimately neither poets nor sculptors could arrest the decline of Hellenic religion. The boldness of philosophic speculation questioned the personality of the gods, the mythical element was gradually eliminated, and the high intelligence of the Greeks was free to work out a truly scientific philosophy of nature.

The Greeks of the Homeric age, about 950 B.C., believed in a **ghost soul,** which enjoyed all the powers, both bodily and mental, of the living man, and differed from the man chiefly in being less substantial and less strictly subject to limitations of time and space; but the ghost soul of the Homeric Greeks was not conceived as the bearer of the mental faculties, or at least as not enjoying the whole of the mental

faculties of the living man. It was rather a shadowy image, which was exhaled with the dying breath or issued through a warrior's wound. It was material, but of thin contexture, retaining the shape man had in life, and gliding along like a shadow. And this shadow or shade, descending to Hades, which was supposed to be an immense subterranean cavern, enjoyed but the shadow of its former life and powers. The souls congregated there were disconsolate in their dismal realm, but this banishment was their natural destiny, and not an avenging judgment. The shades, once banished to Hades, were strictly imprisoned there; and thus the Homeric world was freed from the terror of ghosts that has haunted other peoples. And the cult of the dead had no recognised place in that world; for the dead were incapable of influencing the living for good or ill. The strength and will, the intellect and mental powers in general, were supposed to be dissolved or annihilated at the death of the body. **Disembodied minds were unknown to the Greeks** of this age; even their gods lived upon the earth, and were fully incarnate in bodies which differed from those of men only in this respect, that they were subject to neither disease nor death. The continuance of the ghost-soul in Hades did not constitute a survival of personality, for to the Greeks of this age the body was an essential part of personality. Nevertheless, there appears in Homer the belief in the **immortality of a favoured few.** This immortality was not an immortality of the soul alone, but rather of the whole person, who was conceived as transported bodily by the favour of some divinity to "the isles of the blest," or to the "Elysian Fields," a distant region first located at the margin of the earth, where the sun sets at eve, afterwards in an underworld.

The Homeric beliefs continued to be generally held up to the VIth century B.C. Then a new class of immortals arose, men who, by the power of some god, did not die but were engulfed in some deep chasm or cave, and these heroes became in many cases the centres of local cults. It was probably under the influence of this belief and of these cults that the pre-Homeric belief in the survival of the personality after death was revived. Hesiod's doctrine of the Golden Age was that, though these men had died, their souls were raised to a life even fuller and richer than they had enjoyed in the body; and these souls, partaking of the immortal nature of the gods, were regarded by him as wandering invisible among men, seeing their good and their evil deeds.

Gradually a doctrine developed that *the wicked must be punished.* The bad souls were hurled headlong down into Tartarus. In the various myths and legends we see that certain great evil-doers are condemned to an unlimited expiation, and are compelled to renew some useless, fruitless toil; for example, the Danaides filling a leaking cask. The souls which are to return to earth pass the river Lethe, drinking its waters of forgetfulness, and thus becoming oblivious of their former existence. At first a few select ones, the favourites of the gods—and later all the good souls—were rewarded by being sent to the Elysian Fields in the underworld. Thus we find first all the dead fluttering through the neutral melancholy of Hades without discrimination, and finally we discern a sad middle region, with a Paradise on the right and a Tartarus or hell on the left, the whole presided over by three incorruptible judges, who appointed the new-comers their places in accordance with their deserts.

A belief in the immortality of the soul first appeared in Greece with the Dionysian cult, whose central feature was a mystic union of the worshipper with the god. From Thrace this cult spread throughout all Greece, fusing with the cult of Apollo. Under its influence the populace became familiar with the notion that the soul, with all the mental faculties, is separable from the body; and under the same influence there sprang up the belief that the soul is formed for a higher destiny than its life in the body, that it is clogged and held down by its association with the body, and that it must be freed from that degrading influence by purificatory and ascetic

rites. In the Orphic cult these ideas were further developed, until the soul was regarded as having its true life among the gods, its life in the body being a temporary banishment from this true or higher life. The soul at death goes to judgment in the under-world. Thence it returns to be re-incarnated again and again, until it is wholly purified, when it is set free to live for ever with the gods.

In post-Homeric Greece, the soul of the dead hero was believed to hover in the neighbourhood of the tomb, and since it was held that the surviving souls could affect the welfare of men, especially of their own descendants, they became the objects of local and family cults. The notion of survival, limited to a semi-material shade haunting the neighbourhood of the corpse, was bound up in the Greek mind with the hope of a future resurrection of man in his physical entirety. Hence those who descended into Hades had no difficulty in recognising their former friends. Not only had the corporeal aspect been retained, but even the customary raiment.

It appears that the early Greeks believed man to be made up of three parts : a living spirit or soul, a spiritual body or idol, and an earthly body or investing frame, with its organs of mind.

The Iliad opens with the declaration of " the deep resentment of Achilles precipitating the valiant *spirits* of heroic men down to the place of darkness ; but *themselves* (that is, their mortal frames) it made the dogs' and vultures' booty." And again, in the 23rd Book, Achilles having failed to embrace the ghost of Patroclus, which had just been reasoning with him, says :

" Ye powers ! surely then in Pluto's house
There dwell a certain *spirit* and a *shade*,
But nought substance." (Phrenos, the substantial organ of mind, on earth.)

THE EARLY ROMANS

The Romans had no mythology of their own, nor were their deities conceived as beings like men. Their conceptions were always subject to foreign influences, originally to those of the Etruscans and Greeks, later to the people they conquered.

Zeus became Jupiter, the best and greatest of beings, the father of gods and men, the all-powerful, the king of all kings, the progenitor and producer of all, the god of gods, the one and all ; the Greek goddess Athena became Minerva, Hermes became Mercurius, Poseidon became Neptunus, Aphrodite became Venus, and Mars the god of war, etc. Spirits were innumerable ; every man and every woman, every object, every action, every moral quality had its own spirit. The Lares, similar to the Greek heroes, were worshipped, at first at least, in private ; the Penares, or hearth-spirits, received public adoration ; the Manes, the souls of the dead, at first pure, became later evil spirits.

The gods, which the Romans worshipped, had a somewhat nebulous existence, and were not so much persons as abstractions. They had no human heart, with its virtues and vices ; they were colourless, cold conceptions, each with its own functional activity, corresponding to the daily work of his worshippers, but without influence upon conduct and morality. What the Roman deities really represented was not the experiences of an inner life, but the experience of the Roman agriculturist, warrior, or citizen in his struggle for existence.

The gods were believed constantly to make signs for the guidance of men, and special knowledge was required for their interpretation. These augurs were consulted on every undertaking. The administration of religion was a part of the civil administration. The priests were no special caste, but ordinary men, without special qualification, chosen by the State. They were not mediators, but saw to the ritual. The fulfilment of the outward signs of religion was considered more important than faith and devotion.

The Romans never claimed that their religion was perfect or the only true one. They were tolerant of other religions, so long as they did not offend against civil order, and—as mentioned—often adopted the new ideas. In course of time, the State religion, undermined by philosophy, fell more and more into decline. First there was incredulity and then superstition.

To the Romans, who may be said to have held that there are three souls, death was produced by their separation from the body. The first, the breath the *spiritus*, mounting towards celestial regions ; the second, the *shade*, remaining on the surface of the earth and wandering around the tombs ; the third, the *manes*, descending to the lower regions. The Romans, though they appear to have believed in immortality, seem never to have set store by the idea of personal survival, and few of them endeavoured to rise above the primitive conception of the collective existence of impersonal souls. The notion of **conscious immortality was to Roman philosophers a matter for dubious discussions,** and they rigidly held aloof from metaphysical speculations. " The fear of eternal life," says LUCRETIUS (99-55 B.C.), " should be banished from the universe ; it troubles the peace of mankind, for it prevents the enjoyment of any security or pleasure." (See also Chapter III.)

THE GAULS

The thought of a future existence and of the **transmigration of souls** permeated the life of the Gauls throughout and governed their actions, inspiring them with bravery and contempt for death. They believed that man's immaterial part was a divine emanation, which animated inferior forms of life, first plants and then animals, before being admitted to liberty and transmigration to worlds of trial and atonement peopled by mankind, of which worlds the earth was one. After many transmigrations the soul on its progress towards perfection passed on to higher spheres and ultimately to the circle of the infinite, belonging to God alone. As with the Pythagoreans, the moon was regarded as a sort of half-way Paradise, before the souls reached the sun, which was the real and lasting Paradise. The soul never returns to inferior forms, as is so common in other theories of metempsychosis.

There can be little doubt that the Druids, the priests of Gaul, who had attained to this conception of inhabited worlds, must have possessed profound astronomical knowledge, as indeed Cæsar claimed for them. It is said they knew that the world moves in the universe, of which it does not occupy the centre. The Druids became ready converts to Christianity, but in Gaul, as elsewhere where Gauls had settled, some of the old traditions persisted for a considerable time together with the new faith.

THE WENDS AND LETTO-SLAVS

The Letto-Slavs, peopling Eastern Europe and especially North-Eastern Europe, had a mythological religion, resting on the **doctrine of spirits.** The spirits were divided into spirits of the house, the water, the forest, and the air. The house-spirit watched over and protected the house and its inhabitants, not excluding the animals, sharing all their fortunes. When angry, he could be appeased ; but, when neglected, he could show himself as a spirit of might. Similarly, the other spirits had beneficent and destructive power. It was an animistic doctrine, but clothed in poetical guise. Besides these spirits there were real deities worshipped : the thunder-god, the sun-god, and the god of the underworld. There were also fire-gods and other divine beings, such as the spirit of life, the gods of light and darkness. The Letto-Slavs believed in magic and spells. They had **neither temples nor priests ;** nothing but sacred places and wise men and women.

They disposed of their dead in three ways: (1) by burial, which carried the soul to the underworld; (2) by burning, which bore the soul in the smoke to heaven; (3) by burial or burning in a boat, which transported it to the island of the sun. The soul remained for a while after death in the neighbourhood of the body, then set off on a journey to shadowland, which was sought either in the underworld, or on a happy island in the East, the abode of the sun, or in the sky. The journey was thus a long one, and the survivors were careful to provide the dead with what they would require on their expedition. The idea of retribution had not yet arisen; the life after death was simply a continuation of the life on earth. The souls of the deceased continued in relation with the living, and as their return was dreaded, feasts and sacrifices were celebrated to appease them.

THE TEUTONS

Our knowledge of the Teuton religion is derived from the Eddas, of which the older contains a collection of mythological songs, and the younger is composed chiefly of prose traditions. According to CÆSAR (100-44 B.C.), the Teutons worshipped the sun, Vulcan, and the moon. TACITUS (55-120 A.D.) mentions also other gods.

Wotan was originally a nature-god, the personification of the violent movements of the air, the storm god, a war-like patron of heroes, whom he gathers after their death into his Walhalla; finally he rose to be the supreme Lord of the world. There was Thor, the thundering god, and as such the summer-god, who protects agriculture and is the god of the people. Another god of the air was Loki, also fire-god. These three gods fought together against the winter-giants. Loki gradually became an evil being, a sort of Lucifer, dangerous and treacherous, and was finally thrust out. The struggle between the gods with Loki and the giants is dramatic.

The Teutons worshipped in sacred groves of their big forests. Their priests were not a caste like the Druids. They belonged to the nobility and acted as judges as well. Magic was general.

CHAPTER II

EARLY GREEK PHILOSOPHY

In the early Greek ages the priests were the learned men. The first man to lay aside the priestly character and to make a systematic attempt to account for the universe by philosophy rather than by the conflicting wills of the gods is said to have been

THALES of Miletus (*ca.* 624-548 B.C.).

He taught that **water** (moisture or fluidity) was the fundamental element of all things. All life, animal and vegetable, depends upon this element; all nourishment is moist, heat is generated from moisture, and life is sustained by heat. He predicted an eclipse of the sun which actually took place in the year 585 B.C.

"All living beings are aquatic," said CLAUDE BERNARD. "Beings that live in the air are in reality wandering aquariums," said another physiologist. "No moisture, no life," wrote PREYER. The environment must contain water in certain proportions. In the higher animals there is a mechanism which works automatically to keep at a constant level the quantity of water in the blood.

ANAXIMANDER (*ca.* 611-547 B.C.),

the pupil of Thales, taught that the primary substance whence all things arise is not water, nor, indeed, any form of matter known to us, but an **infinite** something without limit in space or time. Out of this all the worlds are evolved by a necessary process of succession, and into it they return when their fated term of existence is completed. Thus, not only the great thought of the original unity of the cosmos and the development of all phenomena out of the all-pervading primitive matter found expression in Anaximander, but he even enunciated the bold idea of countless worlds in a periodic alternation of birth and death. He considered animals were originally developed from aquatic or fish-like creatures, and that man was born from animals of a different species. His reason for insisting that man had not originally the form he now has shows some acuteness, for "while other animals quickly find food for themselves, man alone requires a long period for suckling; hence he could never have survived had he been originally as he now is."

Anaximander is the inventor of the sun-dial. We are also told that he made the first map, and that he conceived the earth as hanging unsupported in space. Thales had conceived it as a flat disc floating on the water.

ANAXIMENES (*ca.* 560-500 B.C.),

the successor of Anaximander, probably recognising that respiration maintains life, taught that **air** (ether) having the property of infinity was the fundamental principle of existence, the substance out of which all things were made, the animating soul of

man, the support of animal life, and the great conservative force of nature; and in his view, heat and cold, like the solid, liquid, and gaseous states of matter, were all merely so many products of rarefaction and condensation. That water is generated from it we see by the raindrops that come from the clouds and form springs, rivers, and ultimately the sea. Even the soul is but air, since life consists in inhaling and exhaling it, and ceases as soon as that process stops. Anaximenes thus came very near to recognising that oxygen (which was discovered two thousand years later) is needed for life. The earth and the heavenly bodies he considered to be flat and supported by air.

XENOPHANES, of Colophon (*ca.* 575-480 B.C.),

maintained that the primordial element, conceived by Thales as water, and by Anaximenes as air, was **earth**; and this he described as extending downwards to infinity. He attributed omnipotence and omniscience to the material world. He was the first thinker who raised the conception of God to a philosophic plane. If God is the most powerful of beings, he must be One, eternal, and possess omnipotence of mind. He ridiculed the polytheistic anthropomorphism; he resented the ascription of human passions to the gods. Men, he said, make gods in their own image.

"Negroes imagine them as black and with flattened noses; the Thracians, with blue eyes and red hair; if horses and oxen had hands, and could paint and produce works of art as men do, horses would paint the forms of the gods like horses, and oxen like oxen. . . . There is one God, the greatest among gods and men, comparable to mortals neither in form nor thought."

PYTHAGORAS (*ca.* 582-500 B.C.)

had travelled extensively through the then civilised world and was well acquainted with the philosophy of ancient Egypt and the religion of Babylon. For him nature obeys and reflects the laws of **number.** The world becomes an ordered cosmos; its unity is seen in its numerical relations. The essence of things consists in the numbers which express them; the numbers, therefore, are themselves essences. Unity is the symbol of perfection, the first cause of all things, God himself. The animal soul is an emanation from an *anima mundi*, and consists of the intellect, the reason, and the soul proper. God is the soul universal, light of lights, author of Himself. Between the two exists a gradation of higher or lower beings. Man is the lowest of the higher and the highest of the lower beings.

The soul was distinguished from the body as something opposed to nature, rather than a part of it. Even during its sojourn in the body it has no organic relation to it, but maintains uncontaminated its peculiar nature. It does not constitute the personality of man, for any soul may inhabit any body; and after death it tarries in Hades, whence it returns again and again to earth, seeking each time a new body for its abode. So it wanders during long ages, inhabiting in turn many human and animal bodies; its fate at each incarnation being determined by its actions during its preceding periods of embodied life, rising or falling in the scale of existence as each earthly life has or has not been spent in accordance with the law of purity. When it has reached perfection, the discarnate soul is replaced in its astral surroundings and permitted to enjoy the view of that luminous world which is hidden from it entirely during the life of the body. It is by this old Oriental doctrine of **metempsychosis** and **re-incarnation** that Pythagoras explains the inequality of human conditions with its apparent injustices and the mystery of the existence of good and evil.

His doctrine was that animals having been made out of a fermenting mass of matter, by the Soul of the Universe or Supreme Deity, received a vivifying animal principle, or *psyche*, from the Eternal Soul; that this psyche constituted the souls of all living creatures, which were, consequently, in so far, eternal; that a period of union between an earthly body and this spiritual essence constituted animal life; that when the earthly body died, the soul, incapable of death, and yet destined solely for the sphere of earth, was, of necessity, compelled to take up its abode in some other animal body upon earth, and this fortuitously, brute or man. For as facile wax will yield to various impressions, and yet remain the same wax, so the never-dying soul is accommodated to the impressions or necessities of various bodies, and is yet for ever the same soul.

He believed that mankind had always existed, because there never could have been a beginning of things, relying on the scholastic argument that no bird could be born without an egg, and no egg without a bird.

The soul is the numerical harmony of the body, as the world-soul from which it arises is the harmony of the cosmos. According to some authorities, Pythagoras divided the soul into two portions: the rational and the irrational; the former having its seat in the brain, the latter in the heart. Others say he considered the soul as being triple in its essence; *instinctive* in so far as it felt the necessities of material life and the physical world; *animic*, in so far as it was sensitive to the various emotions of affection, hatred, or the passions; and *intellectual*, in so far as it rose to the comprehension of divine laws. These three elements are united into one whole constituting the human soul, which is itself governed by the personal ego, volition.

The subtle element constituting the spirit-envelope in man is a particle drawn from that imponderable fluid filling the entire universe. This etheric fluid is a kind of living and plastic substance permeating all visible objects, and the generator of form and condition. It is the great intermediary between spirit and matter. It may occasionally, especially during sleep, detach itself from the physical body, and thus enter into communication with the universal ether. Thus it was that Pythagoras explained the phenomena of somnambulism, trance, clairvoyance, and prescience of the future, as manifested by the Pythia at Delphi, when uttering the oracles of Apollo.

Pythagoras taught that human life is in God's hands; consequently he condemned suicide as an act of iniquity. But it was not by describing its delights that he sought to reconcile man to life; on the contrary, he maintained that it would be well for the soul to be delivered from the prison house of the body, but she must respect God's commands, and remain on earth to expiate the sins of a former life. It would seem that for him the renunciation of happiness was the necessary condition of virtue, for there appears in his school for the first time the great conception of **asceticism,** which, broadly speaking, consists in sacrificing the natural to the moral.

As a corollary to his notion of number, Pythagoras held the theory of the **opposites** (odd and even, the one and many, right and left, light and darkness, good and evil, health and sickness). Bodily health means harmony, disease means discord. He did a great service to mankind in teaching that disease is of earthly origin and not an affliction brought about by irate gods. He thus made study and rational treatment possible. His principle was, however, less to cure disease than to remain healthy, and to that end was drawn up a careful programme for the daily life. He promoted health mainly by diet and gymnastics, advised music for depression of spirits, and had in use various vegetable drugs. Most noteworthy of all, he included mental affections with the other diseases of mankind, denying their assumed divine significance. Holding such opinions, it is not surprising that he was driven from Athens.

The school of Pythagoras disappeared from history soon after Plato's time, and was revived two centuries later—Neo-Pythagoreans—and became one of the most effective agencies by which the doctrine of immortality was diffused throughout the Roman Empire in association with a severe moral code, thus serving as one of the channels by which Platonism led into Christianity.

HERACLEITOS, of Ephesos (535-475 B.C.),

held that not rest but motion, not permanence but change, is the key to nature and to life. The endless **flux** is a struggle between contrasts. Wisdom is not so much a knowledge of many things as a perception of the underlying unity of warring opposites. Even man's nature consists of opposites, and ethical conduct is based upon it. "Without injustice there could be no justice."

To account for this endless "becoming" and transformation he sought out a new primary element, which like the previous three—water, air, and earth—is of vast extent in its diffusion and necessary to the support of life, namely, **fire.** It was the world-soul. Through the breath, the soul of man partakes of the eternal living fire, which is the basis of all things. Vital warmth maintains life. But by fire he does not mean "flame"; he expressly excludes it, so that we must assume he meant heat or combustion. Living beings require a certain amount of heat. Life, which could not have existed on the globe when it was incandescent, will not be able to exist when it is frozen.

Another idea of his philosophy is the idea of universal law and order. He held that "all human laws draw their sustenance from the one divine law." God is the omnipresent wisdom or Reason by which all lives are animated or diverted. "The one is all and all is one." The human soul, such as is endowed with reason, is an emanation from the universal mind; but it is united with an animal nature, in common with the inferior orders of creation. Man breathes the universal soul or mind, and readily unites with creative intelligence, in a state of waking; sleep being an immediate and temporary suspension of this communication.

Reason (meaning sentiency or consciousness), according to Heracleitos, has an independent existence in the universe. It enters into man from without just as does the air he breathes or the sensation he obtains. Sensation is the passage of something from the outside to the inside of us. It comes into us when we are awake, because the channels are then open, and in sleep the sensations cease because the paths are then closed. Sensation is made to depend on motion, and requires "opposition," so that like does not perceive like.

PARMENIDES, of Elea (540 -B.C.),

clothed his speculations in verse. To him the whole of being is one uniform, unchangeable, limited, luminous sphere, without parts, without a beginning, and without an end. He tells us that only what *is* can be conceived or even spoken of; the non-existent is also the unthinkable. Moreover, what is can never not have been, can never cease to be; in modern language: **matter and force are indestructible.** Mind is the material composition of the body; and the activities of mind, the thoughts, vary in relation to the different constitutions of men. Death is not the end of sensibility for matter, but only the cessation of the individual's sensations.

He described the earth as a perfect sphere, extending equally in all directions from a central point. He is also known for his embryological speculations.

ZENO, of Elea (*ca.* 490-430 B.C.),

like his master Parmenides, denied the reality of motion. The world principle

being one, the multiplicity of things could be due to appearance only, *i.e.*, due to the deception of the senses.

EMPEDOCLES (*ca.* 495-435 B.C.),

statesman, physician, poet, besides philosopher, was the first to grasp the law that **matter persists through all metamorphoses** without loss or gain. He explains that what is can neither begin nor cease to be, and what men call birth and death are simply a mixture and separation of pre-existing substances. Fire, air, earth, and water are the ultimate elements whence all things arise and into which they return. Two powers control the universal process : Love (attraction) drawing the elements into one ; Strife (repulsion) tearing them apart.

Empedocles assumed a kind of hedonic consciousness, *i.e.*, a consciousness reduced simply to a distinction between comfort and discomfort, a desire for good and repulsion from evil, which he supposed to be the universal principle of all activity. This view was held, after Empedocles, by DIDEROT, CABANIS, and the modern materialistic school in general. The same principle of appetition, or of love and of repulsion or hate, was, under the names of affinity, selection, and incompatibility, thought to direct the transformations of bodies when chemistry first began ; when BOERHAAVE, for example, compared chemical combinations to voluntary and conscious alliances, in which the respective elements, drawn together by sympathy, contracted appropriate marriages.

The soul was not considered as an entity apart from the body, and he omitted the idea of an intelligent Ruler.

The external world is known to us through the channels of sense, and that literally. He imagined that streams of material particles emanated from the bodies about us, and that these made their way through certain minute passages or pores with which the organs of sense are supplied, thus producing the characteristic sensation by which the element within is enabled to recognise the element from without as akin to itself.

Smell, says Empedocles, is due to the reception of particles from the odorous bodies, and this naturally seems to receive support from the fact that odour is often associated with bodies wasting in decay. The exciting cause in sound is the air, the current of which strikes on the cartilage within the ear, which rings like a gong. The effluxes reaching the eye from without explain our ability to see objects at a distance from us, and reduce this to a form of touch. In the case of sight we have a flashing—a fire—in the eye.

Empedocles laid the foundations for the notion of **temperaments** or the idea that an individual's characteristics depend upon the mixture of the elements of the body. The decrease of consciousness which occurs in sleep is explained as a reduction of vitality, a symmetrical cooling of the blood.

He divined the truth that light travels with an appreciable velocity ; he knew that the revolution of one body round another can only be maintained by the composition of two forces, a centrifugal and a centripetal ; and he recognised the sexual reproduction of plants. He even suggested the famous doctrine of the **non-survival of the unfit.**

LEUCIPPUS (*ca.* 480 B.C.),

the founder of the **atomic theory,** formed the conception of multitudinous, indestructible, invisible and indivisible particles as the basis of all real existence. He credited all his atoms alike with a downward motion through infinite space.

DEMOCRITUS, of Abdera (*ca.* 460-360 B.C.),

elaborated this theory, and, with the modifications brought about by the progress of science, it has remained the basis of the scientific conception of life. He declared that the atoms—which he represented as indivisible bodies so small as to escape perception—differ in quantity only (in figure, grouping, and position), and that the qualitative differences are merely apparent and due to our sensations. Moreover, they are all persistent, though undergoing multitudinous transformations. Thus he enunciated the principle of the **persistence of matter** and the **conservation of energy,** which it has taken mankind a long time to acknowledge.

Democritus imagined the world to be the result of the concurrence of an infinite number of material atoms, and considered the soul—being part of the world, though animate—as consisting of the same material: warm, fire-like atoms, which are peculiar only in being finer, smoother, more rounded, and therefore more mobile, than any others; these finest atoms permeate the whole body and produce the phenomena of life. These soul atoms are drawn in with the breath, and, when they are no longer breathed in, death ensues.

Thus Democritus regarded the physical body also as an aggregate of atoms (corpuscles), warmed into life by the soul, which departs at death leaving the body inanimate. He asserted that individual souls were the emanation of individual bodies, varying with their matter, and form of matter, brute with brute, fish with fish, man with man, etc.; that the soul bore the same relation to matter as the perfume of a rose bears to the flower, as light and heat bear to the ignited fuel; and it fades as the material fades.

Perception takes place by means of little images which pass to the soul through the senses. Impulse and will, the active life, reveal the reverse process—the pouring out of the images taken in by perception; but perception is imperfect and often deceptive. The configuration of the air may be so changed as not to represent the object faithfully. The senses are, therefore, sometimes inadequate and deceptive.

The objects which produce *taste* and *smell* do so in accordance with their shapes. The source of *sound* throws off particles which, mingling with like elements in the air, stream into the ear and so come to the soul. There is no reason why these particles should strike only on the ear, and they do, in fact, strike upon the whole body; but the ear alone hears, because that organ is best adapted to receive and retain the air. *Sight* is like hearing, in that the original source of the sensation may be at a distance from the person. The primary object, the thing, sends off films or "images," which being infinitely thin cannot be seen individually, and, acting on the air, mould it into the shape of the original object; thus the eye is penetrated, as it were, by an air-figure, which is a copy of the distant object. Thus motions are set up similar to the objects, *i.e.*, pictorial reproductions of them. This so-called copy theory persisted up to the XVIIth century, when it was regarded with new favour on the discovery that an image of the object, although inverted, is indeed thrown upon the retina.

Democritus held the primary colours to be four—white, black, red, and green. A colour is an effect produced by atoms and is expressible in terms of the figure of the atoms in a manner analogous to that in which varieties of taste are explained by differences in the shapes of atoms. All other colours are formed by the mixture of these four.

Democritus distinguished "true" from "obscure" knowledge. These are divisions of knowledge according as it depends on sense or reason; the superiority of reason is consistent with the doctrine that the atom is knowable, but not an object of sense. Thought is superior to sense, for it is, by its nature, conversant with objects not known to the senses.

His theory, while formally acknowledging the possible existence of superhuman

beings, left no place for gods in any true sense of the word. In a world where the atoms alone were eternal, where necessity and mechanical law alone ruled, there could be neither creation, nor providence, nor immortality. The particular combination of atoms which makes the individual is broken up and dispersed at death, and on the same physical analogy we must regard the soul as sharing the dissolution of the body.

Democritus appears to have distinguished various faculties of the soul and to have assigned a seat to each in a different part of the body : thought in the brain, anger in the heart, and desire in the liver.

His moral teaching was very much in the form of proverbial philosophy. For example : Goodness is not abstinence from doing wrong, but from the wish to do wrong. Encouragement and persuasion are a better training to virtue than law and compulsion. From his habit of constantly deriding the follies of men, he acquired the epithet of the laughing philosopher. He was treated as insane by the Abderites for his attempt to find out the cause of madness by dissection.

ANAXAGORAS (500-428 B.C.)

was the teacher of Pericles, the great Athenian statesman. He was the first Greek philosopher who taught that there must be one Great Intelligence ruling over the whole Universe. Observing that men attribute actions to reason, he justified the assertion that reason is the starting-point of the activity which has put in order the chaotic mass of original matter. Reason in this way becomes an immanent force that makes for order, itself pure and unmixed, but the cause of all mixture, a power inherent in some things, and ruler or organiser of all. Hence he suggested an **intelligent First Cause—Nous,** Spirit, Reason—that "knows everything about everything and controls everything," and brought order into the Universe from a primordial chaos. The evolutionary process was therefore not spontaneous, not due to what we call the unaided forces of nature, but due to this guiding and shaping intelligence, the First Cause : Nous. As opposed to the elements of things which are material, he considered the soul as simple, identical, unmixed. It is the principle of reason from which the ends found in nature proceed, acting in opposition to accident and blind necessity. It is also active, not merely intelligent ; it is the moving, working principle, seen not in the living person only, but in all nature.

He considered mind to be the same in all living creatures, both in the animal and vegetable kingdoms, and the different grades of intelligence depending entirely on the structure of the body. By a confusion of vital function and consciousness he attributed to plants reason and knowledge. It was by the intellect alone men became acquainted with the truth, the senses being altogether untrustworthy.

He recognised that it is the brain which hears, not the ear. He said hearing is due to sound which passes through the ear to the brain.

He held that difference in the kind of matter is not due solely to the arrangement of its particles by motion, as Democritus thought ; it is due to the special character of the particles themselves. Material things consist of particles (molecules) which are homogeneous in each kind of body, but various in different kinds. This is the Homoiomeria of Anaxagoras. **He, too, recognised the law of the conservation of energy,** which we associate with the name of MAYER, twenty-four centuries later.

Anaxagoras was the first philosopher who chose Athens as his abode, and, unhappily for the fame of that city, was the first also whose free inquiries brought him into collision with the religious superstitions of the age. He was accused by the Athenian populace of atheism, since he asserted that the so-called divine miracles of his time were nothing more than common natural effects, and that the sun and moon consisted of earth and stone. He had convinced himself, partly as would seem, by the study of meteoric bodies, that the sun was a hot mass of stone,

that the stars were not fire, that the moon was an earthy body, shining not by her own but by reflected light, and causing eclipses of the sun by the interposition of her cold dark orb between him and us. In particular, he interpreted the markings of the moon's surface as indications of plains and ravines. Now at Athens the sun and moon passed for being blessed gods, and a pious belief prevailed that they were worshipped as such by the whole human race. To treat them as inanimate matter was blasphemous, and Anaxagoras was accordingly prosecuted for impiety, condemned, and escaped death by the hemlock only by a timely flight. (See also Chapter IV.).

DIOGENES, of Apollonia (412-323 B.C.)

laid great stress on the evidences of design in nature, the beautiful harmonies of which, according to him, could only be explained as the work of an intelligent cause. He was a physician, and wrote a careful account of the vascular system, which he thought had something to do with the distribution of **air**—or, as we should say, oxygen—over the body. He regarded air as the most important element in the world. It is the principle of life, pervading the whole body, but there are two special centres, the head and the heart. By means of the air round the brain we become conscious of objects ; the more subtle the air the clearer the perceptions.

PROTAGORAS, of Abdera (*ca.* 480-411 B.C.),

was one of the Sophists—itinerant professional teachers who taught oratory and all branches of higher culture to their pupils. The Sophists rejected the current polytheism of their age, and thereby contributed to the great religious revolution that substituted the belief in one God for the belief in many. Protagoras in one of his books said : "About the gods I cannot say whether they exist or not. Life is too short for such difficult investigations." This modest confession of agnosticism brought down an action for blasphemy, to escape the consequences of which he took flight and perished at sea.

For Protagoras, **all external reality or truth is relative to the observer,** who apprehends the world through the medium of the senses ; there is no reliable general knowledge of nature secured by perception. Justice and morals cannot be founded on a supposed objective order of nature. Reason is no better. There is no way to reach any independent truth, either sensible or rational ; all rests upon the experience and nature of man. To say that the senses deceive, is to say that the interpretation put upon sensation is incorrect or false. To say that knowledge is relative is to say that our percepts, images, etc., are capable on occasion of varying interpretations. To say that reason is ineffective, is to say that the beliefs, presuppositions, and processes which are its tools are insufficient. All these misinterpretations turn upon the fact that consciousness possesses data which are taken to be subjective ; that **"ideas" intervene in some sense between the perceiver and the thing perceived** ; that ideas are the mediating or instrumental term in knowledge. It is impossible to pass beyond ideas, and, therefore, man, the possessor of ideas, is "the measure of all things, determining what does, and what does not, exist." To which Plato opposed the principle that God, and not man, is the true measure.

For Protagoras morality is the very foundation of human life, the conditions of every other art, the essential distinction between brute and man, between savages and civilised communities. **Some are born with more, and some with less, capacity for acquiring virtue** ; but that it is an acquisition is proved, among other ways, by the existence of penal law. For punishment can only be justified as a deterrent for wrong-doing—in other words, as a moralising agency. How to be happy is the

important problem. To be happy is to govern one's self. Hence philosophy is the art of being virtuous.

The **Sophists** denied that human reason had thus far succeeded in ascertaining anything, and even affirmed that it is incapable, from its very nature, as dependent on human organisation, of determining the truth at all. If truth were actually in our possession, we have no criterion by which to recognise it, and having no standard of the true, we have no standard of the good, and our ideas of what is good or evil are altogether produced by education or by convention. "**It is might that makes right.**" It is the will of Nature that the strong should rule over the weak. The strong man defying conventional justice instituted by men, confiding in his strength, which would make him feared by others, would give full rein to his passions. From the Sophists' point of view, purely human justice which forbids violence is a mere convention, a prejudice fostered by the weak, whose interest it serves. A modern philosopher—Nietzsche—has revived this defence of the strong.

Merit and evil depending on the social standard and public opinion, those who depart from the social rule should cultivate rhetoric, that noble art by which the wrong may be made to appear the right, and even worthy of praise, or the blame may be attached to one's enemy. The sons of noblemen valued such instruction, which the Sophists were offering to give for adequate payment.

The Sophists discerned in the belief in the gods a successful artifice, employed by legislators in order that fear might prevent, or that remorse might disclose, secret crimes which would otherwise go unpunished. And who will venture to say that the support which the modern State gives to the Church has not for one of its objects to encourage submission and prevent dissatisfaction!

Other Sophists of importance, besides Protagoras, were Hippias, Prodicus, and Gorgias, all living about the latter half of the Vth and the commencement of the IVth century B.C.

HIPPIAS was a naturalist and taught his pupils to ascertain the will of nature by the sedulous study of geometry, astronomy, and physics.

PRODICUS, like the others, rejected the gods of popular religion as supernatural personalities, explaining that they arose from the personification of natural elements and powers.

GORGIAS was a dialectician who argued that there is nothing, and besides, we could not know it if there were, and we could not communicate it if we knew it; thus preaching a philosophy of negation and scepticism.

SOCRATES (470-399 B.C.)

was principally an **ethical teacher.** Self-development, self-consistency, and self-knowledge are the key-words of his teaching. While for the Sophists the teaching of wisdom had been merely an honourable and lucrative profession, for Socrates it was the fulfilment of a duty to his country and of a divine mission. He devoted himself to the moral instruction of the youth of Athens, and, unlike the Sophists, he never thought of procuring for himself a brilliant position.

He opposed the Sophists' individualistic way of employing subjectivism. The world is something to conquer and enjoy, and something to conform to, rather than something to understand; and *the "self" is a body of collective social interests,* rather than a personal being of mere desire, individual personal caprice, and private opinion. Man has by nature a tendency to strive after happiness, and this natural conation is the root of all desire. Satisfaction of desire is only found in the good, so that all desire is really the will to be happy, which is the same ultimately as the will to be good. In his view, virtuous conduct depends upon knowledge in the sense that with adequate knowledge, or insight into the results of action—called by him "wisdom"—one could never do wrong. **Goodness can be taught, for it is a matter of knowledge. Sin is error; bad action is due to mistaken judgment.** Our ideas guide

our actions; ideas are the means of attaining truth and virtue. The will is simply the reason when in action. Freedom is found in intelligent action. Mere external authority, social constraint, religious sanction, cannot replace the inner light of knowledge.

The analysis of human nature gives us only reason and the passions, and the passions cannot overcome reason. The faculties are essentially distinct and therefore do not affect each other. Man cannot have passions in the rational part, nor reason in the emotional part. Motive resolves itself into the question which, among the elements, is the stronger, when there is conflict between the elements.

The mind, by its very supremacy in man, is a proof of God's presence in the Universe. God represents the unchangeably good. There can be no truth in the stories of deceit and lust of Greek mythology. Socrates acknowledges the existence not only of God, but of Providence, and not only of that universal Providence which watches over the whole world, but of a particular Providence, which is interested in the fate of individuals. He recommends men to pray, and to pray only for the good of their souls, and not for temporal goods.

Socrates conceived death as a long sleep, denied that the soul had memory, and professed ignorance as to immortality. All this would not have mattered; but that he had tried to demonstrate the unity of God was too much, and he was accused by the Athenian Dikastery of alleged irreligious teaching and thereby corrupting the youth of Athens, and was condemned to death in the manner of his day, by drinking a cup of the juice of the poisonous hemlock.

PLATO (427-347 B.C.)

rejected the notion of previous philosophers of the soul consisting of a subtle kind of substance permeating every part of the body, which after the death of the body continued to exist, and might appear as a dim vapour-like duplicate of it, or ghost. He believed the soul to have three parts. One, an immortal or rational part, coming from God; another a mortal, animal or sensitive part, the seat of appetite and sensation, belonging to the body; and a third, lying between these and making their interaction possible—will or spirit—by means of which reason conquered desire. Plants have the lowest part; animals the two lower; but the rational part is exclusively human.

This rational soul he regarded as immaterial and metaphysical in nature, incapable of being perceived by the senses, and only to be grasped by the intellect. The union with the mortal, material and physical body was only a minor incident of its long career, a temporary association for the course of the individual life. The rational soul existed as such, as an "eternal idea," before it entered the human body; and when it quitted it, it sought such other form as was most suited to its character for its habitation. Plato thus drew a fundamental distinction between soul and body.

He ascribed **personal immortality** to the soul. When we recall by an act of mind a former experience with which we are familiar, but which actually has never been experienced in this life, the remembrance must be the revival by the soul of experiences that belong to the soul itself. That which we thus recollect is truth independent of the present time, in its nature eternal; and therefore our own thought, properly understood, proves that the soul has an existence of its own, an activity independent of all sensation, and a life which is at least not limited to the span of bodily existence.

Plato was an adherent of metempyschosis or the transmigration of souls. After death the soul is in some intermediary region, subjected to reward and punishment, and must in most cases undergo a new incarnation, which corresponds to the stage

of purification already attained. Finally the soul is purged and then finds a lasting abode in the ideal world.

To secure the triumph of good over evil, perfect happiness for the good man in this life is not enough ; he must also have the prospect of felicity in a life to come, while very much the reverse is in store for the bad. For the immortality of the soul, though not generally accepted, is, according to Plato, quite certain. He argues that if anything could destroy the soul it would perish by moral corruption —which, as we know by experience, does not happen. Therefore souls live for ever, migrating after apparent death into a new body, higher or lower than the last habitation, as their own choice, which God leaves free, may decide. But before resuming their earthly existence all souls have to pass through an intermediate stage of disembodied consciousness, lasting a thousand years, in which they receive tenfold retribution for the good or evil deeds performed in life, the worst offenders being subjected to everlasting torments. Each soul before returning to earth is described as taking a draught of Lethe, whereby all remembrance of the experiences in the intermediate state is blotted out.

The rational soul is capable of three states according to the way in which it is related to objects. With respect to the real, it has knowledge ; with respect to the contingent, opinion ; and with respect to the non-existent, ignorance. The soul is imprisoned in the body, the body hinders the soul, hence the difference in our forms of knowledge.

A man who knows something *feels* sure of it ; knowledge is therefore psychologically a kind of feeling, and it is true that knowledge is felt certainty. All emotions belong to the soul, for they are conscious states, and therefore in some way connected with knowledge. The body never has knowledge, however indispensable an instrument it may be to the attainment of knowledge in some cases. The soul knows itself and knows also the body. Pains and pleasures arise from both sources, though as known the affections are in the soul. The body may be in pain while the soul has pleasure, *e.g.*, the pain of hunger combined with pleasure of expectation ; or body and soul may both be in pain as when pain of the body is joined with despair of relief. The unmixed pleasures belong to the soul. They are the intellectual and æsthetical pleasures, and, in general, pleasures that are not preceded by pain.

The material soul he believed to be endowed with the faculty of receiving impressions and giving rise to imagination. Therefore **memory and imagination were regarded by him as material qualities,** dependent upon organisation ; while reason, on the contrary, was a faculty essentially spiritual and independent of all organisation.

The rational part acts on the brain, being the part nearest the heavens, and man being, as it were, an inverted plant, " for the divine power suspended the head and root of us from that place where the generation of the soul first began." The irrational soul acts on the spinal cord. Both brain and cord are the conductors of vital force. But the seat of the irrational, material, or vegetative soul—which needs food for its preservation—is in the abdomen ; and the will, or spirit, the intermediate link between the mortal and immortal soul, has its seat in the heart.

The heart was probably chosen by Plato as the seat of spirit or courage from observation of the feelings attending fear, anger, and the like ; while the desires and passions could be relegated to the lowest parts, not only to banish them as far as possible from the head, but also as a result of observing the processes of nature, hunger and reproduction. As the desires arising in the lowest soul are known to and can disturb the highest soul, so the movements of the highest soul can produce effects in the lowest. Thus the power of thought is like the acid element in the liver : it is therefore capable of commanding sympathetic activity in the liver ; and

this explains why some people not only *know* a thing to be bad, but also have a positive disgust for it, a *feeling* of its badness.

The liver, in which the thoughts issuing from the brain are, so to speak, reflected as in a mirror, is the seat of the faculty of prophesying. The spleen, which is closely connected with the liver, Plato regarded as a sort of reservoir of the impurities of the blood. The active principle, setting the brain and viscera in motion, was described as *pneuma*, or universal soul, "a vital movement animating all nature." This furnished the brain and senses with a kind of aura, constituting the element of their activity.

Plato was not the first to regard the passions—pride, ambition, courage, anger, love, etc.—as innate and placing them in the different viscera. Full six hundred years before, David showed that the popular, and consequently the ancient, opinion of his day was, that not only the affections, but even the reasoning power, resided in the heart and kidneys; the latter being possibly considered from very ancient time the chief seat of vitality and passion; and the heart as the seat of understanding, as may be seen by reference to the oldest of all authorities, the Book of Job. The liver was also spoken of as the fountain of life, and was considered, up to the days of Harvey, the laboratory of the blood.

According to Plato, man is not merely a mixture of elements, as the physiologists hold; he is a mixture of natures, and the science of temperaments requires as its complement a **science of character.** Character depends largely on the extent to which one or other of the natures is developed: a man may be characterised by excess of passion, or of spirit, or of intellect. The study of man from this point of view is therefore essentially a study of conduct.

Life is a collection of activities, a perpetual striving after fulfilment of the need, whether it be for physical or spiritual satisfaction. The will depends upon the mind's grasp of an end; the creature acts in the way which it thinks best. All conduct is therefore in the first case merely doing what one thinks best. Right conduct can only be achieved when that which is thought best is at the same time truly and really the best. Hence the mind must be trained to think rightly. Men act for the ends which they approve; they live for that which they like, and their likings reflect their nature. The common element in all cases is the liking. The distinction of characters depends upon the tendency of the likings, and this again depends upon the balance of the elements in the nature of man; evil likings arise from natures in which the evil elements predominate. **Evil** is not the possession of any one part, whether higher or lower; it **consists entirely in the breach of proper relations between the parts.**

The highest good is not pleasure, nor knowledge alone, but the greatest possible likeness to God, as the absolute good. The virtue of the human soul is the fitness for its proper work. It includes various particular virtues, which form a system based on the classification of the faculties or parts of the human soul. The virtue of the cognitive part of the soul is the knowledge of the good, or wisdom; that of the courageous part is valour, which consists in preserving correct and legitimate ideas of what is to be feared and what is not to be feared; the virtue of the appetitive part is temperance (moderation or self-control), which consists in the agreement of the better and worse parts of the soul as to which should rule; justice finally is the universal virtue, and consists in the fulfilment by each part of its peculiar function. Piety is justice with reference to the gods. Justice consists, not as the old maxim said, in doing good to one's friends, and evil to one's enemies, but in doing good to all men without distinction. Thus Plato enjoins the forgiveness of injuries. To do injustice is worse than to suffer injustice.

Temperance is for Plato the renunciation of pleasure and the release of the soul from the body. Appetite, which is lawless and blind, can be conquered only by setting against it the spirited passion which, of its own impulse, makes for the good. Wisdom is not only first among the virtues, it is also the principle of them all. One of the ramifications of wisdom is philosophical love, or the joint striving of two souls for the attainment of philosophical knowledge. Virtue should be desired, not from

motives of reward and punishment, but because it is in itself the health and beauty of the soul. The social virtues depend on individual morality. The virtue of rulers is wisdom, of warriors valour, and of the lower orders (labourers and tradespeople) self-restraint and willing obedience.

Plato, like Hippocrates, considered the moral character of dreams as the expression of desires which are usually suppressed. He seems to favour the idea that in sleep the rational soul, if it is not troubled by the irrational parts, can attain truths not otherwise revealed.

According to Plato, we can only thoroughly understand the **faculties of the mind** by carefully studying the effects they produce. We ought then to distinguish as many faculties of the mind as there are different and distinct mental operations.

Plato distinguishes primarily two principal faculties: that of *feeling* and *thinking*. To feel is to be affected by an external impression; to think is to operate upon our ideas. The faculty of thinking divides itself again into two others, the *understanding* and *reason*. The understanding is that power which combines sensible images; reason is that supreme faculty which regulates all others, directs to an end or object, marks the relation of things, and forms conclusions from the whole. The understanding and reason exercise themselves both under an *active* and *passive* form; under the latter form they receive and preserve notions; and under the former they are united, separated, combined, and placed in logical and methodical order. Thought is a species of inward self-instructor; it interrogates itself and furnishes the answers. This self-instructor, through the means of language, forms the *judgment*, which consists in the uniting of ideas together, in the same manner as discourses are formed through the instrumentality of nouns and verbs. The understanding is closely linked to sensation; for every sensation is but a confused judgment, which the understanding has afterwards to develop. The senses furnish the materials, and the understanding elaborates them. *Imagination* is a mental activity in a sensuous form. Sensation, memory, and opinion are all accompanied by an imagination. The word *phantasy* in Plato suggests the unreal as opposed to the real. It produces appearances.

There are in our minds *images*, *notions*, and *ideas*; the first belong to sensation, the second to the understanding, and the third to reason.

Ideas, according to Plato, are original endowments of the mind, but they are at first latent and we are not conscious of them. Education has to draw them out. They are derived from a previous state of the soul and we recover them by an act of memory or recollection. Sensations provoke ideas; they do not create them. Their function is to recall to our minds our latent possessions. The soul longs to see those truths again which it once knew.

Ideas or concepts are not merely subjective states of mind, as with Socrates, but absolute realities existing in themselves. Every actual thing in nature has its absolute prototype or model in "idea." What degree of reality things have comes only from the presence of this prototype, of which the thing is a mere "shadow." The ideas constitute a hierarchy or ascending series, the supreme idea being God or the Good. The idea of the good must be the highest idea, and it must be divine. The divine reason in man responds to the divine good in God. By love and contemplation the soul realises the union of wisdom and goodness in God, and attains its own proper immortality.

To Plato, God was the infinite and purely spiritual embodiment of truth, beauty, and goodness. These three qualities were not ideals but spiritual realities, shining upon the earth like stars on a cloudless night, reminding us of the spirit world in which the soul once lived, and to which it will return when freed from the prison of the flesh. To be like unto God is to escape from the material or sensible world, which is of necessity the abode of evil, and to take flight towards the world of Ideas. No doubt, man, inasmuch as he consists of a body composed of many

elements and of a soul of many faculties, cannot become one, like the divine Unity. But, in so far as he keeps his body subject to his soul, and the faculties of his soul subject to his reason, he realises such unity as his nature admits of.

Since to Plato the **pursuit of wisdom** was to be the highest aim of life, the body could only be regarded from the point of view of its utility in helping or hindering this pursuit. Apart from the various diseases of the body, which of necessity must impair the activity of the soul in seeking after truth, the complex and unnecessary desires of the body are always tending to drag the soul down to a lower level, and to prevent it from realising those aims which are its ultimate goal. He believed the good soul could improve the body, but the good body does not improve the soul; indeed, "excessive attention to the training of the body brings with it evils as great as the undue neglect of it." The body then gradually swallows up the mind; the whole man swells with the pride of conscious strength; by degrees his courage sinks into brutality and his high spirit into insolence; his senses, the windows of his mind, are clogged and darkened; his intelligence, neglected and starved, grows weak, dwarfed, and blind.

Education to Plato is information, not the mere acquisition of knowledge, but the formation of mind. Knowledge cannot be thrust into the soul from without nor attached to it as an ornament may be attached to the body. Knowledge is activity, and the wise man is he who has acquired through training perfection in the exercise of his faculties. The education of youth was regulated by Plato in accordance with the principles of a gradual advance to the cognition of the ideas and to the corresponding practical activity in the State, so that only the best qualified persons could rise to the highest stations, while the rest were destined to exercise inferior practical functions.

To the children of rulers and warriors Plato provided from the first to the second year care of the body; from three to six narration of myths; from seven to ten gymnastics; from ten to thirteen reading and writing; from fourteen to sixteen poetry and music; from sixteen to eighteen mathematical sciences; from eighteen to twenty military exercises. Then follows a first sifting. Persons possessing an inferior capacity for science, but capable of bravery, remain simply warriors; the rest go on, until the age of thirty, learning the sciences in their mutual relations as parts of one whole. Then comes a second sifting. The less promising are assigned to practical public offices, the others assume positions of authority until the fiftieth year. After this they are received into the number of rulers and fill in turn the highest offices of the State.

Of interest also is Plato's view of the **treatment of disease** by drugs:

"This method of treatment should be used only in urgent need, and a man of sense will never resort to it except in extremity. Diseases require a certain time to run their course, and if one attempts by violent remedies to combat them before their period, one may produce out of one disorder several, or turn a mild affection into an incurable one."

After speaking of bodily disease, Plato discourses on **insanity**:

"In the above manner are diseases of the body produced, but the diseases of the soul, resulting from the habit of the body, are as follows. We must admit that the disease of the soul is folly, or a privation of intellect, and that there are two kinds of folly—the one madness, the other ignorance (imbecility). Whatever passion, therefore, a person experiences that induces either of them, must be called a disease. Excessive pleasures and pains, however, are what we should deem the greatest diseases of the soul, for which a man is over-elevated with joy or unduly depressed with grief, and so hastens immoderately either to retain the one or fly from the

other, he can neither perceive nor hear anything properly, but is agitated with fury, and very little capable of exercising the reasoning powers. . . . And, indeed, it may be almost asserted that all intemperance in any kind of pleasure, and all disgraceful conduct, is not properly blamed as the consequence of voluntary guilt. For no one is voluntarily bad; but who is depraved becomes so through a certain bad habit of body, and an ill-governed education. . . . All the vicious are vicious through two most involuntary causes, which we shall always ascribe rather to the planters, than the things planted, and to the trainers, rather than those trained."

In the laws which he laid down for his "Republic," he provided for the insane, as follows:

"If any one is insane, let him not be seen openly in the city, but let the relations of such person watch over him at home, in the best manner they know of; and if they are negligent, let them pay a fine."

A further proof of his wisdom is shown by his definite views on **eugenics.**

He praises Æsculapius for his practice of treating only definite curable ailments, and not those persons diseased through and through; so that he did not lengthen out useless lives and prevented weak fathers from begetting weak sons. The true way of improving the human race, he says, is by a scientifically directed system of breeding. "The State alone should regulate marriages, not according to the will of the parties, but solely in view of the general good of the nation." He held that it was the duty of the magistrates to choose the bravest men and the most beautiful women so as to obtain specially good offspring. Aristotle wrote to the same effect.

NOTE

The history given in this chapter shows the Greeks in the VIth, Vth and IVth centuries B.C. to have been intellectually superior to the rest of mankind and to have produced a whole series of pioneers in philosophy, supreme thinkers, men of extraordinary wisdom, in search after truth, and most of them of exemplary character. Ancient Greece was evidently a country in which free discourse was the habit of the people, the discussion being at first confined to the problems of the universe and gradually extending to man's nature, his past and future. The influence of the teaching of these great men has persisted, as we shall see, throughout the ages, and no succeeding discovery in philosophy can be estimated at its true worth unless the history of the progress of human thought from the very beginning is kept in mind. That is the reason why this work contains the *whole* history of human speculation, though it may be already familiar to the reader and have been described in a better and fuller manner in other works. Such a proceeding was deemed necessary, in order that the general reader may comprehend properly the results of modern research and speculation.

In the succeeding chapter the history of Greek philosophy will be continued to its decay; from Aristotle, the universal genius, philosopher and naturalist, going through the whole history of Greek rationalism and Stoic moral philosophy, to the Alexandrian revival of Platonism, which contributed so much to what is best in the Christian Church.

CHAPTER III

LATER GREEK PHILOSOPHY

ARISTOTLE (384-322 B.C.)

WAS one of the greatest scientific men and speculative geniuses that ever lived. He may be considered the father of natural history, the founder of comparative anatomy, anthropology, embryology, besides having produced the best collection of physiological facts known in his time, derived mostly from his own observation.

So far as is known, he was the first to treat systematically of the mental processes and laws, and his influence here, as in other departments of philosophic study, has dominated subsequent inquiry. His method was not to begin with ideas furnished by the mind, but with the facts of sense derived from observation of Nature. A thing with him was not to be regarded as true, because the imagination had suggested it, or because it was amenable to dialectical treatment, but because the reason could verify it inductively by an appeal to experience.

Aristotle approached psychology from the point of view of biology, and by him soul was ascribed to all material things that manifest powers of spontaneous movement and growth, that is to say, to all living organisms. **The soul was to him the sum of the vital functions.** His *psyche* would therefore be more correctly translated "vital principle," rather than soul, like the "entelechy" of DRIESCH in recent years.

Man absorbs nutriment, perceives objects, and transcends the immediate moment of perception in thought. Aristotle accordingly, using Plato's idea, admitted three grades of life, arranged in a progressive series of increasing perfection: the **vegetative** or nutritive, the **sensitive** or animal, and the **rational** or human soul. The plant mind is nutritive only; the animal is nutritive and sensitive; the human mind is nutritive, sensitive, and rational. In man the parts of the soul are hardly more than divisions of psychic activity, but their separate existence in the world of nature is the justification for speaking of them as separate parts or souls.

In the theory of the relation of these parts, Aristotle advances to a **genetic** point of view. They are not separate parts in the sense of having different local seats in the body, as Plato taught, but functions of the one developing principle. The higher is developed from and includes the lower. Man, who is at the end of nature, exhibits in himself the various steps of development. He is placed among the animals, but distinguished from them by certain features—by the relative size of the brain, by two-leggedness, by mental characters, and, above all, by the fact that in him the thinking or rational soul is present. This is implanted in him before birth from without; and at death it goes back to its source, the divine reason, where it continues in eternal but impersonal form. It is twofold in its nature in man, partaking both of divine reason and of the sensitive soul; it is both active and passive. It is man, in the masculine gender only, that realises the end of nature.

Aristotle thus attempted to trace **a series of continuous gradations connecting**

the inorganic with the organic world, plants with animals, and the lower animals with man. Yet he was not an evolutionist, as we understand the term now. For he held that all the animal species were immutable; they always had existed, and always would exist; and **he was a strong teleologist,** believing that the animal organs had been designed and made for the functions that they now perform. Thus, while Anaxagoras had said that man was the most rational being because he had hands, Aristotle reversed this dictum: man has hands because he is the most rational being; for the instrument must be fitted to its work, not the work to its instrument.

For Aristotle, matter is not an independent principle. **Matter is pure potentiality.** It exists only in connection with *form* and *design*. Matter united with form is matter as we find it; it is organised. Matter is the substratum; the form is that which makes of matter a particular, determinate, or real thing; it is the perfection, the activity, the soul of the thing.

The objective world is a world in which reason is immanent. There are two great modes of reason, considered as cause, in the world: a cause is either a potency or an act. Every change from the potential to the actual is brought about by a cause—the *moving* cause. It may either operate from within, as is the case with the animal germ; or it may operate from without, as is the case with artistic construction, in which the material is given and the work of the artist is added to produce the shape he has in his own mind. In either case there is an *operative* cause by which the materials are moulded into form. The *final* cause is that for which everything exists. A final cause always implies intelligence, which an *efficient* cause does not necessarily imply. The first great final cause of all, that is the intelligence which originally set in motion the whole universe, is pure actuality, self-evident, and unmoved.

Every thing is in a sense a combination of soul and body. They can be separated in thought only. The body is the *material* cause of the organism; the soul is the *efficient* cause, for it produces its movements; it is also its *formal* cause, for it determines the form of the individual organism; and it is its *final* cause, for it is the end for the sake of which the body exists.

Since everything that becomes has its formal cause, which is the principle and its end, one may say that there is in every being a principle analogous to the soul. **The soul is** in the proper sense of the word **the first entelechy of an organised body** potentially possessing life. Thus the entelechy of the eye is the action of looking at something at a given moment. Supposing the eye were by itself a complete living thing, its soul would be the faculty of vision. The soul is to the body what the vision is to the eye, and in this sense it has something of the body; but this something is neither figure nor motion, but the particular activity which gives to the body figure and motion, the cause of the agreement and harmony between all its parts.

A dead body is properly only matter; for the soul is the essence, the true being of that which we call body. It has the functional value of an instrument. The soul is not in the body as in a dwelling, which it may abandon; it cannot travel from body to body, being able to exist only in the body that corresponds to its essence, and which by this very fact it creates.

The soul does not stand in need of purification or of a series of re-incarnations. Its office lies in pure contemplative thought, which is made possible for it by the possession of certain absolute truths in no wise to be acquired from the world of experience. The divine spirit exists only in self-contemplation, apart from the world, beyond the outermost heaven, which is the sphere of the fixed stars, that are made of ether and have spirits which are moved by love, directed towards God. There is no unity in the world except that which results from a universal tendency towards the same perfection, that is, towards God. In his system, therefore, **a world-soul is not required.**

Aristotle's belief was that the rational principle implanted in man before birth was in essence akin to ether and returned after the bodily dissolution to the place whence it came—the celestial spheres. To the criticism that this does not explain why the mind took so long to grow up in youth, he replied that the mind had to become gradually accustomed, like the eye, to brilliant light, and that it did not become so accustomed till after childhood had passed. He also held that **the mind was always fresh, although the instrument might be impaired by disease and old age.** Aristotle believed also that all consciousness ceased with death. **The soul has, after death, no personal existence,** but exists only as a divine absolute force, which, combining again with an animated human body, renders it a rational man; but she has no recollection of a former existence.

The internal organs were to Aristotle chiefly a machinery designed to balance the extremes of heat and cold. The lungs draw the air not to keep up the animal heat, but to moderate it; therefore the gills of fishes are not respiratory organs, there being no occasion for air to cool the blood where water supplied the need. The **brain** was to him a gland containing a compound of water and earth, and quite of secondary importance, partly for reason of its locality, partly because it was the coldest part of the body, being devoid of blood, and having for its chief and only function the cooling of the heart. Into this grave error Aristotle was led by his metaphysical notion that the sensitive soul was indissolubly connected with heat, and therefore could not have its seat in the coldest region of the body.

The heart occupies the noblest position and has an *a priori* claim to be regarded as the seat of the noblest functions. It is the central seat of life, sensation, motion, and heat. The heart is the place from which the tendons move the limbs. He could not prove that the heart is sensitive, but he knew that the brain is insensitive. When the brain becomes too moist or too dry, it does not either refrigerate the heart or congeal the humour; and when the brain becomes too large (hydrocephalic), the temperament becomes too moist; therefore an abnormally large head was a sign of stupidity.

Aristotle affirmed that the brain does not receive blood-vessels, and this opinion is probably owing to his never having opened the human subject. Yet he knew that the membranes of the brain are covered with a multitude of blood vessels. He held that there is no continuity between the brain and the organs of sense, and he therefore derived all the senses from the heart. He maintained that the ear does not communicate by any opening with the brain, but that the brain sends to each ear a vessel (the acoustic nerve). He first gave the name of aorta to the largest artery of the body, but he attributed the same functions to it as to the veins.

The obvious relation of breath to life leads him to the natural primitive view that air and the principle of life are either akin or identical. Life is activity, and this activity is exhibited as intaking and outgiving, notable in inspiration and expiration. He foreshadowed our modern notions of the **dependence of life on combustion** or oxydation, asserting the dependence of the psychical (vital) functions on fire or heat.

The soul cannot exist without natural heat; death and violent destruction mean respectively the exhaustion and extinction of the vital heat. The body has a natural fire or principle of heat, and this is nourished by the **pneuma.** The vital heat is found in all things that have life. It is the life principle which resides in the heart. Sensations are conveyed to the central seat of sensation—the heart—by that which fills the veins—and the veins are filled with blood and pneuma. The inner pneuma is distinct from the outer pneuma, *i.e.*, from the air which we breathe. The inner pneuma is a secretion resulting from processes going on in the body; it moves with the blood and is said to depend on the blood for its existence, probably because loss of blood reduces vitality. The active element is of the nature of fire, and this is the principle of fertility in seed; this heat is not distinguished from

pneuma except in so far as the pneuma may lose its principle of heat and so become insufficient. Excess of blood reduces vitality, as in sleep; death may be due to exhaustion of heat, though excess of heat may also destroy the exact balance of elements which make life possible.

The organs of sense are in every case constructed to propagate the outer movements inward to the pneuma which they contain; this movement results in a further movement which the pneuma transmits through the blood to the centre, the heart. The pneuma is thus a sentient organism of a subtle nature spread through the body and acting as the universal medium of sensation. In later psychology, as will be shown, this appears as a doctrine of "animal spirits."

According to Aristotle, **there is nothing in the mind that was not previously in the senses**; that is to say, ideas are anterior to all knowledge, but are not innate. They are introduced through the medium of the senses, and become graven on the understanding, which he compared to a waxen tablet untouched by the stilus, or to a sheet of blank paper. Perception results from the reaction on external impressions of the organs of sense, which are thus raised from a potential to an energetic condition, the "form" alone without the "matter" of the thing perceived being communicacated—a theory still preserved in the word "information." Sensation, to be adequate, must be a mean between two extremes. Thus for distinct seeing, the light must be neither too faint nor too intense; for distinct hearing, the sound must be neither too low nor too loud.

The separate senses are insufficient of themselves to explain the fact of sense-perception. The universal qualities of things are perceived by all the senses, and therefore require a special faculty, a **common sense,** for the co-ordination of the various sensations and their formation into true perceptions. It is in the common sense that the judgment of things as true or false takes place, and the common "sensible qualities"—notion, number, shape, size—are attributed to things. The common sense gives unity to consciousness itself. Its organ is the heart, the seat of the sentient soul.

The common sense is the basis also for the phenomena of sleep and dreams. Sleep is caused by fatigue, in which the common sense loses vitality. It may also be caused by the rising of gases from the stomach to the brain and descending to the heart.

An image is primarily the effect of the external stimulus. Reproduction of the image in the absence of the original stimulus is **imagination** (phantasy). Imagination can be clearly distinguished from both sense and thought. It is not sense, for the image of an object is no longer visible; it is not thought, because it involves no belief or reasoning. It is an intermediary faculty between sense and reason.

The possibility of storing up the movement is the condition of **memory**; it is that retention without which memory is impossible. But memory for him is more than that, it is a condition in which an image present to the mind is known to be the copy of an object which had been present itself on some former occasion. In this way memory is an experience midway between mere passive retention and active recollection. The art of **recollection** (reminiscence) consists in starting a sequence of ideas, a train of imagination. Recollection is the voluntary effort which by exciting an idea creates a stimulus for the whole chain of ideas. The laws of this process are the *laws of association* between psychic activities: the laws of similarity, dissimilarity, and contiguity.

Memory is possessed by animals, but only man has active recollection and constructive imagination.

The imaging function is necessary to thought as sensation is to imagination. By the productive imagination the necessary schemata are supplied to the reason. Artistic imagination is imitative, producing a purified or idealised picture of the

real. The drama serves to afford an outlet for the emotions of pity and fear—a function by which the soul is purged and ennobled.

Reason, the power by which we form abstract ideas or concepts, is the highest faculty of the soul, and that by which man is distinguished from all other animals. There are two kinds of reason in man—the actual and the potential, the active and the passive: that which produces everything, and that which becomes everything. The former alone is separate and distinct from the body, eternal, immortal.

Man is so constituted as to stand between the animal and the divine natures; there are in him the desires of the beast united with a reason that is godlike: in the relation of these two are contained the problems of the **psychology of conduct.**

Conation acting in the irrational part of our nature depends on sensation for its direction. Sensations are always attended by pleasure and pain, and these again by Desire, which has an emotional quality, because it begins in the pain of want and ends in the pleasure of satisfaction. All mental and bodily dispositions are accompanied by feelings: by pleasure when unhindered in activity, by displeasure when inhibited. Those who are fond of music, geometry, etc., make progress in that kind of work, because they delight in it—thus he argues for innate dispositions. Without disposition to it, the exercise is painful. From a mixture of both states—pleasure and displeasure or pain—arise the emotions; sometimes apparently without reason, though in consequence of bodily conditions. Character, emotion, desires are all dependent on feeling. Emotion prompts to action, but along with this impulsive spontaneous action there is deliberate will, which arises in desire. Desire is awakened by ideas or knowledge. Desire which is guided by reason Aristotle, with Plato, calls Will in the narrower sense of the word, appropriating the name Desire to its irrational exercise.

There is a hierarchy of active motives and ends, as of intellectual states. Stages of desire, will, and rational choice depend upon perceptions, empirical knowledge, and rational insight. The rational will is free; but the principle of will in general extends into all organic nature, in the form of impulse or potentiality. The **formation of character** is a process by which impulsive action is checked and the power of rational choice developed. Control consists in the mastery over tendencies to excess. The ideal character is that of the man who never loses his head, never fails to act from reason or to defend his actions as properly calculated and adapted. In all things there is a mean; even in the emotions there is a mean, and reason dictates it. On the basis of emotional differences, Aristotle founded differences of temperament.

Passion arises without reflection, spontaneously. It is both a lasting tendency towards certain types of action and a passive state. That it is a modification of the body as well as of the soul is sufficiently proved by the organic disturbances which accompany it. Each passion is both a state of the soul and a principle of action it is an element of the character.

The actions and passions of a living being have two aspects—one which is formal and of the soul, and the other material and of the body. When an animal or a man is angry, his emotion is at once a mental and a bodily fact. Indeed, all our acts are at once physical and psychical; and health of the soul implies health of the body. The superiority of our organism is due to the fact that it is the instrument of a superior kind of soul. Man, as has been mentioned already, does not think because he has hands—he has hands because he thinks. Aristotle, however, makes one exception. The active intellect has no bodily organ; it comes from without is separable, and alone eternal and immortal.

Aristotle places the passions under two categories: those in which pleasure predominates (love, courage, benevolence); and those in which pain predominate

and which are by far the most numerous (rage, hatred, fear, pity, just indignation, envy, shame, jealousy). Anger, fear, courage are types of feelings allied to the spirit of resistance. Anger arises from the sense of wrong and seeks after revenge. Fear is consciousness of danger with prospect of ultimate disaster ; while courage is the consciousness of danger accompanied by assurance of successful resistance. Each passion should be studied, in the first place, in him who feels it ; secondly, in its object ; and lastly, in its motives. Aristotle does not regard the suppression of the passions as possible or desirable ; but if they are well employed, he thinks that they may be the weapons of virtue.

The end of all action is happiness, but by happiness Aristotle does not mean pleasure and the absence of pain. Perfect happiness, according to him, would be the unhindered exercise of reason. Our passions are an obstacle to perfect happi ness, which lies in intelligence alone. The wise man need not go outside himself to seek happiness. He finds it in his own contemplation. The reason does not attain to its full vigour if our moral nature is not in a well-regulated state. On the other hand, moral virtue implies the due regulation of our moral nature, with all its instincts, appetites, and passions ; and this state only exists when they are subordinated to the control of the reasoning faculties. Hence the different parts of human nature reciprocally act and react on each other. Every act of self-control and every good resolution carried into effect increase the vigour of the pure reason and render the highest faculty of our being more capable of performing its work. Again, the more powerful the reason becomes, the fewer obstacles the lower part of our nature puts in its way, the more effectually does it influence the moral life and strengthen and confirm our habits of virtue. Not moral teaching is required, but the formation of moral habits. We become just and temperate not by listening to sermons in praise of justice and temperance, but by continually practising forbearance and mutual respect. According to Aristotle, the whole of morality consists in *willing* to observe in all things the due mean, and in *actually* observing it. The virtues of which he makes the most exhaustive study are the virtues of social life : justice and friendship.

Morality is concerned with pains and pleasures, and vice is tendency to excess. A man may avoid pain too much or seek pleasure too much, while it is his duty to pursue the mean in each case. Assuming that he knows and, in a sense, wills the good, what conditions cause failure ? The answer is that in some cases desire rises into action before the process of deliberation is complete. According to Plato, vice was ignorance. Aristotle saw that it was possible to have a right conception and yet fail in action ; for the principle of action is not identical with the principle of reason. Man is not a creature ruled by knowledge, he may have reason and yet not be wholly rational ; he may lose his reason and regain it, as he may be drunk and become sober. The power of clear reasoning is not always at the same degree of intensity. The passions can reduce a man's realisation of principle.

Individuals may start life maimed in respect of virtue ; there may be some essential flaw in a man's make-up, or disease may cause abnormal states. Moral deformity can be a natural phenomenon. **Wickedness is not always viciousness, it is frequently a congenital defect of will power for the right conduct.** Where there is viciousness pure and simple the condition approximates to that of the animal whose desires have no controlling reason. It is an exaggeration to call a man a beast, but as a descriptive term the word indicates a truth ; desire may be so perverse as to be unhuman. Bestiality is a failure of nature to produce the normal type or a decline from the normal state due to such accidental causes as disease.

The faculties are innate, but virtue and vice are acquired. He who would act morally must not only do the right, but he must do it in the right frame of mind. It is this, and not the outward effect, that gives to the action its moral worth. In order to be able to act morally, one must first be a man with a certain psychological and physical constitution and with a natural capacity for virtue ; for every virtue presupposes certain natural qualities, definite impulses and inclinations in which the moral qualities already to a certain extent reside. This natural disposition, however, is not yet moral. It is found, not only in children, but even in the lower

animals. Natural disposition and the operation of natural impulses do not depend upon ourselves, whereas virtue is in our own power. He excludes emotions such as fear, anger, pity, etc., from the sphere of praise and blame. Bravery, self-control, generosity, magnanimity, head the list of virtues. Religion is an absolute moral necessity, but the popular beliefs are palpable fables.

The soul and the body appeared to Aristotle to sympathise. When the former in any degree changes in quality, it also changes the form of the body, and, *vice versa*, when the latter undergoes a change in quality, it affects the condition of the soul. His perception of the fundamental principle of **physiognomy** is evident when he adds that, since it is one of the functions of the soul to be sorrowful and to rejoice, the face of the sorrowful must look sad, and of those who rejoice, cheerful. He believed vicious instincts to be hereditary, and gives in his book on "Physiognomy" the physical signs of habits, vices, and crimes; some of which are in accordance with modern scientific observation. He describes even a connection between the shape of the head and the mental disposition: "Those who have a large head are sagacious—are like dogs; those who have a small head are stupid—are like asses; those who have no shame—are like birds with curved claws." He even went so far as to contemplate the possibility of the mental and physical correspondence being retained after death. The sympathy between soul and body would remain if the form of the latter were retained. There would, however, be this difference, that the one could not contribute to the other in this life. In proof of this relationship during life he observes that **insanity** appears to attach itself to the soul, and yet physicians, by purging the body, and by diet, free the soul from insanity. As, therefore, the body is liberated from disease at the same time, it is clear that they contribute to each other. The similitude between physical forms and the mental powers is thus strongly insisted upon.

Aristotle was fully alive to the influence of fever in causing hallucinations or illusions, the instance given being the appearance of animals on the wall. If the patient is not very ill, he recognises the nature of the illusion; otherwise he is deceived. He compares this deception of the senses to what happens when the timid man, under the influence of fear, fancies he sees enemies from the slightest resemblance, or when the lover, under the influence of affection, thinks he sees the object of his love. In short, in proportion to the intensity of the passion by which a man is influenced is the resemblance by which he is deceived.

Charged with atheism, Aristotle left Athens in 322, and died soon after at the age of sixty-three.

THE PERIPATETICS

Aristotle used the open space of the Lyceum as a resort for his philosophical discussions, conversing with his scholars while he walked up and down in that gymnasium between the rows of trees; and from this custom his school derived the name of the Peripatetics.

THEOPHRASTUS, of Eresos (372-288 B.C.),

a physician, was his immediate successor. Of him need only be mentioned that he realised that the passions have their origin in corporeal movements, which, however, are only their occasional cause; the real principle of passion is the soul. Passion, in its turn, reacts on the body, modifies the movements of the latter, and the relations between them. Pleasure increases the powers of the body; pain contracts them.

The greater part of his works have perished. Among those preserved is his

History of Plants, in which he enumerates about five hundred different kinds, describes the details of their structure, the uses of their organs, the laws of their reproduction, and their diseases. He explains the fecundation of the female flowers by the pollen of the male; he recognises hermaphrodite and unisexual flowers, and points out how the fecundation of the latter is effected by the wind, insects, and by the water in the case of aquatic plants.

STRATO (-270 B.C.)

followed Theophrastus as philosophic teacher from 288 to 270 B.C., and represents the culmination of the naturalistic development begun by his predecessor. The activities of the soul are motions, and motions are inseparable from matter; for this reason he does not admit the existence of an immaterial soul, separable reason, or pure thought.

The object of science is the corporeal soul, which is a single force diffused through the body; it is distributed in the sense organs as the air in the flute. Reason is the activity of the central soul which is situated in the fore-part of the brain between the eyebrows. The soul is a pneuma controlled by the will and its diffusion through the body is deduced from the doctrine of the nerves. Attention is recognised as the indispensable condition for converting impressions into perceptions. Attention for Strato probably meant a direction of the pneuma or spirits to the organs of sense. Impressions may occur without coming into consciousness if the mind is occupied in some other direction. He did not consider that the actual sensation arose in the organ of the soul. There is no real distinction between reason and sensation; consciousness is a unity and denoted a rationality common to all functions of the soul. In this the animals share; they and we alike have only a reason which has grown up with the body. There is no immortality, no connate endowment of eternal truths, no reminiscence, and no pure activity of reason.

THE SCEPTIC SCHOOL

existed side by side with the Epicurean and Stoic schools.

ARISTIPPUS, of Cyrene (435-356 B.C.), a disciple to some extent of Socrates, had already argued that, as all knowledge consists in the first place of sensations, and that as these are the result of external impacts which they do not necessarily resemble, we have no certain information about the external world.

But **PYRRHO** (375-288 B.C.) was the real founder of the Sceptic school. According to him, we cannot know what things really are. Neither our senses nor our ideas teach us the truth. Complete reserve of opinion is the only satisfactory condition of thought.

He was followed by **ARCESILAUS** (316-241 B.C.), who said we cannot really know anything. One can say, "So it appears to me," but not, "So it is." Without any definite knowledge we must resign ourselves to our lot.

Another prominent sceptic was **CARNEADES** (213-129 B.C.), who held that self-preservation proves stronger than altruistic motives, when necessity arises. The moral and intellectual perfections of man are conditioned by his social and material environment. If we had no wants, no companions, no bodily senses, they would not exist.

In conduct the Sceptics were in the habit of following the usages prevalent among them, but their main efforts were directed toward holding their judgments in suspense, welcoming any ideas that seemed useful, and carefully avoiding such zeal for any opinion as seemed hostile to peace of thought.

The ten arguments, given fully by SEXTUS EMPIRICUS, are designed to show that we have no right to be confident in any opinion, because:

(1) The senses often deceive us ;
(2) Men differ in their natural needs and tastes ;
(3) Our senses often differ from each other in the impressions they give us of the same object ;
(4) The same man varies in opinion according as he is well or sick, sane or insane, drunk or sober, hungry, frightened, in joy, or in sorrow ;
(5) Different nations differ utterly in morals and theology ;
(6) We do not know substances in themselves, but only by their properties ;
(7) Objects appear differently on account of their position ;
(8) Many things affect us very differently in small and in large quantities ;
(9) What is rare is more valued and noticed than what is common ;
(10) Nothing can be known by itself, but only in its relations to something else.

Such arguments forced even the Platonists to admit that truth is utterly beyond our reach, and that the Infinite or Absolute is incomprehensible ; so that it is useless to inquire after any thing more than mere probability, and even this is unattainable in regard to God or immortality.

THE EPICUREANS

EPICURUS (342-270 B.C.), who lived at Athens, followed the **atomic theory** of Democritus and held that sensation is produced by images in the form of volatile atoms passing from the object through the air and striking upon the sense organs. Differences in the quality of the same organs must be explained by differences in the form of movement of the active bodies. All life and thought proceed from the constant motion of the atoms ; and these have power to change their direction spontaneously. This variability enables the mind to develop itself independently, and thus each man can become the author of his own destiny, and defy the Fates. Although Epicurus held that whatever takes place is the result of physical causes, operating by innate and natural laws, he was no fatalist. **He believed in freedom of the will,** or rather freedom of choice. He based a doctrine of freedom upon the postulate of accidental deviations in the course of falling atoms.

The soul was composed of very subtle elements diffused through the body, giving life to every part. He gave two proofs of this subtlety : in the first place, the promptitude with which the will moves the body ; in the second place, the fact that a man when dead weighs as much as when alive. The soul consisted of fire, air, pneuma, and of a fourth more mobile, more subtle element, which was the principle of sensation. The irrational soul (anima) extended throughout the body, of which it was the vivifying force. The rational soul (animus) was situated in the breast, and it alone possessed sensation and motion. These two souls, although they constituted one and the same being, were capable of difference in condition ; the mind might be serene, whilst the animal soul was in pain. The reciprocal action of the body and the soul was a sufficient proof of the corporeal nature of the latter.

Dreams and visions prove the existence of deities, but there is no proof that they take any notice of our conduct. They must be supposed to be perfectly good, and if so they can have no jealousy or anger. They must also be thought perfectly happy, but this requires that they should not trouble themselves about human actions, or any other natural phenomena. **Supernaturalistic beliefs of every sort were the worst enemies of that freedom from anxiety which to him was the principal condition of felicity.** There was no more fatal cause of anxiety about our future than the fear of what the gods were going to do to us in this life or in the next ; a fear which seems to have tortured many people of his time. According to Epicurus, as already mentioned, the immortals never troubled their heads about mundane affairs ; and as the soul did not survive the body, nothing need be apprehended from a future state. With the dissolution of the body there naturally followed the annihilation of the soul, and therefore, that which man regards as the most terrible

of all evils—death—is nothing to be afraid of. "When we are, death is not; and when death is, we are not." The sage may dismiss the thought of it.

We are to be virtuous from purely prudential considerations; not in order to make other people or the world in general happier, but because by that method we shall best secure our own good, our own pleasure. By pleasure, however, was not meant self-indulgence and sensuality, but happiness, such as is derived, for example, from agreeable social intercourse. Friendship always remained an object of special culture among the Epicureans. Their harmony remained unbroken by any difference of opinion.

The pleasures of the soul are exceedingly more precious than those of the body; for the body is only affected by the present, the past, and the future. The love of pleasure is a primitive instinct which gives the impulse to activity and determines its end. Epicurus distinguished between pleasure in repose, and pleasure in movement. The former is the true pleasure; the latter is only a means employed by nature to reach her end, which is the absence of pain. He did not admit an intermediate state. If only pain be absent, we enjoy all the pleasure that is possible. True happiness consists therefore in freedom from pain and in peace of mind. In order to rise above the present pain, men should enjoy life as a whole, and the pleasures that are past but capable of being recalled. He desired them to drive away the momentary suffering by all the pleasant memories they have stored up, and to free the mind from actual pain by occupying it with former joys and future hopes. It is therefore always open to man to be happy and free.

He classified **desires** under three descriptions. The first are natural and necessary—hunger, thirst; the second, natural but not necessary—love, family; the third are neither natural nor necessary—wealth, honour—and arise out of false opinion. To be happy it is enough to be able to satisfy the desires that are natural and necessary.

TITUS CARUS LUCRETIUS (99-55 B.C.),

the Latin Epicurean, may be quoted here as giving the gist of the Epicurean creed, besides the atomic theory of Democritus. Lucretius wrote a didactic poem, "On the Nature of Things" (55 B.C.), in which he endeavoured to emancipate the human mind from the superstitious fear of the gods. He ridiculed the belief that in the thunder and lightning the Lord of Heaven displays his power and manifests his will. Lucretius asks why, in that case, so many bolts are wasted without effect in the water and in desert regions; why Jupiter does not strike the wicked, but his own temples and statues. This imaginary power of the gods, he says, can avail nothing against fate and the laws of nature; for even their holy temples and images are not exempt from decay. In answer to those who hold that the world was originally formed by gods, he thinks it sufficient to object the evil and irregularities which are discovered in it. To those who fear that a denial of all religion must lead to godless principles and shameful crimes, he objects that religion itself has led to the greatest enormities: human sacrifices, for instance. It is not piety to prostrate one's self before every altar; piety consists rather in the calm and imperturbable feeling of the sage. What return could human gratitude be to perfectly happy beings, that they should be induced to undertake any thing for the sake of man? What could induce them to wake up from their eternal repose to the creation of the world? This false worship he derives from the ignorance of man, who from the manifestations of the divinity, in sleep, and even in his waking senses, had been led to form an idea of immortal beings of human form, but endued with eternal youth and infinite power, in order to be able to refer to the power of these gods, those phenomena of nature of which he could not discover the causes. The gods are not interested in human affairs, and do not exercise any providential control of them, and they have

no direction over the course of physical events. Instead of the gods creating the world—as commonly held—the world creates the gods. He attacks also the belief in the immortality of the soul. Who, he argues, that is acquainted with the nature of the soul, can doubt that this weak, frail body must, as soon as it is deprived of its shell, by being expelled from the body, be destroyed by the slightest shock? Nature is the only deity that he is willing to venerate; he preaches her holy laws and ordinances, and teaches that she produces all things, and suffers them again to decline and perish as soon as they have grown to their measure, as determined by their respective laws of existence. In the fifth Book, Lucretius points out the great fact of the **survival of the fittest.**

THE STOIC SCHOOL

Contemporaneous with the Sceptics and Epicureans we have the Stoic School.

ZENO, of Kittion (336-264 B.C.)

was the founder and the most representative of the Stoic School. He came from Cyprus to Athens; but his teaching became most popular in Rome. The natural bent of the Roman mind was towards practical affairs, and, therefore, Rome never developed a philosophy of its own, and its men of culture adopted Greek philosophy: its practical teaching more than its abstract speculations. Stoicism, therefore, formed numerous adherents and became the philosophic basis of that system of jurisprudence which is Rome's gift to the world.

Zeno, to begin with, opposed the spiritualism of Plato and Aristotle, if by spiritualism is meant that which falls outside the range of natural laws. **Psychic phenomena are reduced to physical facts.** All things are real in so far as they are capable of acting or of being acted upon. All things are therefore material. As Zeno defines matter in terms of action there is no dead matter and no opposition between matter and spirit. A pure **monism** is the result.

The corporeal cannot be affected by anything that is not corporeal; the body is affected by the soul, and soul is therefore corporeal. It is extended throughout the body as pneuma—the breath of life. It comes into being with the body in the physical mode of generation; but the material is a part of the divine fire which descended into the bodies of men when they first arose out of the ether. This fire of the soul is nourished by the blood, and the governing part of the soul has its seat in the heart, the centre of the course of the blood; for does not the air we breathe penetrate into our chest? Does not speech, the first manifestation of thought, proceed from the chest? In generation a part of the soul of the parents is transmitted to the embryo, which, so long as it is in the womb, has only a vegetative soul. It is after birth, and under the action of the external air, that, by a sort of condensation, the animal soul is formed. **Mental characteristics are inherited no less than physical qualities, and must therefore be corporeal.** Differences of character can be expressed in terms of finer or denser conditions of soul-matter.

There is a cycle of creative periods, and the soul has only the duration of one of them. Zeno admitted a survival of the human soul after death, but no purgatory. We must not expect annihilation, but reunion; and, as the tired man looks forward to the insensibility of sleep, so the philosopher, weary of the world, should look forward to the tranquillity of extinction. Of these things, however, we should think doubtingly, since the mind can produce no certain knowledge from its internal resources alone. **It is unphilosophical to inquire into first causes**; we must deal only with phenomena. Above all, we must never forget that man cannot ascertain absolute truth, and that the final result of human inquiry into the matter is that

we are incapable of perfect knowledge ; that, even if the truth be in our possession, we cannot be sure of it.

Every appetite, lust, desire, springs from imperfect knowledge. **Our nature is imposed upon us by Fate,** but we must learn to control our passions, and live free, intelligent, virtuous lives, in all things in accordance with reason. We must bear in mind that the majority of men are imperfectly educated, and hence we must not needlessly offend the religious ideas of our age. It is enough for us ourselves to know that, **though there is a Supreme Power, there is no Supreme Being.** There is an invisible principle, but not a personal God, to whom it would be not so much blasphemy as absurdity to impute the form, the sentiments, the passions of man. All revelation is, necessarily, a mere fiction. **That which men call chance is only the effect of an unknown cause.** Even of chances there is a law. There is no such thing as Providence, for Nature proceeds under irresistible laws, and in this respect **the universe is only a vast automatic engine.** The vital force which pervades the world is what the illiterate call God. The modifications through which all things are passing take place in an irresistible way, and hence it may be said that the progress of the world is, under destiny, like a seed—it can evolve only in a predetermined mode. Therefore, **the course of nature cannot be changed by prayer,** nor is it desirable that it should be changed.

SENECA (3 B.C.-65 A.D.) says : "No prayer is needed, except to ask for a good state of mind, for health of soul. . . . God is within thee. It is absurd to fear the gods, for they are ever beneficent. The only worthy temple of God is the universe ; he is not to be worshipped by temples, but by a pure heart ; not by sacrifices, but by a good life."

The **mind** is devoid of all content, a white sheet on which the senses write their various characters—the elements of knowledge. Only CHRYSIPPUS (280-207 B.C.), who followed Zeno, held that the result of sensation was not an impression but a modification of the mind. When the mind is subjected to the action of an object, the result is an image of the object, a presentation, which Zeno termed *phantasy* (image-making, imagination or ideation), and held to be connected with light, showing the object to the mind and illuminating the mind.

Mental activity as it is found in men is a developed and specialised form of the universal reason. The creature who possesses reason is therefore only its vehicle, and is perhaps more correctly described as possessed by reason. **Instinct is unconscious reason.** The reason has an inner and an outer activity. As inner activity it is the faculty of judgment and choice ; as outer reason it is manifested by speech. Reason in itself has no tendency to error ; man has by nature the infallible reason. It follows that truth is natural, error unnatural. If men err, it is through some depravity, and the supreme end of all science is the discovery of a cure for this depravity.

The passions are diseases of the reason, which cause assent to be wrongly given ; they are not useful and good in some degree as the Peripatetics held. **Virtue is knowledge, but vice is not ignorance ; it is due to want of restraint.** Error and vice are not identical in nature ; a wrong opinion may be corrected when a vicious habit cannot be changed. Vice is in our power at first, but may in time pass into a confirmed and unchangeable character. All passions are voluntary ; man is not a slave to passions ; there is no "lower" self tyrannising over a "higher" ; the affective side of our nature is not essentially distinct from the rational. The only valid distinction is between right and wrong activities of the reason : the ideal is right reason.

To understand the passions aright we must distinguish them from natural **impulses.** Zeno defines impulses as a tendency of the soul to or from something, covering both appetite and aversion. They are natural inclinations in creatures

endowed with sensation, and are really subconscious workings of reason. As the creature attains a higher degree of reason, impulse becomes rational and becomes an element in conduct. In place of mere impulse we now have conscious adoption of ends of action. The will to attain or avoid is now fully conscious assent. Zeno recognises that "the first impulse which an animal has is to protect itself," that is the **tendency to self-preservation.** When the impulses throw off the yoke of reason, passion is born. Passion is an excessive and irrational desire, a vicious, disordered reason. All passions are bad. Zeno distinguishes four ruling elements: pain, corresponding to present evil; fear, to a future evil; pleasure, corresponding to a present good; desire, to a future good; besides numerous subdivisions. As we pursue the good by a natural instinct, so we avoid the evil by a natural instinct. This instinct, when regulated by reason, becomes a caution, which is quite different from fear.

The Stoics maintained that the only man who can properly be said to be free is the man who leads a virtuous life. The free man is the man who lives as he wishes, but no man wishes to live a life of sin, and, consequently, the vicious man, however rich and powerful he may be, is really a slave; while the man who is virtuous under all circumstances, and he alone, is really free. Error of conduct they referred to errors of judgment; and errors of judgment are due to diseased states of mind, the obliquities of passion, which cause assent to be wrongly given. Accordingly the Stoics took a very broad view of abnormal mental states. They divided men into two classes; the wise and the foolish—just as sticks may be divided into straight and crooked sticks; and they called special attention to the fact, as it was neatly put by them, that very few sticks in this world are absolutely straight.

According to the Stoic teaching, man is a law unto himself. **Happiness is not to be sought in outward things, but in indifference to, and superiority over, all desires and passions.** Material good or evil, wealth or poverty, can neither add nor detract from the soul, and they are, therefore, to be despised. The world is as good as it can be made.

Virtue, to be truly such, must be accepted by us not as an external command, not as sanctioned by threats or promises, to be fulfilled either here or hereafter, nor yet as something the possession of which will enhance our self-esteem; but as our own free choice, to be preferred before all other gifts, even were its rejection to be condemned by none but the judge within our breast. The organic conception of the world and of society makes the virtue of humanity an imperative duty. **Conscientiousness toward man and resignation toward fate** became watchwords. In the Roman group they were embodied in **lofty maxims of friendship, duty, and humanity.** High thinking and plain living were the order. We are all members of one body, and the interest of each is identified with the interest of all. That the mutual slaughter of human beings should be made an entertaining spectacle, as in the gladiatorial games in Rome, was revolting to Seneca. The same feeling of humanity set itself strongly against the abuse of slavery.

The Stoic movement was a return to sober and practical understanding, after the vogue of high theories of the reason. Knowledge is the interest of practical life; prudence guided by information; freedom as expression of personality in a world ruled by law and subject to fate; social obligation and calm enjoyment opposed to capricious pleasure; such were the Stoic counsels of perfection. As a consequence of this Stoic teaching, the cry "Back to Nature," the search for landscape beauty, the enjoyment of country scenes and pleasure, spread widely, and the romantic love of the sexes became a leading motive of idyllic and dramatic poetry.

The Stoics gave currency to a new designation of the animating principle or theory of the vital processes, namely **pneuma.** Primarily, as has been already explained, the pneuma was regarded as the breath of life; it was warm air closely associated with the blood; it was a vital principle transmitted in generation; it

varied in density and accumulated especially in one region of the body. With the introduction of the pneuma began that trichotomy of human personality into body, soul, and spirit, which has figured prominently in the speculations of theologians. The conception of the soul or psyche, which through all the Greek philosophy had covered both the animating principle of all living things and the intellectual or mental principle of man, became differentiated into two conceptions, which long continued to figure in the European culture tradition more or less independently of one another : namely, on the one hand the vital force of the physiologists, and on the other hand the spirit or immaterial soul of man.

POSIDONIUS (133-50 B.C.),

an independent member of the Stoic School—the teacher of Cicero—held that we cannot explain everything by reason, the principle of the passions must be in the two inferior parts of the soul, which are intimately united with the body.

SENECA (3 B.C.-65 A.D.)

was adviser to Nero, until accused of conspiracy against him. He recognised **the influence of temperament on the passions.** It is the amount of warmth in the organism that is the cause of anger, which arises out of the heating of the blood in the region of the heart. In old age heat decreases, and anger gives place to persistent ill-temper. This was also the view of Galen. Since animals were not held to have reason, they were supposed to have something resembling passion. Animals, says Seneca, have images from which arise impetuous movements ; but these outbursts are violent, obscure, and fleeting. What is anger in man is ferocity in the brute. The animal tends to self-preservation and desires what is proper to its constitution, and by obeying this earliest natural instinct, it discovers pleasure. Pleasure is therefore not a primitive fact, but an accessory, or result.

EPICTETUS (60-118 A.D.)

was brought to Rome as a slave in the court of Nero, and sought comfort in philosophy, salvation amid the imperfections of life, rather than an intellectual discipline. He held that true liberty consists in controlling our thoughts and desires, in defending ourselves against external evils, entrenched in the impregnable fortress of the will. Some things depend upon ourselves, others do not. **What depends on ourselves is our thought,** whereas health, wealth, and all external advantages are things we have no control over. We should cling to what depends on ourselves, and nothing could then affect us. Liberty of mind is our most precious possession, not only because it frees us from all the evils created by opinion, but also because it is one with reason, that divine part of the soul, and therefore our dignity rests on it.

The Emperor **MARCUS AURELIUS** (121-180 A.D.),

a philosopher on a throne, took up the religious aspects of Stoicism. " To reverence God and help man " was his summary of a good life. But while he was intent upon the salvation of his own soul, he neglected the affairs of State and did not prevent the fiercest persecutions of the Christians.

THE NEO-PLATONIC SCHOOL

Neo-Platonism was an attempt to combine the philosophy of Plato with the mysticism of the East.

PHILO (20 B.C.-54 A.D.),

a great Jewish commentator, a contemporary of Jesus, may be regarded as the precursor of the Neo-Platonic School. He endeavoured to unite Greek thought with Hebrew religion. Owing to his character, fascinating philosophical speculations and literary ability, he exercised a great influence on Christian opinions.

The Egyptian Jews appear to have formed a mixed society mainly Hellenic in manner and language, but still thoroughly Jewish in temper. A note altogether foreign to the Old Testament is struck in the repeated references to individual immortality; but the idea was still in its infancy and the nature of the immortal life was but vaguely outlined. The allegorical method of interpreting the Sacred Scriptures, which had long prevailed among the more cultivated of the Alexandrian Jews, was adopted by Philo without restriction. The prophets were only involuntary instruments of the spirit which spoke through them. Philo criticises the attitude of those who merely hold fast to the literal sense of the Scriptures as law, as unworthy and superstitious. **The anthropomorphic representations of Scripture are only permitted as an accommodation to the wants of sensuous man,** while for the discerning and spiritual it declares that God is not like a man, nor like the Heavens, nor like the world. God is exalted by Philo as above all human knowledge and virtue and above the idea of the good, as Plato had assumed. He contends that God is to be worshipped as a personal being, yet he conceives him at the same time as the most general of existences. **Philo rejects the notion of a resurrection of the body** and holds to the natural immortality of the soul.

According to Philo, man's bodily form is made from the ground, the soul from no created thing, but from the father of all; so that, although man was mortal as to his body, he was immortal as to his mind. The death of man is the separation of soul from the body; the death of the soul is the corruption of virtue and the assumption of vice. A polished, purified soul does not die, but emigrates: it is of an inextinguishable and deathless race, and goes to heaven, escaping the dissolution and corruption which death seems to introduce. Different regions are set apart for different things—heaven for the good, the confines of the earth for the bad.

The Hebrews, like so many other peoples, had conceived the soul as air, wind, breath. But this air was breathed into man by God, and therefore, as the conception of God was dematerialised, so also the pneuma emanating from him to become the soul of man becomes an immaterial substance. But in Philo's doctrine the process of dematerialisation is not completed. The animal soul of man is generated and destroyed with the body, and the pneuma, which is the rational soul breathed into him by God, is the last sublimation of the physical principle of the Stoics. Furthermore, just as there are two distinct souls in human nature, so life, too, is divided between the **life of the flesh** and the **life of the spirit,** or between sense and reason. The explanation of this dual nature is to be found in the story of creation; for there we learn that man was created, as to his body, from the earth, and as to his soul, by God himself.

To the rational soul, Philo attributes three separate faculties: understanding, sensation, and speech; and to the irrational soul, the sensual passions and affections. He affirms that the understanding is not only a divine spirit, but an inseparable portion of the divine essence itself. The soul is possessed of complete liberty of action. God has given to man **prudence** to govern his reason, **courage** to restrain his passions, and **temperance** to repress his sensual desires. Sometimes the soul, invested with the senses, only sees sensible objects; sometimes, by taking a spontaneous flight, it disengages itself from material influences, and elevates itself to the perception of intelligent things. It is this deliverance from the bondage of the body that the truly wise always aspire after; the overcoming of this conflict between the senses and the free exercise of the understanding, constitute wisdom in

its loftiest acceptation. It is from this contemplation of the divine essence that **man obtains all his true knowledge, and arrives at virtuous excellence.**

PLUTARCH (40-120 A.D.),

the historian, was an eclectic Platonist. He recognised a cosmic dualism, and in accordance with it an essential dualism in man. The soul is a unity of opposing principles, of rational and irrational principles, good and evil. The reason rules over the irrational principles, which include desire and spirit. To this Platonic division of psychic activities are added the nutritive and sensitive functions (of Aristotle), but these are to be recognised as ethically neutral. Thus results a fivefold division of activities: nutritive, sensitive, desire, spirit, and reason.

Influenced by Jewish notions, Plutarch describes God as the origin of all that is good. He is one who sees but is not seen; knows and is not known, though we can attain some knowledge of him through nature and still more in moments of inspiration. He is Providence, superior to intellect, a forethought which is before all thought; and between God and man there are intermediate beings, the lesser gods who reside in heaven and the spirits who watch over men. **The universe is governed by Providence and Destiny.** Nevertheless the will is free, for Destiny is a hypothetical necessity, which leaves particular actions untouched. **Man acts under unchanging laws, but the law does not compel any action.**

Man's thoughts come to him from outside, from something not himself, and his intuitions are really revelations. **Dreams** are experiences of the soul when it withdraws into itself away from the body. He believes in a **second sight,** which is an activity of the soul possible under certain conditions. These conditions are realised in sleep, in physical states produced by ascetic practices, and under the influence of certain exhalations, *e.g.*, those at Delphi. The "scientific" explanation of all these cases is that the pneuma becomes more refined and capable of exercising powers which are hindered by the grossness of its usual condition. With this mystic notion is associated Plutarch's doctrine of a **world of spirits,** kingdom of purer beings with whom the soul of man has communion when it is purified by the contemplation of eternal truths. The union of soul and body is traced to a "fall"; the soul has consequently a power of self-restoration by which it may ascend from earth to the moon and thence again to the sun. For the sun is the original source of spirit as the earth is of the body.

The proof that the soul is immortal consists in (1) the need of a future life in which goodness may be rewarded; (2) the origin of the soul, which is born of God; (3) the natural feeling of abhorrence from the idea of annihilation.

Plutarch maintained that animals can think, but as a rule it is unreflective thought, *i.e.*, instinct. (His medical views will be dealt with in the next chapter.)

PLOTINUS (205-270 A.D.)

The mystical character of Neo-Platonism found eloquent expression in Plotinus, who came to Rome from Egypt, and is the most representative of this school. He rejected the Stoic doctrine of the pneuma, and also the idea of a central Reason. His own belief was that the soul is a reality belonging to a higher degree of Being than matter.

Our personality, according to Plotinus, cannot be a property of the body, for this is composed of parts, and **is in a state of perpetual flux.** A man's self, then, is his soul; and the soul cannot be material, for the ultimate elements of matter are inanimate, and it is inconceivable that animation and reason should result from the aggregation of particles which, taken singly, are destitute of both; while, even where

it is possible, their disposition in a certain order would argue the presence of an intelligence controlling them from without. Again, to suppose that the soul shares in the changes of the body is incompatible with the self-identity that memory reveals. To suppose that it is an extended substance is irreconcilable with its simultaneous presence as an indivisible whole at every point to which its activity reaches, as well as with the fact that all our sensations, though received through different organs, are referred to a common centre of consciousness. If the sensorium is a fluid body, it will have no more power of retaining impressions than water has; if it is a solid, new impressions will not be received at all, or only after the old impressions have been effaced. Passing from sensation to thought, it is admitted that abstract conceptions are incorporeal; how, then, can they be received and entertained by a corporeal substance? Or what connection can there be between different arrangements of material particles and such notions as temperance and justice? So much for the Stoics.

Turning from them to the Epicureans, Plotinus argues that to deduce mind from atoms is even more absurd than to deduce it from the elementary bodies. Granting that the atoms have a natural deflection, and so impinge upon one another, still this could do no more than produce a disturbance in the bodies against which they strike. But to what atomic movement can psychic energies and affections be attributed? What sort of collision in the vertical line of descent, or in the oblique line of deflection, or in any direction you please, will account for the appearance of a particular kind of reasoning or mental impulse or thought? How can it account for the existence of such process at all? **Plotinus agrees with Epicurus in upholding human free-will** as against Stoic fatalism; but, instead of using it as another argument against materialism, he prefers to regard the soul's self-determination as a logical consequence of her spiritual nature.

According to Plotinus, the soul uses the organs of sense as its instruments; it is itself unaffected. External impressions are made upon the sensitive soul by objects and are stored there until the cognitive soul turns toward them and chooses to behold them.

Memory is the soul's power of knowing its own former activities. We have memories of activities which were not sensations, memories of thoughts themselves; and this could not be if memory was only a storehouse of impressions. Memory depends on forms, but forms are not impressions; they are modes of activity directed toward sensation rather than derived from it. Memory of that which did not happen is memory of an activity which failed to reach its object; clearly there could be no memory of an object that failed to reach the soul. Memory is a state which may be described as an affection of the soul apart from the body. The body may assist or hinder the soul in its efforts, but the body does not itself remember in the proper sense of the term. Being a kind of thought and distinctively a mental activity, it belongs to sensation rather than feeling.

Feelings leave traces, and there is a certain cumulative tendency in feelings which amounts to a **propensity**; this is an obscure form of retention which occurs below the level of conscious unity.

According to Plotinus, **thought in its highest form is passionless**; the body alone is affected by the emotions. The soul merely perceives what takes place in the body; it has a passionless perception of them. The soul by itself has no sensuous desires. A movement arises in the body, in consequence a desire springs up in the lower part of the soul which belongs to animal life and is connected with the body, and this desire awakens in the superior, the real soul, images by which it is either satisfied or repressed. Passion has sometimes also its starting point in the soul. Anger always implies a disturbance of the blood and of the bile, but this organic disturbance is sometimes a starting point and sometimes a consequence, and is caused in the soul by the idea of injustice. Thus feelings and desires that are purely spiritual may be awakened in the soul, such as joy, the desire for knowledge, and the love of beauty, which prepare us for the pure contemplation of the true.

The soul is that which has life in itself and gives life to the organism; it is immaterial and gives life to the body. It is more correct to say that body is in soul than that soul is in body. Soul does not mix with body, but dwells beside it, and either goes forth to it or withdraws from it. Neither are the sensuous faculties lodged in the body; they are only present with the body, the soul lending to each bodily organ the force necessary for the execution of its functions. Thus **the soul is present** not only in the individual parts of the body, but **in the whole body,** and present everywhere in its entirety, not divided among the different parts of the body.

The Soul is distinguished from Spirit chiefly by the presence of unfulfilled desire; Spirit being free from all desires.

There is a **World-Soul,** which is an object of worship, and scarcely distinguishable from Spirit. It is only by contemplating the World-Soul that the individual soul can understand itself.

The world issues from God—who is impersonal, and above all beings and all thought—by a series of emanations or outpourings; by these He is manifested, without loss of impoverishment to Himself. In concentric circles, the Divine becomes dilute, its perfections are impaired in the world-soul and in angels, demons, and men. This is the "fall," the descent of man.

In consequence of their descent into corporeality, the souls of men have forgotten their divine origin and become unmindful of the Heavenly Father. They wished to be independent and fell constantly farther and farther from God. Hence the need of man's conversion to that which is the more excellent. Man has not lost his freedom, the absence of constraint. Some men remain buried in the sensuous, holding pleasure to be the only good and pain the only evil; they seek to attain the former and to avoid the latter, and this they regard as their wisdom. Others, who are capable of rising to a certain point, but are yet unable to discern that which is above them, become only virtuous, and devote themselves to practical life, aiming merely to make a right choice among those things which are, after all, only of an inferior nature. But there is a third class of men of divine nature, who, gifted with higher power and keener vision, turn toward the radiance which shines from above and rise into its presence. This is the highest point of contemplation. It is reached when we are completely buried in ourselves and elevated even above thought, in a state of unconscious ecstasy and love, suddenly filled with the divine light. Thus we become so immediately one with the primal being that all distinction between it and us disappears.

There are no words in which to describe ecstasy, because ecstasy transcends reason. It is arrived at by a sort of self-hypnotism, "by a suspension of all the intellectual faculties, by repose and the annihilation of thought." As the soul learns to know sleep when slumbering, so it is in ecstasy or the annihilation of all the faculties of her being, that she knows that which is above existence and above truth.

The greatest men of Rome regarded the teaching of Plotinus as a message from Heaven, and venerated him as a prophet. (One of the latest and best works on "The Philosophy of Plotinus" is by the Dean of St. Paul's, the Rev. Dr. W. R. Inge.)

Towards the end of the fourth century Neo-Platonism changed its character. The search for truth was gradually subordinated to the promotion of polytheism as opposed to Christianity. **PROCLUS** (410-485 A.D.) was the last prominent representative. Under the Emperor JUSTINIAN (483-565), by whose edict Pagan philosophies were oppressed and the schools of Greek philosophy at Athens and Alexandria were closed, Neo-Platonism ceased to exist as a school, and priests became the depositories of such knowledge as survived.

CHAPTER IV

MEDICAL VIEWS OF MIND AND BRAIN IN ANCIENT GREECE AND ROME

MEDICINE IN ANCIENT GREECE

IN giving a history of the speculations of men on the nature of the soul, it is not sufficient, as psychologists do, to give an account only of the history of philosophic thought, but we must take note of the civilisation in general and the progress or neglect of science in particular; more especially that branch of science which deals with human life, namely medicine, and that particular part of it which deals with the disorders of the human mind, namely insanity.

The earliest records of Hellenic life show that it was universally believed that **every sickness was due to the anger of some offended god,** and especially was this supposed to be the case in epidemics and plagues. Such a paralysing notion was necessarily inconsistent with any attempt at the relief of communities by the exercise of sanitary measures. There was one god, however, in Greek mythology—Apollo—who was hailed as the god of light and the promoter of health. He was supposed to disperse epidemics, thus showing that the ancient Greeks were informed of the power of the sun's rays to destroy infection. Apollo was supposed to have taught Centaur, and he, in turn, to have taught **ÆSCULAPIUS,** who probably lived in the thirteenth century B.C. and was ultimately deified as the Greek God of Medicine. Splendid temples were built to him in lovely and healthy places on wooded hills and mountain sides, near mineral springs, a sort of **popular sanatoria,** managed by trained priests and, in intention, not unlike the health resorts of modern times. Patients flocked to the temples of Æsculapius, or were brought there by their friends, to offer up sacrifice and prayer to the gods, as in more modern times these were brought to holy wells and churches. It does not appear that any fee was exacted for the celestial advice; but the gratitude of the patient was frequently displayed by optional gifts.

The practice of Greek medicine became almost entirely restricted to the temples of Æsculapius, the most important of which were situated at Rhodes, Cnidos, and Cos. The priests were known as Asclepiàdæ, but the name was applied in time to the healers of the temple who were not priests. **Mental suggestion** was extensively applied.

After prayers to the god of healing, ablutions and sacrifices, the patient was put to sleep on the skin of the animal offered at the altar, or at the feet of the statue of the divinity, while the priests performed their sacred rites. **In a dream** he would have pointed out to him what he ought to do for the recovery of his health. Pure air, cheerful surroundings, proper diet and temperate habits were advocated, and, among other methods of treatment, exercise, massage, sea-bathing, the use of mineral waters, purgatives and emetics, and hemlock as a sedative, were prescribed. When a cure was effected, a record of the case was carved on the temple walls.

These temples were the famous medical schools of ancient Greece; but medicine at

this period was not a science to be taught to all comers, but was a mystery to be orally transmitted. A spirit of emulation prevailed, and a high ethical standard was attained, as is shown by the famous **oath**—said to have originated in Egypt—prescribed for students when they completed their course of study. The pupil swore to lead a holy life, to follow the profession to the best of his ability and judgment, not to dispense poisons or to aid abortion, if asked to do so, not to take advantage of the opportunity of seduction, and to keep the information supplied by the patient a secret.

The Pythagoreans apparently first introduced the custom of **visiting** patients in their own homes, and they went from city to city and house to house in performance of this duty. For this reason they were called periodic or ambulant physicians, in opposition to the Asclepiadæ, who prescribed only in the temples.

ALKMAEON (550-500 B.C.),

a doctor of Crotona, contemporary and disciple of Pythagoras, was **the first to demonstrate the intimate connection of the brain with conscious life.** He was especially devoted to the study of anatomy and physiology, and is credited with the distinction of having been the first person to dissect animals for the purpose of learning the formation of the different parts of their bodies. To him we owe the first treatment of the human organism which is in any sense based on direct scientific work, *i.e.*, on physiological and biological facts. He has the credit of being the discoverer of the optic nerve, and he endeavoured to explain the sensation of light as it strikes the eye : reflection gives an image of the object in the watery element of the eye. He attempted also an explanation of hearing, the moving air converging the sound to a chamber filled with air in the ear, otherwise the air and not the sound would be conveyed to the brain. It is interesting to observe that **he explained sleep** as due to the retirement of the blood into the larger bloodvessels.

PHILOLAOS (-480 B.C.),

Alkmaeon's pupil, developed his teachings and distinguished between sensory, animal and vegetative functions and their localisations, later more definitely stated by Plato and Aristotle. He localised the " human " element in the brain (the seat of the intellect), the " animal " in the heart, and the " vegetative " (growth) in the navel. The causes of disease, according to him, were bile, blood, and phlegm.

EMPEDOCLES, of Agrigentum (*ca.* 495-435 B.C.),

the philosopher, of whom an account was given in Chapter II., was another famous physician. He is remembered as having placed the seat of hearing in the labyrinth of the temporal bone, which he discovered (the ossicles of the ear were not discovered until two thousand years later), and for having anticipated the doctrine of natural selection.

Empedocles asserted that the embryo results from a mixture of male and female semen, and receives the form of either as one or the other predominates, or according as the imagination of the mother may be more or less called into action. He gave the name of amnios to the membrane which encloses the fœtus and to the water in which it swims.

ANAXAGORAS, of Chazomene (500-428 B.C.),

a contemporary of Empedocles (see Chapter II.), celebrated for his Homoiomerian theory as well as for his assumption of a future spiritual life, belonged to those

philosophers, who, like Herakleitos, practised dissection of animals, following the illuminating example of Alkmaeon. Anaxagoras laid the foundation of **dissection of the brain,** and is the first to mention the lateral ventricles. The brain he supposed to be the first organ developed in the embryo. Most acute affections, according to him, are caused by bile (of which he distinguished two varieties : black and yellow) which permeates the blood and organs.

Anaxagoras believed that the embryo proceeds solely from the paternal semen, and that the mother provides only a place for its development.

HIPPOCRATES (460-370 B.C.)

Hippocrates lived in the golden age of Greek culture, about the second half of the Vth and the beginning of the IVth centuries B.C. This period corresponds to that wonderful epoch in which human intelligence suddenly attained to heights not since surpassed. The three men most distinguished in science and philosophy at this period were : Hippocrates, Plato, and Aristotle. They were contemporaries of Pericles, the statesman, Herodotus and Thucydides, the historians, and many other remarkable men.

Hippocrates was **the first to separate medicine from philosophy,** to deliver it from the thraldom of superstition and the sophistries of philosophers ; in short, to give it an independent existence. He led his patients out of the temples of Æsculapius and proceeded to treat them by ordinary medical means. He taught that one disease is no more divine or human than another, but that each is due to a natural and intelligible cause, and showed that in the observation of facts lay the only path leading to truth in medicine. When the gods were stripped of the power of producing disease, they likewise ceased to be called upon to cure it.

Hippocrates is rightly called the father of medicine. He lays emphasis on climate—the atmosphere breathed—and all the elements which constitute environment. His views upon the importance of diet, exercise, gymnastics, massage, and hygiene were sound and wise. He was also the father of surgery. True, many of the works attributed to him may have been the production of his pupils. None the less, eight of his seventeen genuine works are strictly surgical. He was a skilful bone operator in dislocations and fractures, and performed operations on the head, thoracic and abdominal cavities, and used as an **antiseptic** " raw tar water," a crude sort of carbolic acid.

In fracture of the skull with depressed bone the **trepan** was applied, and in cases where blood and pus had accumulated they were skilfully evacuated. He insisted that no injuries to the head were to be considered trifling ; even wounds of the scalp may prove dangerous if neglected. He said that convulsions are the frequent consequence of head injuries, and that they occur on the opposite side of the body to that in which the brain injury is seated. All this is in harmony with modern knowledge.

Among the diseases of antiquity there was one, **epilepsy,** which by reason of the spectacular manner of its operation was peculiarly, calculated to support the prevalent belief in the supernatural source of disease. Hercules was supposed to suffer from it, hence the disease was known as Morbus Herculeus ; but later it came to be known as *morbus sacer*, or " sacred disease," under which name Hippocrates described it, on account of its assumed divine origin, but he did not consider it " sacred " ; for to him all diseases were divine, and all human. He wrote :

" The sacred disease appears to me to be in no wise more divine nor more sacred than other diseases ; but has a natural cause, from which it originates like other

affections. Men regard its nature and cause as divine from ignorance and wonder, because it is not at all like other diseases. . . . They who referred this disease to the gods appear to me to have been just such persons as the conjurors, purificators, mountebanks, and charlatans now are. . . . Such persons, then, using the divinity as a pretext and screen for their own inability to afford any assistance, have given out that the disease is sacred, adding suitable reasons for this opinion, and they have instituted a mode of treatment which is safe for themselves—namely, by applying purifications and incantations, and enforcing abstinence from baths and many articles of food, which are unwholesome to men in disease. . . . This disease is formed from those things which enter and go out of the body, and it is not more difficult to understand and cure than the others, neither is it more divine than other diseases."

He goes on to say that epilepsy in "its origin is hereditary," and herein he gave form and currency to a teaching already present in the Pythagorean School. Altogether, **he believed in the hereditary transmission of qualities,** not only physical but also mental. "Our tendencies toward virtue and vice, as well as toward health and disease, come rather from our parents and from the principles of which we are composed, than from ourselves." Again, in speaking of the qualities necessary for a physician, he speaks of natural and innate dispositions.

According to Hippocrates, man was a miniature embodiment of the universe; the four elements of the latter—earth, water, fire, and air—being represented by the **four humours:** blood (warm) found in the vessels, yellow bile (dry) in the liver, mucus (cold) in the head, and black bile (moist) in the spleen; these four humours contributing to the body the respective qualities of dryness, moisture, heat, and cold. He explained the differences of organisation, *i.e.*, of the temperaments of men, on the basis of these four humours. In this respect we must remember that the ancients had no scientific instruments aiding them in diagnosis and that they had no physiological and little anatomical knowledge. In consequence they eagerly cultivated a knowledge of external signs, and finding that people differed, often remarkably, in external conformation, as well as in mental and moral character, they attributed those differences to the excess of one or other of the humours of the body—*e.g.*, the blood, bile, lymph, or phlegm, and according to the mixing of these fluids there resulted an excess or deficiency in their constitutions. Therefore persons were described as of a sanguine, bilious, melancholy, or phlegmatic temperament.

Similarly Hippocrates explained all disease by a mixture of these four humours and based his medical treatment upon this theory, prescribing medicine to expel the predominant humour—to expel mucus, or to remove bile, etc. If a disease were progressing favourably these humours became changed and combined, preparatory to the expulsion of the morbid matter, which took place at definite periods known as critical days. This humoral pathology was derived from the fact that digestive disturbances precede or accompany most diseases. It lasted for ten centuries and was abandoned only after the Renaissance. Whatever we may think of it, it must be acknowledged that Hippocrates was the first independent physician, one of the greatest minds of all time, a close observer, an acute clinician, and a practical therapeutist. We must acknowledge that amidst much that is crude and empirical in his works, there is genuine recognition that in the field of disease events follow a natural sequence, that effects are proportionate to causes, that order reigns, and that the business of the physician is to investigate that order.

We are indebted to him for the **classification of diseases** into sporadic, epidemic, and endemic, and he also separated acute from chronic diseases. He divided the causes of disease into two classes: general, such as climate, water, and sanitation; and personal, such as improper food and neglect of exercise.

Public opinion condemned dissection of the human body in ancient Greece, but it is certain that dissections were performed to a limited extent. Hippocrates did not know the difference between arteries and veins, and nerves and ligaments and

various membranes were all thought to have analogous functions, but his writings display a correct knowledge of the anatomy of certain parts of the body such as the joints and the brain.

Within the body the **brain** occupies the most important place. From it proceed, according to Hippocrates, all the veins of the body. Into the brain lead the various passages of sense—eyes, nose, ears. All diseases begin from the brain because from it flow the humours that are found throughout the body. The brain is the seat of intelligence, but only because it is adapted to retain the air, a medium by which the air communicates to us its nature; the changes in the diaphragm and heart are merely reflex action due to the contraction of air vessels. Thus the heart palpitates in fear; but this is secondary, a reverberation of the original encephalic motion. Thought can only arise in the absence of commotion. Insanity arises from a humid condition of the brain which causes it to move perpetually and produces confusion of the senses.

Of Alkmæon we have no direct records—his writings have all been lost—but there is plenty of evidence that Hippocrates laid down the principle that **the brain is the organ of mind,** that consciousness is located in the brain, and that **insanity** is merely the result of some disturbance in this organ. He said:

"Men ought to know that from nothing else but the brain come joy, despondency, and lamentation . . . and by the same organ we become mad and delirious and fears and terrors assail us, some by night and some by day; and dreams, and untimely wanderings, and cares that are not suitable, and ignorance of present circumstances, desuetude, and unskilfulness. All these things we endure from the brain when it is not healthy, but is more hot, more cold, or more moist, or more dry than natural, or when it suffers any other preternatural and unusual affection. And we become mad through humidity (of the brain). For when it is more moist than natural, it is necessarily put into motion, and, the affected part being moved, neither the sight nor the hearing can be at rest, and the tongue speaks in accordance with the sight and hearing. As long as the brain is at rest man enjoys his reason; but the depravement of the brain arises from phlegm and bile, either of which you may recognise in this manner: Those who are mad from phlegm are quiet and do not cry out or make a noise, but those from bile are vociferous, malignant, and will not be quiet, but are always doing something improper. If the madness be constant, these are the causes thereof; but if terrors and fears assail, they are connected with derangement of the brain, and derangement is owing to its being heated. And it is heated by bile when it is determined to the brain along the blood-vessels running from the trunk, and fear is present until it returns again to the veins and trunk, when it ceases. He is grieved and troubled when the brain is unseasonably cooled and contracted beyond its wont. It suffers this from phlegm, and from the same affection the patient becomes oblivious."

He regarded mental derangement as a disease similar in its nature to bodily disease, and distinguished between mania, melancholia, and dementia, the oldest division of insanity which prevailed till quite recent times.

As to those labouring under melancholia, he spoke of their anxiety, their love of solitary places, their fears, and the frightful dreams by which they are tormented. He mentioned also loss of sleep and aversion to food. Mania he recognises as insanity with violence, and dementia as mental weakness. Insanity was due to the bile mixed with the blood being carried to the brain. The black bile, for instance, was the cause of the dark passions, such as suspicion, jealousy, hatred, and revenge; while the yellow bile produced great irritability, high spirits, and extravagance. Considering our modern theories of the causation of insanity by toxins, we are enabled to take a more lenient view of the Hippocratic pathology than older writers have done.

As regards the **causation of insanity,** practically all the factors which are discussed

in current text-books were set down. Physical and mental causes were distinguished, and the effects of moral shock and of organic disease of the brain, or of remote organs, were recognised; likewise the modifying influence of climate and season, of age and critical times of life. The results of alcoholic excesses and the prolonged use of other drugs, of excessive indulgence or repression of the appetites, of protracted watching and fatigue, of exposure to extremes of temperature, of injuries to the head, of reverses of fortune, of disappointment in love, of the subjection of the mind to fear and superstition, of the sustained tension of sinew and nerve in the race for fame and fortune—all those things found place in the etiology of insanity as set forth by the Hippocratic school.

Provision for the insane in Greece was made by having dangerous lunatics imprisoned, harmless lunatics cared for by their friends, and prodigals deprived of the control over their property.

That the Greek public took a very broad view of insanity and often regarded very harmless deviation from ordinary conduct as indicating its existence is afforded by an interesting illustration in the commission which Hippocrates received from Abdera to make inquisition into the mental state of the worthy anatomist Democritus, who had caused anxiety to the inhabitants by his practice of dissecting the bodies of animals.

Modern psycho-analysts were anticipated by Hippocrates, who thought some **dreams** belong to a special class that can only be understood by the interpreters who have a science of their own. In the dream state the soul acts freely; it is no longer disturbed by sensations, for the body sleeps. The soul then produces impressions instead of receiving them. Underlying these reflections seems to be the idea that the soul discovers in sleep what in the waking state goes on unnoticed. This amounts almost to the view of the modern Freud school that a latent consciousness comes to the surface in dreams.

Hippocrates approved of prayer as an excellent thing, but he remarks that it does not remove the need for self-help.

THE DOGMATISTS (about 357-264 B.C.)

With the decadence of philosophy in Greece medical knowledge also suffered, but there were some schools which gained considerable renown. First of these in time was the Dogmatic School. The Dogmatists made an attempt to found a scientific system of medicine, and sought for the hidden **causes of disease,** though their efforts were premature. The Dogmatists had the acumen to perceive that a science of medicine must be based upon physiology; their error consisted in attempting to erect a complete edifice before there were materials suitable or sufficient for the foundation.

The Dogmatists maintained that it was not enough for the physician to know the mere symptoms of his patient's malady; he must acquaint himself with the hidden causes. He must know the principles on which the human machinery is constructed before he can scientifically treat the accidents and disturbances to which it is liable. He must have a theory which he can apply to the treatment of his patients, and the best physician would be the one who best knew how the disease originated. Experiments without theory were valueless; their chief use was the confirmation of his conjectures. Anyone can discover the immediate or evident causes, but the physician must discover the remote or hidden causes, otherwise his practice will be mere guess-work. Another striking factor in the development of the school was the influence of the Sophists. This had the effect of giving an enormous importance to the power of talking, so that to be a skilled rhetorician was a sure passport to success as a physician.

The Dogmatists found a close relation between the two facts of animal heat and

respiration. They attached great importance to the pneuma, coming from the ether. "All space between heaven and earth is filled with a subtle vapour which is for mortals the principle of life and the cause of disease." The chief representatives of the Dogmatic School were **DIOXIPPUS** (*ca.* 370 B.C.) and **PRAXAGORAS** of Cos (*ca.* 340 B.C.).

Praxagoras distinguished the arteries from the veins. The veins were full of blood, and the arteries, which in the dead body were empty, only serve for the circulation of the air, or of the pneuma; and they play in sensation the part which we attribute to the nerves. He believed that a wounded artery attracted the blood from other parts of the body, thus causing it to flow out. Galen was astonished that Praxagoras should have pretended to judge of the state of the blood by feeling the pulse, as he did not admit the existence of that fluid in the arterial vessels. As numerous anastomoses were found between the veins and the arteries, a whole theory of disease was based by Praxagoras on the invasion of the arteries by the blood. He explained epilepsy as caused by obstruction of the bloodvessels. There is a similar modern theory that the epileptic fits are due to spasmodic contraction of the cerebral arteries.

The later members of the Dogmatic School came under a very different influence, namely, that of the Stoics, and this had the effect of giving a materialistic turn to their doctrines.

THE ALEXANDRIAN SCHOOL

began meanwhile to flourish during the reign of the Ptolemies, the enlightened rulers, at Alexandria, some 300 years B.C. PTOLEMY SOTER (367-283 B.C.) originated and PTOLEMY PHILADELPHUS (309-246 B.C.) completed the Alexandrian Museum and Library. It was the greatest attempt at a collection and organisation of human knowledge. The studies were arranged in four comprehensive divisions or faculties, as in a University, namely: Literature, Mathematics, Astronomy, and Medicine, the last including such subjects as Natural History.

Under the munificent patronage of these princes, **astronomy** began to be cultivated as a science of combined observation and theory. One of the earliest astronomers was **ARISTARCHUS** (*ca.* 212-140 B.C.), who came from Samos to Alexandria and was tutor to the sons of one of the Ptolemies. He taught that the sun was immovable like the fixed stars, and that it was the earth which travelled round the ecliptic. He knew also that our earth does not stand quite upright in its journey round the sun, but that a line drawn through the earth from the North to the South Pole would be sloping or oblique to the ecliptic, and that this obliquity is the cause of our four seasons. Aristarchus appears also to have been the first Greek who understood that night and day were caused by the earth turning round its axis every day. If the Greeks had understood his teaching, especially about the earth moving round the sun, they would have made much more progress in astronomy. Some, like Pythagoras, for example, knew that the earth moves, but they would not believe that it went round the sun. This had to be re-discovered 1,700 years later by Copernicus.

The Greeks in spite of all their great intellectual genius failed in physical science. The cause of this failure appears to be that the ancient Greek philosophers eagerly grasped at generalisations, suggested indeed by observation, but unsupported by the slow and laborious process of experimental verification; and they applied these generalities as universal principles, satisfied with any conclusions which might by mental operations alone be clearly deduced. In the Alexandrian School we find observation and experiment in some measure taking the place of speculations as to what would happen according to certain assumed principles. Results of permanent value were thereupon attained.

The famous **EUCLID** (367-283 B.C.) opened a geometrical school in Alexandria

about 300 B.C. His fame was eclipsed by his pupil **ARCHIMEDES** (287-212 B.C.), the greatest mathematician of antiquity, who in mathematics, geometry, physics, and mechanics, had no equal. A contemporary, famous for his chronological and astronomical works, was **ERATOSTHENES** (276-194 B.C.), who was Keeper of the Alexandrian Library. He made a map of all the world that was then known, and described the countries of Europe, Asia, and Lybia. But his two great works were laying down the first parallel of latitude and trying to measure the circumference of the earth.

It is to **HIPPARCHUS** of Alexandria (190-120 B.C.), a mathematician as well as an observer, that the origin of astronomy, as a science of mental calculation, is generally attributed. His works perished, along with many other priceless relics of the past, in that great calamity for the human race, the conflagration of the Alexandrian Library. Hipparchus, by enrolling the visible stars to the number of 1,080, by discovering the precession of the equinoxes, by detection of the eccentricities of the solar and lunar orbits, his calculation of the solar year but twelve seconds more than its real length, his tables of the apparent motions of the sun and moon, his directions for the systematic prediction of eclipses and for the study of straight and spherical triangles, and his construction of a map of the starry firmament, as well as of accurate tables of the apparent motions of the sun and moon, made such achievements as place his name above that of any observer in Alexandria. It was on the basis of his observations that JULIUS CÆSAR (100-44 B.C.), with the aid of an astronomer from Egypt, was able to accomplish the famous reform of the calendar, establishing the Roman year, which had varied from 355 to 378 days, according to the caprices of the priests, to three years of 365 days followed by a fourth of 366 ; and no change has since been found necessary except that adopted in 1581 of not taking the close of a century as a leap year, unless divisible by 400.

Our knowledge of the discoveries of Hipparchus is derived from the work of his celebrated successor, the astronomer and geographer, **PTOLEMAEUS,** who flourished about the year 140 A.D. He is the author of one of the greatest astronomical books, containing nearly all the knowledge we possess of the astronomy of the ancients. His system of the world, the Ptolemaic system, which maintained its ground for upwards of thirteen centuries, placed the earth immovable in the centre of the universe, the sun, the moon, and the planets being supposed to revolve severally in orbits of different magnitudes ; the entire heavens turning round the earth in every twenty-four hours. For the irregular motions of the planets Ptolemaeus had invented an ingenious theory of epicycles and eccentrics, based upon imaginary circular orbits.

The greater part of the Alexandrian Library, which contained the collected literature of Greece, Rome, India, and Egypt, was housed in the famous museum in that part of Alexandria called the Brucheion. This part was destroyed by fire during the siege of the town by Julius Cæsar (100-44 B.C.). Mark Antony (83-30 B.C.), then at the urgent desire of Cleopatra, transferred to Alexandria the books and manuscripts from Pergamos. The other part of the library was kept at Alexandria in the Serapeum, the temple of Jupiter Serapis, and there it remained till the time of Theodosius the Great (346-395 A.D.), until in 391 both temple and library were almost completely destroyed by a fanatical mob of Christians. When Alexandria was taken by the Arabs in 641, under the Caliph Omar, the destruction of the library was completed.

It was in the Alexandrian School that the study of anatomy was carried furthest in antiquity. Among the Greek, dissection of the human body was considered a sacrilege, but at Alexandria not only were dead bodies supplied in abundance but, as we learn from Celsus, vivisection was practised on condemned criminals.

HEROPHILUS (335-280 B.C.),

a pupil of Praxagoras, was one of the first physicians appointed to ascertain the true structure and functions of the human body, and he became most **famous for his researches into the anatomy and physiology of the nervous system.** He considered the

nerves as organs of sensation, but distinguished that some were subject to the will, and that these arose from the brain and spinal cord. He carefully dissected the human brain—he is reported to have been the first to do so—and he refuted Aristotle's view of that organ. He was also the first to distinguish the nerves from the tendons, to describe the membranes of the brain, the choroid plexus, the venous sinuses including the torcular Herophili, the cerebral ventricles, and the calamus scriptorius, which he believed to be the **special seat of the soul.** He traced the course of the nerve trunks for some distance from their origin in the brain and spinal cord. He held that the sensory nerves arose in the membranes and the motor nerves in the substance of the brain. **He compared the brain of man with those of animals and came to the conclusion that the richness of the convolutions in the former must have some relation to his superior intelligence.** He assumed four fundamental life forces: the nourishing, situated in the liver; the heating, in the heart; the thinking, in the brain; and feeling, in the nerves. In this respect he seems to have followed Aristotle. He observed also the difference of blood pulsations as regards their strength and velocity, and remarked that it was not in the artery itself but in the heart that the origin of the force which induces pulsation should be sought after. So great was his reputation that an anatomist of comparatively modern times considered him infallible.

ERASISTRATOS (330-250 B.C.),

was another physician of eminence at Alexandria, only a few years younger than Herophilus, who carried on the same researches into the structure and functions of the brain and nervous system, so that there is some doubt which of the two made these discoveries. It is certain that Erasistratos made comparisons between the human brain and those of animals, and that he arrived at the same conclusion as Herophilus, that the superiority of the human brain—the richness of the convolutions—pointed to its psychical activities. He, too, at first believed the nerves sprung from the *dura mater*, the outer covering of the brain, but on closer examination he discovered that they sprung from the substance of the brain. He placed the seat of the soul first in the membranes of the brain, later in the cerebellum.

Erasistratos assumed the body being permeated by a kind of energy or vital force—pneuma—which reached the heart by respiration through the lungs—pneuma zooticon—and through the arteries was delivered to the brain—pneuma psychicon. Some historians say that he had a knowledge of the circulation of the blood and discovered the valves of the heart.

The pupils of Herophilus founded the so-called

EMPIRICAL SCHOOL OF MEDICINE,

which arose in Alexandria about 280 B.C. They took Aristotle as their intellectual leader, but were influenced also by the Eleatic school of thought and the Sceptics. The Eleatic School, as represented by Parmenides, had constantly opposed the knowledge which comes to us by the senses to that which we acquire by the powers of the mind. Hence they believed that one avenue to knowledge was as uncertain as the other. It is impossible to know the true nature of things, for perception only shows us things as they appear, and not as they are. The only correct attitude, therefore, which a man can adopt is that of suspension of judgment.

Whereas the Dogmatic School, as we have already mentioned, induced people to believe that medicine, like modern politics, was a matter of rhetoric, and took

fluency in discourse and subtlety in argument as the standard of medical skill, the Empiricists adopted the unanswerable attitude of the practical man that "diseases are not cured by eloquence, but by remedies," and that "a man does not even become a farmer or a pilot by arguing, but by practice." They defined disease as "a union of symptoms which are observed always in the same way in the human body." The whole art and science of medicine became, therefore, reduced to a system of therapeutics. Their main object being not to understand disease, but to remove it, they made no attempt to discover the causes and regarded the study of anatomy as superfluous. They did not want to know, for example, how we digest, but what is digestible. They taught that **experience was the only teacher,** and that it was idle to speculate upon remote causes. It has often been said that the besetting sin of men of science is to fancy they have finished off all things in heaven and earth by giving them names; certainly the Empirics, according to Galen, were "terrible men for names."

MEDICINE IN ROME

The study of anatomy declined with the Alexandrian University, which fell on evil days when the Romans conquered Egypt, and ceased to exist when the city was captured by the Arabs. Medical knowledge was now transferred to Rome, the centre of intellectual activity. Indeed, it may be said to have already migrated after the destruction of Corinth (146 B.C.). Before the Greek invasion, the Romans, as the elder Pliny (23-79) tells us, "got on for 600 years without doctors." The oldest and best instructed of the relatives would treat the diseases of the family as he understood them, relying mainly on domestic medicine and religious observances. But there were also a number of itinerant quacks, uneducated foreigners, mostly freedmen and slaves; and for this reason, down to the time of Cæsar, physicians formed a class despised by the better order of Romans.

The old Roman medicine consisted of three branches: (1) sacred rites paid to the higher gods of healing; (2) deprecatory rites paid to the malevolent deities who caused special diseases; (3) an empirical popular medicine. Among the ancient gods of healing the chief was *Salus*, an old Roman or Sabine goddess, whose temple stood on the *mons salutaris*, one of the summits of the Quirinal. Another was the goddess *Carna*, invoked to preserve the health of the bodily organs. In the Vth century B.C., on the occasion of a pestilence, a temple was dedicated to Apollo, who was later honoured as *Apollo medicus*. Greek medicine was introduced with the worship of Asklepios, 293 B.C., but Greek physicians were emancipated only by Julius Cæsar in 49 B.C., when the profession of medicine was for the first time considered an honourable calling for a free-born citizen of Rome. But there were plenty of Jewish physicians practising in the Roman provinces and esteemed for their learning.

Though there was little that can be called medical science in the early days of Rome, there was a considerable amount of knowledge of **sanitation.** The Romans built a drainage system of big sewers at the close of the VIIth century B.C., later uniting private drains with the public sewers. Their aqueducts for the supply of water from the hills were also marvellous works, and dated back to the IVth century B.C. They practised cremation, had sensible, well-ventilated houses, magnificent public baths; altogether they were remarkable for their hygienic achievements.

The Romans appear to have been nearly always at war. During the first five hundred years they were at war with the different states of Italy, and for the next two hundred years with other nations. Their special talent for military science and the making and administration of laws was of far greater consequence than their active literary contributions to science, philosophy, and medicine. As regards philosophy, it appears to have attracted the attention of the Romans only as

furnishing **precepts for the guidance or consolation of life,** and we find them divided between the two rival schools of the Epicureans and the Stoics.

The first Greek medical school of renown in Rome was

THE METHODICAL SCHOOL,

whose followers took as their philosophical guide Epicurus. Its chief representative was **ASCLEPIADES** (128-56 B.C.). He was a Greek physician, a man of wide culture, a pupil of the Alexandrian School, who in the last days of the Republic came to Rome, where he became the friend of Cicero, Mark Antony, and other leading men. He was the inventor of many new methods in surgery and medicine. He attributed disease to constricted or relaxed conditions of the solid particles of the body. This doctrine of "strictum et laxum" has been revived as "sthenic and asthenic" states by JOHN BROWN (see Chapter X.). Asclepiades was **no believer in drug medication** with the exception of "good wine," and this only in adjusted doses, and relied largely on hygiene, temperance, exercise, open air, and bathing. He had an immense reputation with the public, which then, as in modern times, was enough to incur the enmity of his own profession, who denounced him as a quack.

Asclepiades prescribed for the **insane** abstinence from food, drink, and sleep in the early part of the day; the patient should drink water in the evening; that then gentle frictions should be employed, while, later on, liquid food should be administered, the frictions being repeated. By such means it was hoped to induce sleep. In fomentations of mandragora, poppy, or hyoscyamus he had no faith. Still worse was venesection. His patients were directed to be placed in the light—a protest against dark cells.

It is said that Asclepiades and his adherents, **SORANUS,** the great gynæcologist (*ca.* 110-150), and **CÆLIUS AURELIANUS** (*ca.* 400 A.D.)—of whom we shall speak presently—were the only physicians throughout ages past and ages to come who deviated from the accepted Hippocratic doctrine that the four humours and their noxious potency in excess determined various mental disorders. They set up in place of the bilious diathesis the theory of **vital force,** to a surplus or deficiency of which disease was to be ascribed.

More fortunate than many other doctors in all ages, Asclepiades lived to a great age without illness, a circumstance which he attributed to the efficacy of his own hygienic precepts.

His friend, the great orator,

CICERO (106-43 B.C.),

too, held very comprehensive views of **insanity.** It is also noteworthy that as regards physiology, and the soul's immortality, Cicero was involved in great doubt.

Man, he says, cannot understand even his own frame, however assiduously he may dissect it in order to examine its internal structure; for who can say that its parts have not undergone a change during the operation? How much less can he hope to determine the nature of the soul, its mortality or immortality? A knowledge of the body is more easily attainable than that of the soul. Man may persuade himself that there are gods, yet even this is a question not without its difficulties. What if nature produced all things out of herself? If we believe in the providence of God, how can the existence of evil be explained?

In his Tusculan Disputations he said:

"All fools are disordered in mind; all fools, therefore, are insane. For it is the opinion of philosophers that sanity or health of mind consists in a certain tranquillity, or equanimity, or, as they term it, constancy. And they consider the

mind, when void of these qualities, as insane; since sanity can no more exist in a disordered mind than in a disordered body. We separate, however, this insanity from fury; being of the nature of folly, that term possesses a wider signification."

The distinction drawn by Cicero between insanity and fury—insania and furor—was an important practical distinction in ancient Rome. Those persons who laboured under the disorder called *furor*, which is defined by Cicero as consisting in a confusion of mind in regard to everything—mentis ad omnia cæcitas—and corresponds probably to our expression "blind fury," were placed under tutelage of persons who were responsible for them and had the power to imprison them. The law also took cognisance of persons suffering from a less violent kind of insanity, under the name of *mente capti*. These and other defective persons, unable to take charge of their property themselves, were placed under the care of curators. They are defined by ULPIANUS (170-228) as persons "who have neither method nor purpose in their expenditure, but squander their means in havoc and dissipation." The Romans looked on insanity as a disease which was to be cured, if at all, by ordinary medical treatment. Harmless cases were therefore sent to houses of physicians; only the dangerous ones were removed to places of detention.

HORACE (65-8 B.C.),

the Latin poet, also showed great familiarity with the symptoms of insanity. His references to **madness** are sufficiently numerous to authorise the conclusion that mental disorders were of considerable frequency.

Horace considers that some persons are sane on all subjects but one, the indulgence of which renders them so happy that they would rather not be deprived of it, and that he himself, if he was a dull and foolish poet, had better not be enlightened. As an example, he relates the story of a monomaniac at Argos, who fancied he was hearing some excellent tragedy when in an empty theatre, and joyfully applauded it; but who, notwithstanding this delusion, could perform the duties of life with propriety, was an honest neighbour, an amiable host, a kind husband, and could forgive his slaves. He would not lose his temper when a bottle seal was broken, and he had sense enough to avoid an open well or precipice. This monomaniac, when cured by pure hellebore, reprimanded his friends, exclaiming "By Pollux, you have destroyed, not saved me, from whom my pleasure is thus taken away, and a most agreeable delusion of mind forcibly removed."

In describing a man who was mad, he tells us what the Roman law would do with him, namely, the prætor would interdict him, and order the care of him to devolve upon his sane relations.

CORNELIUS CELSUS (25 B.C.-50 A.D.),

the celebrated Roman physician in the time of Tiberius, gives very definite rules for the **treatment of insanity.** He objected to rough measures in slight cases—patients who are merely a little incoherent and do slight injury with their hands. The audacity of the more violent was to be subdued, and they were to be made to submit to blows, as any one else would be who required restraint. The patient whose mirth was excessive should be scolded. Should conciliation fail, patients should be cured by some sort of torment; thus, should they be detected in falsehood or deceit, they should be hungered, or bound in chains, or flogged. Under this vigorous policy and resolute treatment they would be at last quite disposed to capitulate, to eat anything, and so successful is the practice that even their memory will be refreshed! To startle a patient suddenly, greatly to terrify him—this was

excellent treatment. There was, however, a better side in Celsus. He directed that all that was possible should be done to divert the melancholiac from his sadness, and to excite cheerful hopes, pleasure being sought in fables and sports, and whatever else might conduce to health. Of course bleeding and, if not contra-indicated, starvation diet, with an emetic and a smart purgative of white hellebore, were enjoined. Sadness, as all the old physicians thought, was the result of black bile. Music was not overlooked, and reading aloud to the patient was recommended. Celsus recommended the rocking motion of a hammock and the sound of a waterfall to induce sleep.

Celsus left an encyclopædia which is the best account of ancient medicine we have, and the elder PLINY (23-79) left another, containing mostly folklore medicine.

PLUTARCH (40-120 A.D.),

supplied one of the best chapters on insanity to be found in the writings of antiquity. In his "Morals," he insisted that every disease or defect is peculiar to a special part or faculty; in the same way, no one can be said to be beside himself or mad to whom Nature never gave the use of thought, reason, and understanding. He thus recognised that the idiot and imbecile are not suffering from madness, for they never possessed understanding. He then met the objection which may be made from the fact that dogs go mad, and that he himself had seen horses in the same condition, while bulls and foxes are said to become mad, by replying that it is evident that even these creatures have a sort of reason which is not to be despised, and can become disordered. Plutarch asserted that, as it would be absurd to say that a melancholic or delirious man is not beside himself, so is there no other explanation to be given of the corresponding state into which the lower animals fall. The man who thought otherwise seemed to Plutarch either to overlook what is just before his eyes, or else to fight against the truth itself.

Plutarch has left us a most accurate description of **religious melancholy.**

"The melancholiac magnifies every little evil by the scaring spectres of his anxiety. He looks on himself as a man whom the gods hate and pursue with anger, and a far worse lot is before him; he dares not employ any means of averting or of remedying the evil, lest he be found fighting against the gods. The physician, the consoling friend, are driven away. 'Leave me,' says the wretched man, 'the impious, the accursed, hated of the gods, to suffer my punishment.' He sits out of doors, wrapped in sackcloth or in filthy rags; ever and anon he rolls himself naked in the dirt, confessing aloud this and that sin; he has eaten or drunk something wrong; he has gone some way or other which the divine being did not approve of, The festivals in honour of the gods give no pleasure to the melancholic, but they fill him rather with fear and affright. He proves in his own case the saying of Pythagoras to be false—that we are happiest when we approach the gods—for it is just then that he is most wretched. Temples and altars are places of refuge for the persecuted; but where all others find deliverance from their fears, there the melancholic man most fears and trembles. Asleep or awake, he is alike haunted by the spectres of his anxiety. Awake, he makes no use of his reason; and asleep, he enjoys no respite from his alarms. His reason always slumbers; his fears are always awake. Nowhere can he find an escape from his imaginary terrors."

THE PNEUMATIC SCHOOL

was founded by **ATHENÆUS,** who practised in Rome in the time of Emperor Claudius, about 50 A.D. It was inspired by the philosophy of Plato, and—in opposition to the humoral theory of the Dogmatists and the solidism of the Methodists—introduced the aeriform, spiritual principle of the pneuma, the world-soul of

the Stoics, which in their opinion was the cause of health and of disease. (The pneuma, as we have already explained, comes by the way of the respiration from the air into the heart, and is driven thence into the vessels and the whole body—dilatation of the arteries driving it onwards, contraction in the contrary direction.) Yet they also gave the elementary qualities—warmth, coldness, moisture and dryness—a place in their system. **ANTYLLOS** (*ca.* 140 A.D.), whose works were used by Galen, and **ALEXANDER of APHRODISIAS** (*ca.* 198 A.D.) were the most distinguished followers of this school. The teaching of the Pneumatists speedily gave way to that of

THE ECLECTIC SCHOOL,

which had no definite system, except that it made a selection of the views and methods of Dogmatists, Methodists and Empirics. Its earliest representative was

ARETÆUS, the Cappadocean (30-90 A.D.).

Whereas Erasistratus, Herophilus, and others of the ancient writers believed in the division of the nerves into those of sensation and those of motion, it is in the works of Aretæus that we first find mention of **the difference of a brain and spinal lesion** upon motion. Treating of "Paralysis," he observed that when the trouble originates in the spinal marrow of the right side, the right side of the body will be paralysed; and if the affection is on the right side of the head, the left side of the body will be affected, and *vice versa*. "The cause of this is the interchange in the origin of the nerves, for they do not pass along the same side until their terminations, but each of them passes over to the other side from that of its origin, decussating each other in the form of the letter 'X.'" He distinguished paralysis of sensation from that of motion, and called the mixed condition paraplegia.

Aretæus was also the first to describe **manic-depressive insanity,** having observed that mania and melancholia frequently change one into the other. "Sometimes mania begins and melancholia succeeds, or melancholia begins and mania follows; and often in the same patient both forms alternate with each other, or are several times interchanged." He maintained that in melancholia the distress is confined to one subject. This view of partial insanity or monomania prevailed till the middle of last century. Melancholia he believed to be due to excessive aridity in the system; and mania he believed to be induced by luxury, lust, gluttony, and drunkenness. Living too fast was then, as now, a cause of nervous breakdown. Clearly men can live too fast without telephones and motor-cars.

By far the most celebrated representative of the Eclectic School was the great

CLAUDIUS GALENUS (131-201 A.D.),

Greek philosopher and physician, whose writings were destined to dominate medical thought and practice for over thirteen centuries. He was one of the most conspicuous figures in medical history. But it was by his philosophical writings that he attained to his extraordinary position in the Middle Ages. He enjoyed an immense reputation in Rome, where he practised surgery. He was medical attendant to Emperor Marcus Aurelius, the Stoic philosopher. The reason of his power lay in the fact that his writings supplied an encyclopædic knowledge of the medical art down to his own time, with commentaries and additions of his own, written with great assurance and conveying an impression of finality, for he asserted that he had finished what Hippocrates had begun.

Galen, as he is usually called, saw the obvious absurdity of attempting to have

any sound knowledge of disease without knowledge of the structure of the human body. He wrought an enormous reform in medicine by insisting on the importance of **anatomy,** which he studied practically. He added numerous anatomical descriptions to our knowledge, derived from his own dissections, which, however, he was permitted to make on animals only. The mistake he made was that he imagined that what was true of animals in the matter of anatomical structure would be equally true of man. Galen was also the **first experimental physiologist** and, among other things, cut the spinal cord to make studies of paralysis. He made some remarkably true observations.

He distinguished between sensory, motor, and mixed nerve trunks. The spinal cord serves as a conductor of sensation and of motor impulses, and it also plays the part of a brain for those structures of the body which lie below the head. It gives off nerves like streamlets. Division of the spinal cord longitudinally in its median axis does not give rise to paralysis. Transverse division, on the other hand, causes symmetrical paralyses. If the cord is divided between the third and fourth cervical vertebræ respiration is arrested, and if the division is made between the cervical and the thoracic portions of the spinal column, the animal breathes with the aid only of its diaphragm and of the upper muscles of the trunk of the body. Division of the recurrent nerves produces aphonia ; if the fifth cervical nerve is divided, the scapular muscles on the corresponding side will be paralysed. The ganglia are organs for reinforcing the energy of the nerves. The fact that both cerebral and spinal cord nerve-filaments enter into the composition of the sympathetic nerves explains the extraordinary sensitiveness of the abdominal organs.

Galen also distinguishes clearly nerve and muscle. The muscle has the power of contraction which is regulated by the nerve ; for the nerve supplies the force. The brain is the source of movement, the nerve is the medium, and the muscle the instrument. The brain is the source of the nerves, for anatomy shows the spinal cord starting from the base of the brain and sending out nerves, like branches, to all parts. The brain is not an expansion of the spinal marrow ; it is the origin or cause, not the effect. Brain and nerves can be further analysed into (1) the external membranes and (2) the inner substance, related to each other as are the bark and the pith of a reed. Of these the inner part is the true brain, the real seat of sensation. The functions of the membranes are to hold the parts of the brain firmly together and to unite the bloodvessels. The brain is of the same substance as the nerves, but softer, " as it necessarily would be, inasmuch as it receives all the sensations, perceives all the imaginations, and then has to comprehend all the objects of the understanding ; for what is soft is more easily changed than what is hard." Since double nerves are necessary, the soft for sensation, the hard for motion, so also is the brain double, the anterior being the softer, the posterior the harder. The brain itself is not sensitive ; it expands and contracts synchronously with the respiratory movements, the purpose of which action is to drive the pneuma from the cavities of that organ into the nerves. The nerves are the conductors of the pneuma, and transmit the motor impulses from the centre to the periphery, and sensations from the periphery to the centre. The nerves have three functions : (1) through their connections with the organs of sense they produce sensation ; (2) being joined to the muscles they produce voluntary motion ; and (3) they develop in other organs consciousness of dangerous modifications.

Galen showed that the brain was well supplied with blood and was warm—and not cold, as Aristotle had assumed. He further maintained that its elaborate structure was against Aristotle's notion of its being a mere refrigerator, since, for this purpose, a " crude and formless sponge " would have sufficed. Against the theory of the seat of the soul in the heart, Galen cited the experiments made on living animals. Vivisection, he says, proves that the principle of sensation, of speech, and of voluntary motion, is not in the heart, but the brain. Pressure upon the brain causes stupor. An injury of the tissues surrounding the fourth ventricle or of those which constitute the beginning of the spinal cord produces death.

He agreed with Erasistratos in the opinion that the plexuses and convolutions are larger in man than in animals; but he did not admit that the intellect of man depended on this, because asses also have a brain much convoluted.

A brain-anatomist of distinction, previous to Galen, was MARIANUS (Marinos), *ca.* 80 A.D.; he distinguished seven pairs of cranial nerves. Galen, in his works, refers frequently to him.

Galen also taught a fact frequently disputed, even at the present time, that **the skull is moulded on the brain,** and not the brain on the skull. (De usu partium, lib. VIII.) This subject of the cranio-cerebral relations is of some importance, and is dealt with in Chapters XIII., XVIII., and XXIV.

Galen showed that the arteries contain blood, and not air, as was thought hitherto. He especially emphasised the renewal of the blood in the lungs, and expressed the hope that we shall some day succeed in isolating the permanent element in the atmosphere—the pneuma—which is taken into the blood in respiration. Fifteen centuries later, LAVOISIER discovered this element: oxygen. Galen imagined that the air inhaled passed to the skull through the cribriform plate of the ethmoid bone, and passed out by the same channel, carrying off humours from the brain into the nose. But some of this air remained and was converted, first into vital spirits in the anterior ventricles of the brain, and then by further refinement in the fourth ventricle, into psychic spirits.

The use of the anterior or superior ventricles is, according to Galen:

(1) To receive air through the nostrils and mixing this with the vital spirit brought into the ventricles through the arteries from the heart, to prepare the animal spirits transmitted from the brain to the nerves for motion and sensation. The brain has a double movement: a diastolic, by which it receives the air and vital spirit into the ventricles; and a systolic, by which it distributes the animal spirits to the nerves.

(2) By the same entrance, sensible objects, and objects of smell, are introduced.

(3) The effete matter from the bodies contained in the ventricles collects there, the accumulation of which excites apoplexy and epilepsy, unless a suitable outlet be provided. There is, however, a double outlet, through the nostrils, and through the infundibulum and pituitary gland, by two ducts opening into the palate and cavity of the mouth.

The animal spirits are transmitted from the anterior ventricles to the fourth ventricle through an opening (now known as the "aqueduct of Sylvius"). The anterior ventricles are double, for the purpose that, if the one suffers, the other may serve. Of this Galen gave an example.

Galen believed the fourth ventricle to be the residence of the soul. The refined material constituting the psychic spirits was derived in part from the vapours of digested food; so that the production and the nature of the psychic pneuma depend on both air and the food. Climate and diet therefore directly affect the rational powers, whether this pneuma were to be considered the soul itself or the organ of the soul. The pneuma was the necessary condition of life, and the alterations in the vital breath were the cause of the diseases of the body, of disturbances of the soul, of death itself. Therefore, in the treatment of disease, Galen laid great stress on diet, exercise, and especially on reliance upon nature. "Nature is the overseer by whom health is supplied to the sick; no one can be saved unless nature conquers the disease, and no one dies unless nature succumbs."

The doctrine of the pneuma led Galen to adopt Plato's tripartite division of the soul and to reduce all the different functions of the body to three groups, which correspond to the three forms of the pneuma or vital spirit. The *pneuma psychicon*, the rational aspect of the soul, has its seat in the brain and nerves, and is the cause of thought, sensation, and voluntary movement; the *pneuma zooticon*, in the

heart, is responsible for the heat of the heart, the pulse, and the temperature; the *pneuma physicon*, seated in the liver, is the source of the vegetative functions, digestion and assimilation, growth and reproduction.

The distinction of desire, temper, and intellect correspond to the physiological parts: desire pertains to the liver, being connected with nutrition principally; temper is vitality, and belongs to the spirits of the heart; intellect is connected with the brain. The nature of the individual depends on these three parts; and the character of each part of the soul depends on the temperament of the part.

"The force of the soul is due to the pneuma, which is carried to the brain with the blood after having been prepared by the vital spirits." This, he says, explains why changes in the soul follow on general changes in the body, and why all opinions are the result of our physical condition. Thus he recognised the influence of the body on the mind. The intellect and the passions are seen to be closely connected with bodily states, and as passions are diseases of the soul that begin in physical causes, their cure lies partly in the treatment of bodily states. For Galen **the evil soul is a diseased soul,** and as a patient requires a doctor, so the vicious man must put himself in the hands of the good man for treatment and restoration to health.

Galen clung to the **humoral theory** of the Hippocratic school with some modifications. He distinguished eight **temperaments,** of which the four composite ones were produced of heat and dryness, of heat and moisture, of cold and dryness, and of cold and moisture, with the names of the choleric, the sanguine, the melancholic, and the phlegmatic temperaments. This theory is of special interest because, although the physical and physiological ideas underlying it have long been discarded, the terms still remain in use and are commonly employed when discussing character.

With Galen moisture produces fatuity, and dryness sagacity, and therefore the sagacity of a man will be diminished in proportion to the excess of moisture over dryness. He therefore advises the medical practitioner to endeavour above all things to preserve a happy medium between these opposite qualities. Should he be of the opinion that the whole of the patient's body may contain melancholy blood, he is to employ venesection. On the other hand, bleeding must be avoided if madness arise from idiopathic disease, "as from it the melancholy humour is made." This humour is a condition of the blood "thickened, and more like black bile, which, exhaling to the brain, causes melancholic symptoms to affect the mind." (De cognescendis curandisque animi morbis).

He distinguished insanity with and without fever. With fever, he called it *frenzy;* without fever and accompanied by violence, *mania;* and when accompanied by fever and distress, *melancholia.*

During the time of his activity the early Christians were making considerable noise in the Roman world, disputing about the relative prerogatives of soul and body, and above the turmoil we hear the calm voice of Galen describing his experiments and conclusions concerning **the nature of the mind and the brain.**

"There is much contention," he writes, "as to whether the faculty of thought is merely resident in us as in a temporary domicile, or is to be regarded as a material portion of the body. Whatever be the difficulty of resolving this question, it is at least permissible to state as the result of experience that in using the trephine, if the brain be compressed, all sensation and all movement are instantly abolished. If inflammation develops in this organ, the same accidents are sometimes observed, and there is uniformly a disturbance of the thought processes. Burns on the head may lead to delirium, and blows on this part may be succeeded by a state of somnolence or stupor. An active morbid process in the neighbourhood of the brain may produce a disorder in the function of thought. It would be very desirable to know first of all in what part of this organ is the seat of intelligence. If we were well acquainted with the physiology of the brain, we should assuredly find in the pathological condition both the place and the nature of the malady. As for myself,

I believe that the brain is at once the seat of the voluntary movements, of the intelligence, of feeling, and of memory."

Galen in his philosophic doctrines was thoroughly eclectic. The philosopher who had the greatest influence on his speculations was Aristotle. Of the latter's principles the most important was the doctrine of the final causes. "Nature makes nothing in vain." Galen accepted this law and proceeded to show that every structure and function of the human body subserved some profound end—that, in fact, **the aim or object of any structure was the cause of its existence.** For instance, Galen agreed with Aristotle that men had hands because he was the wisest of animals; whereas—as has already been mentioned—the earlier philosopher Anaxagoras, more in accordance with the spirit of modern science, had said that man was the wisest of animals because he had hands. In his work *De usu partium* Galen endeavours to prove that all the parts of the body have been so well constructed, and in such exact relation with the functions they have to perform, that it is impossible to conceive any better arrangement; anatomy and physiology simply appear as two methods which lead to the proof of the wisdom of God. For this reason, Galen never tired of praising the Creator for his profound intelligence in the construction of the universe:

"The Father of all Nature has shown His goodness in providing wisely for the happiness of all His creatures in assigning to each what could be useful to it. Let us then glorify Him by hymns and psalms. He has shown His infinite wisdom in arriving at His beneficent ends. He has given proof of His omnipotence in creating everything in perfect conformity with its destiny. It is thus that His will has been accomplished."

After Galen, medical attainment rapidly declined, and no great man enlightened the darkness of thirteen hundred years which lasted till the coming of Vesalius. During all that time the writings of Galen were almost the only source of knowledge of human anatomy, just as the books of Aristotle were for the whole of natural history. The dogmatic rule of the Church, admirable as it was for its time and its peculiar task, made medical advance impossible.

Yet there are a few physicians, living in the fourth century A.D., who are rarely mentioned in books on medical history, of special importance to us, in view of the subject with which we are dealing, because of their speculations on the **mental functions of the brain.**

POSEIDONIOS (*ca.* 400 A.D.),

son of the physician PHILOSTORGIOS (358-425), is generally quoted as living about 350 A.D., when mentioned at all, but it is self-evident that this date cannot be correct. He gave a fairly accurate description of various nervous and mental disorders and their treatment, including nightmare and hydrophobia. He combated the theory of the demoniacal origin of insanity. But **his fame rests chiefly on the fact that he apparently was the first to attempt to localise mental functions.**

His theory was that *imagination* is related to the anterior part of the brain; *reason* resides in the lateral ventricles; and *memory* in the hinder part of the brain.

This theory, as we shall see in the next two chapters, was adopted by the Christian Fathers, and later by the Arab philosophers and physicians, and held its ground practically till the end of the eighteenth century, with very little variation.

My investigation, however, leads me to believe that Poseidonios was not the originator of this theory, that he only gave expression to an opinion current at the time, and that some earlier writer, whose work has been lost, speculated on this subject. Indeed, the writers of the Middle Ages, who have adopted this localisation theory, refer it to Aristotle, as if he originated it; but, except that Aristotle furnished the classification of the faculties for it, I can find no evidence for this view.

On the contrary, Aristotle is very definite on the importance of the heart, as compared to the brain. It is a fact, however, that all the localisationists, whether Christian Fathers, Arabians, or later writers, were Aristotelians.

That the theory of Poseidonios was known earlier is also made probable by the fact that the ancient Greek poets, painters, and sculptors had adopted it. Thus when an artist desired to represent poetic genius or a scientific man, he always formed a large projecting forehead ; on the contrary, a short but broad head, with powerful muscular forms, represented the idea of muscular force. Hence Jupiter was depicted with a majestic forehead, projecting beyond the face ; while the athletes and gladiators were designed with retreating foreheads. Women had also small heads—instance the Venus of Milo.

ORIBASIOS, of Pergamos (325-403 A.D.), Court physician to Emperor Julian, popularised Galen's doctrines and was a great compiler. He published about seventy books, of which only a third are in existence. In vol. vii. of his *Encyclopædia* there is a description of the doctrine of temperaments, wherein he mentions that **ANTYLLOS** (*ca.* 140 A.D.), a distinguished surgeon, founded a sort of phrenology, *i.e.*, a doctrine of the localisation of the mental functions of the brain. **ADAMANTIUS,** of Alexandria (*ca.* 350 A.D.), a noted Greek physician, is mentioned by Baptista Porta in his " Physiognomy " (1596) as having speculated to a considerable extent on the mental functions of the brain. **AETIUS** (502-575) did the same ; and so did **ALEXANDER OF TRALLES** (525-605), a much-travelled physician who finally settled in Rome, and who was the only one of the Byzantine compilers who displayed any special originality, particularly on insanity. He taught the world how to deal with melancholia and mania, and distinguished acute and chronic headache, and hydrophobia.

CÆLIUS AURELIANUS (*ca.* 400 A.D.),

who, in his work " De Morbis Acutis et Chronicis," revived the teachings of Soranus, appears to have been the most enlightened physician of that time as regards the treatment of insane, long before Ætius and Alexander of Tralles.

It has to be mentioned that Celsus's treatment, which has been described in the early part of this chapter, was copied by physicians, in his time and for centuries afterwards, and these adopted, not what was good in it, but his harsh methods, which were even intensified. Now, Cælius criticises these physicians. He says :

" They themselves seem to rave rather than to be disposed to cure their patients, when they compare them with wild beasts who must be softened by the deprivation of food and the torments of thirst. Misled, doubtless, by the same error, they recommend that patients be cruelly chained, forgetting that their limbs may be bruised or broken, and that it is more expedient to restrain them by the hand of man than by the weight of iron. They go so far as to advise physical violence, the whip, as if by such means to force a return of reason. This deplorable treatment can only aggravate the condition, and supply unwelcome memories to salute the return of their intelligence."

Cælius's **humane method** of treatment was not revived until the nineteenth century. The following extract from his work shows him to have been fourteen hundred years in advance of his time.

" Excited patients should be placed in a somewhat subdued light, in a room with a mild temperature, and where there are no disturbing noises. There should be no pictures on the walls, and the air should enter by elevated openings. . . . The beds should be of solid construction and so placed that the patients cannot see the door, and are not annoyed by what is passing. . . . Frequent visits, particularly on the part of strangers, are to be forbidden, and the attendants should be vigorously enjoined to repress the outbreaks of the patients in such a manner as never to

irritate them by showing too much spirit, and, on the other hand, not, by too much laxness, to allow them to increase their extravagances. Their faults should not, therefore, be allowed to pass unnoticed, and one should use, as occasion requires, a calculating indulgence, or a mild reproof, setting forth the advantages of amendment in conduct. If the patients become violent and are controlled with difficulty . . . several attendants should be at hand to subdue them, as it were, without their knowledge and without provoking them, by approaching as if to give them massage. If they are irritated by the presence of other persons, and then only in very rare instances, may restraint ligatures be used, but with the greatest precautions . . . employing only bands of soft texture; for methods of repression, if injudiciously applied, give rise to or augment excitement instead of relieving it. . . . One should begin by giving nourishment very cautiously, and at first only the lightest and most easily digested food. . . . If the evacuations are not regular, enemata must not be neglected. . . . One should carefully observe the character of the delirium, and have recourse to the salutary influence of moral impressions, diverting thoughts, or welcome news. . . . If there be persistent wakefulness, a swing-bed may be tried, or one may resort to the continued sound of falling water, the monotone of which often produces sleep. . . . When the excitement declines, consciousness becomes clearer and sleep returns, nourishment should be increased and more varied; and as the patients recover their strength they should be taken for walks and given other physical exercise. . . . When the symptoms have subsided and the mind is no longer dangerously impressionable, a change of scene may be counselled. Trips by land and water, varied distractions and mental diversions, agreeable conversations and affection may do excellent service. Ennui and the spirit of gloom are only too ready to fasten upon those who have already been their victims; and if healthy, sane men can fall suddenly into a morbid state under the influence of grief, how much more is this result to be feared in those who are convalescent or just recovered, and who are still living, as it were, in the atmosphere of their disease?"

Minute and praiseworthy were the rules laid down by this enlightened physician as to the **duties of attendants.** Thus they were to beware of appearing to confirm the patient's delusions, and so deepen his malady; but, on the other hand, they were to take care not to exasperate him by needless opposition, and they were to endeavour to correct his delusion, at one time by indulging condescension, and at another by insinuations.

Fomentations, by means of warm sponges, were to be applied over the eyelids in order to relax them, and at the same time exert a beneficial influence over the membranes of the brain. Restlessness and sleeplessness were to be relieved by carrying the patient about on a litter. During convalescence, theatrical entertainments were to be given, and it was supposed that excitement would be lessened by representing scenes of a solemn or tragic character. Riding, walking, and the exertion of the voice were recommended.

For the poorer patients, farming was to be encouraged if they were agriculturists; while, if sailors, they were to be allowed to go on the water. He denounced the abstinence which Celsus had extolled, and asserted that a low diet was more calculated to cause than to cure madness. He spoke against the practice, pursued by some, of making patients intoxicated, inasmuch as insanity was often caused by drink. He was opposed to venesection (but not to cupping), and to reducing the strength of the patient by the administration of hellebore and aloes; on the contrary, he favoured soothing and invigorating the patient by emollient and astringent applications respectively.

The reader will do well to keep the foregoing account of the enlightened view of Cælius Aurelianus on the treatment of the insane in memory, and compare it with the awful state of the insane fourteen centuries later, at the time of Gall and Pinel, as described in Chapter XV.

SECTION II

VIEWS OF THE SOUL, MIND, AND BRAIN IN THE MIDDLE AGES

CHAPTER V

CHRISTIANITY AND THE EARLY SCHOLASTICS

We have now to deal with the rise of Christianity. With the gradual downfall of the Roman Empire and the general upheaval of nations ancient philosophy and civilisation were buried, and with the general insecurity of life, each individual had to think for himself. In time of trouble man seeks religious comfort, and the Christian religion seemed created for the consolation of the **individual man.** At its very origin it appealed to the poor and oppressed, the perplexed, the despairing, the sick, and the penitent. Pagan philosophy, with its eye fixed upon the State, took but small account of the individual, whereas for the Christian Fathers the meanest human soul was worthy of all their energies. It was to the individual that the message of the Gospel made its appeal.

Christianity attached value to the individual lives of the most wretched and outcast of mankind. For the slave and his master there was one law, one hope, one Saviour, one Judge. Sympathy was shown to the unfortunate, and forgiveness to the guilty. To the needy the charities of the faithful were freely given. Love, to the Christian, was the supreme principle in practical life which brought with it happiness and virtue, and every other good. The Christian exalted faith above knowledge, and defined it as an act of self-surrender to the word of God ; but he taught that the supreme happiness is not of this world ; it is in another life to come. The faith in that belief takes the form of another virtue, namely hope. Thus we have faith, hope, and charity as the three great Christian virtues.

New doctrines of justice and love were taught. The personal virtues of humility, charity, resignation received a new interpretation. True happiness was not to be attained by victory over our enemies, but by victory over ourselves ; not by success in life, but by a pure and holy life ; not by the esteem of men, but by the approval of our conscience. The spirit of compassion, self-sacrifice, devotion, and unselfishness was enjoined. The moral virtues were transformed to a loftier character : chastity became purity, patience resignation, benevolence love ; in short, virtue became holiness, and vice sin. Altogether, Christianity presented the world with higher and purer notions of the nature and destiny of man than had been held before. The Christian religion gave men something to live for, and something to die for. It supplied mankind not only with an ideal of excellence, but with a powerful motive of conduct, presenting it with an object of both fear and love. It thus gave rise to a far higher discipline of the affections, ot the inner life of man. And, by so doing, it produced those saintly types of character which it is impossible not to admire.

It was undoubtedly because these altruistic ideals exerted a dissolving influence

upon existing society, and not because of their theological tenets, that the early Christians suffered martyrdom, for the Romans were proverbially tolerant of the abstract religious opinion of others, owing largely to the agnosticism and indifference of the educated ruling classes. But Imperial Rome had long been in process of disintegration. It survived only a century and a half the establishment of Christianity as the religion of the State. It was in the year 313 that the edict of Milan gave civil rights and toleration to the Christians throughout the Roman Empire, and Christianity became the official religion of the State. Owing to its incomparable organisation the Church soon attained to extraordinary power.

The Christian Deity was very different from the deity of the heathen philosophers. The latter was a Being very far removed from all human sympathy and regard, who ruled and governed the world by general laws, but took no interest in the petty affairs of man; whereas the Christian system brought the Deity, so to speak, nearer to mankind; instituted a close and mutual sympathy between them, and represented both under the familiar and interesting relationship of Father and children.

We have seen that the later Hebrew religion was a veiled dualism. By it, evil is no longer ascribed to God. He no longer tempts man to evil. This world is the devil's world, the next is God's. All men are destined to destruction, unless some mightier and beneficent being can save them. It is this conception of human life as the arena of a struggle between the powers of light and darkness that rendered possible the conception of a Saviour, so different from the Messiah who was to restore the throne of David.

It was expected that the Messiah would make himself known by miracles. They were demanded in those days. God himself revealed himself in miracles. Miracles are happenings, which at the time appear inexplicable by natural causes. And since nothing happens without a cause, they were attributed to Divine agency.

Christ discarded all theology and all dogmas. He was the champion and defender of the simple doctrine of love to God and love to man, apart from the sacrifices and ceremonies of the Jewish ritual. He rejected the Mosaic notion of the character and attributes of God as a God of hatred and anger, or subject to the passions and imperfections of humanity; and proclaimed as a solace to the poor and unhappy that God is a God of love, to be worshipped in spirit and in truth; a God who demands of His creatures no vain observances, no heavy burdens of ceremonials, but a cheerful, happy enjoyment of life, provided they keep within the limits of the divine laws, which are neither galling nor heavy, but easy, light and good.

The early Christians were persecuted by the Romans. For what reason? In Rome there was toleration for all religions. All the peoples were free to continue in the practice of their own religion, and to worship the gods of their fathers in the ways in which their fathers worshipped. But the early Christians must have appeared to the Romans to be a people without a religion. They had no temple, no priests, no altar, no sacrifices. The sacramentum, originally a military oath of allegiance, took a religious meaning, and soon extended to people who did not serve in the army or hold office. A Cæsar worship sprang up and became widespread throughout the Empire. The emperor was Consul, Imperator, and Pontifex Maximus. But Cæsar worship was not opposed to the worship of gods; the emperor was simply the symbol of all that was great and good, even if he did not always act up to it. Cæsar was the defender, the ruler, the protector. He was idealised, just as the monarchy was up to recent times held in high esteem as a symbol, though the person occupying the throne might not be capable. Now, the early Christians were only a small sect of poor followers, with totally different standards. It had to make up in enthusiasm, zeal, devotion, what it lacked in learning, wealth, and power. In course of time it was an organised body, with a religion,

an ethic, its own mode of life. But the belief in and worship of the One God meant that its members could not take part in the common life of the community. It meant that Christians could not take part in military service, for that meant that they acknowledged the divinity of the emperor. It meant that they could not hold civil office in the national service, for that implied the same thing. They were the "conscientious objectors" in the Roman Empire. They held different ideals. The emperors recognised the antagonism, and even the best of them were most severe persecutors. They demanded faithfulness and obedience to the State.

For three hundred years Christianity was a religion without a ritual, or a priesthood, or temples, or altars, or public worship. Every Christian communicated direct with God from his innermost heart. The first converts being all Jews, Christianity for the first hundred years retained the principal beliefs of Judaism with some exceptions, *e.g.*, those of exclusive nationality and bigoted formalism. Historically regarded, it was simply Judaism, with the addition of the faith that the Messiah had actually come in the person of Jesus Christ, and was to come again. It was ST. PAUL (-65) who broke with Judaising apostles and who taught that the test of the Christian salvation was the possession of the mind of Christ, that those who are led by the spirit of God are sons of God. If the Jews had their national God, the Christians, on the other hand, had the doctrine of exclusive salvation. With St. Paul descent from Abraham was nothing, observance of the legal code was nothing; for every man was rewarded according to his works. The God of the Jews became the God of the universe and the Father of all. Henceforth the Christian religion spread rapidly, particularly among the peoples that had no divine records, no previous sacred books to preoccupy them.

Man, for the Greeks, began as a race; for St. Paul, history began with the first man, Adam. He regarded Moses in a literal sense. Man was originally made perfect and fell from a state of purity and perfection, dragging with him the whole posterity. The "Fall of Man" was not referred to by Jesus. The conception of the originally perfect man probably arose from the observation that animals are born perfect, that is to say, with instincts corresponding to their structure, and man is the only creature in whom this perfect co-ordination does not exist. The belief is natural that man through some cause, such as sin, *i.e.*, wrong use of his free will, lost his original perfection. That the whole of posterity should suffer ever afterwards is not unreasonable either, in the light of modern science, for have we not discovered the continuity of the germ plasm?

Salvation by faith in the Atonement is the central feature of the scheme of St. Paul. Right conduct is a natural sequel to right belief. Such is the **evangelical** or **spiritual** Christianity. Next came the **ecclesiastical,** or **dogmatic** Christianity, which was apt to emphasise the efficacy of ceremonies, concentrate attention on ecclesiastical details, and elaborate the material acts of worship. Finally came the **governing** or **hierarchical** Christianity, which glorified the priestly office and sought after temporal power.

Christianity regarded man under a twofold aspect: as flesh and spirit; the one a temporal accompaniment and dependent medium, the other an immortal being in itself. The **soul of man** is conscious, personal, immortal. The body is a temporary resting-place of the soul between two eternities. The resurrection applies to man in his entirety. The souls of the righteous will ascend to heaven, and those who are not rewarded now will be rewarded in the life to come, when amends shall be made. Unrequited virtue will be duly recompensed and triumphant vice will be punished by purgatory, until the souls are sufficiently purified to be deemed worthy of sharing in the celestial felicity. In this they differed from the Jews, who observed the laws of God simply because they were the laws of God, and not because of temporal or future rewards. The Christian truths, like those of the Jews, were claimed to be based on "revelation," but, granted that they were revealed truths,

they might still be imperfect, for they came through minds possessing imperfect knowledge, and were for a people even more ignorant.

Among the Greek philosophers the dominant conception of the soul was that of a material substance, very thin and mobile, and having the power of spontaneous movement. The early Fathers, who shaped the doctrines of the Christian Church up to the fifth century, continued to hold this view of the soul. It was even held to be heretical to deny the material nature of the soul; for only material substances, it was thought, could be susceptible of physical pains and pleasures; therefore a material soul was required by the doctrine of retribution after death. The spiritualisation of the soul seems to have been achieved by way of the refinement of the conception of God.

The views of the Fathers of the Church will be dealt with presently. For the present it need only be mentioned that Christian religion took its rise at the beginning of the IIIrd century, in the school for Catechists at Alexandria. TERTULLIAN (160-220) is still materialistic. In ORIGEN (185-253) we find the admission of "comparative" immortality of the soul. In NEMESIUS (*ca.* 340-400) we arrive at a much higher stage of development; and in AUGUSTINE (354-430) we have the doctrine of immateriality completely expressed. No sooner was Aristotle revived by the Arabians, than this tendency to immaterialism was greatly strengthened. Aristotle supposed the capacity for suffering and enjoyment to cease at death; the rational soul, which alone is separable from the body, being destitute of sensation and appetite. The primitive Christian doctrine, on the other hand, maintained the complete persistence of these faculties, independent of a fleshly body. But, in later times, when Aristotle was forced into the service of the Church, the ecclesiastical standpoint had entirely changed, and Aristotle's immaterialism only reinforced opinions which, through the Pauline teaching of Augustine and Athanasius, more especially, had become generally diffused through Christendom. ATHANASIUS (296-373), Bishop of Alexandria, urged upon the Church the Egyptian idea of a triune deity ruling the world. He fought for fifty years for the orthodoxy of the catholic faith.

Philosophic heretics appeared early in the history of Christianity. The **GNOSTICS** rose already in the first century and gained strength in the second. They were the originators not only of a rational theology, but also of a doctrine of comparative religion, and may be called religious philosophers. Their philosophical explanations of the mysteries of religion were often most fantastic; but we know little of them except from hostile sources. They called themselves Christians, but cared little for the authority of bishops or apostles. The resurrection of the body, as well as the outward second coming and material millennium, they rejected utterly.

Other heretics were the **MANICHEANS.** Manicheism was a universalist religion, offering itself to men of all conditions and all races as the way of salvation, spreading from the confines of Babylonia and Persia to North Africa and Spain about the IVth century. St. Augustine was a follower of it for nine years. MANI (240-276), its founder, was crucified. The dominant idea is the opposition of light and darkness, in other words, of good and evil. The visible world is a result of the mixture of these two eternally hostile elements. In man, the soul is luminous, the body opaque; the luminous elements have to be liberated from the prison of matter. When all the captive light and all the souls of the just shall have mounted to heaven, the end of the world will come after a general conflagration. In practice, men are divided into the *perfect* or *elect*, and the simply *faithful* or *auditors*. The former constitute a kind of priesthood; they must abstain from marriage, from the flesh of animals (except fish), from wine, from all cupidity and all lying. The Manichean religion was very simple. It enjoined no sacrifices, no images, but frequent fasts, four prayers a day to the sun and the moon, which were not worshipped as gods, but revered as manifestations of light. The Manicheans practised baptism, communism, and a sort of initiation. Like the Persians, they admitted the existence of a whole army of good and evil genii. The Manicheans were gentle and peaceable

persons, but as they rejected the rites of existing Churches, and claimed to confine themselves to the ministrations of their own priests, those of other religions persecuted them furiously, and excited the mob against them by calumnies. Manicheism was not completely exterminated until the XIth century.

The primitive Christians, like the Jews, were strongly opposed to the **worship of images**; but Pope GREGORY THE GREAT (544-604) thought it politic to make concessions to the ignorant in that matter. The Barbarians had only been superficially converted; the old traditions and practices had never been forgotten; the tendency to idolatry had never been eradicated and, it is said, the converts insisted on image worship. Hence the introduction of representations of the Saviour, the Virgin, angels and martyrs, and the demonstration of miracles. These images and pictures were of course intended to stimulate appropriate ideas. It is only the ignorant that worship images themselves; it is an advance in civilisation when the *thought* of a deity is sufficient to arouse profound ideas.

Pope **GREGORY THE GREAT** (544-604), in a letter which he wrote to Serenus, Bishop of Marseilles, who took strong measures against the use of images, said: "It is one thing to adore a picture, another to learn, through representation in a picture, what is worthy to be adored. For what the faithful who read receive from books is given to the simple in pictures; since by them the ignorant are instructed in their duty, and in them the illiterate can read." For the same reason governments at the present day organise cinematograph exhibitions of what they want to impress upon the public.

When these images had failed to protect the people from disasters, there arose great opposition to them, and Emperor Leo III. published an edict in 726 prohibiting their worship, and ordering their destruction. Again, in 754, a clerical council at Constantinople decreed that all visible symbols of Christ were blasphemous and that image worship was a corruption of Christianity. On both occasions the monks rose in uproar. There were more prohibitions and risings, and ultimately the images were restored in the East. In the West the Pope himself was for the retention of the images; the Emperor was defied, and thus Rome broke away.

In Christ's teaching we find a wise philosophy confirmatory of man's noblest hopes, but the Church gradually added various rigid dogmas, to which adherence was demanded of every Christian. "Submit to the guidance of the Church while you live, or you shall go to Hell when you die." By various devices the conceptions of Heaven and Hell, especially the latter, were rendered very vivid and real, and the common people were led to believe in incessant providential interventions, as if there were no such thing as law in the government of the world.

The sole thought of many of the early Christians being the saving of their souls, they erred in looking down upon their bodies with contempt, as vile and despicable, the home of the fleshly lusts which war against the soul, and as needing to be vigilantly kept in subjection. Among the Greeks, the glory of the human body was the central conception of art, and beauty of every order was the highest object of worship; early Christianity put a low estimate upon physical beauty. The body was regarded as an unmingled evil, its passions and its beauty as the most deadly of temptations. Hygiene was neglected, and, when disease occurred, it was believed that its progress could be stayed by supplication in Prayer.

The Romans, as is well known, spent a considerable part of the day in bathing. The maximum of luxuriousness in the baths of Rome was reached in the later empire. At that time wealthy people had complete bathing establishments attached to their villas, while there are said to have been upwards of 870 public baths in Rome. The bath consisted of several rooms: the undressing room; the cool room, containing also a cold plunge bath; the warm room; hot air room, having a hot water bath at one end of it. To these was added another room, where after a

cold water affusion the visitor was massaged by an attendant and subsequently anointed all over. A long rest was then taken in a lounging place specially constructed. As luxury grew, these baths became to an increasing degree houses of assignation, and the most frightful immorality prevailed, as may be gathered from the Roman satirists. It was for this reason that these Roman baths were denounced by the Christian Fathers.

All the same, it cannot be denied that many of the early Christians carried the principle of bodily mortification for the sake of spiritual purity to revolting excesses. Persons who wished to give proof of sanctity practised mortification by wearing the same clothes winter and summer and often not taking them off. They accepted the inevitable consequences of parasites and eruptions as penitential exercises, whereby merit would be gained in the eye of heaven. Thousands of holy men and women, holding pleasure to be guilt and all contact with the world sinful, withdrew from it, vegetating in deserts and marshes—the more devout in almost inaccessible caves and rocks, the more prudent in spots not too remote from the abodes of charitable adorers. Many of these anchorites never washed; they lived on roots and grass, and grew to resemble beasts rather than human beings; some of them became insane.

But it would be grossly unjust to credit these unclean habits to the Christian Church. Partly they were due to a misapplication of the Christian teaching, and partly these habits were simply the sign of the Barbarian time. For even in the later Middle Ages dirt and squalor were common.

If sickness and poverty were common, the Christian Church also sought to alleviate human suffering, though it did nothing to remove the causes, which was held to be the business of the State. The large-minded charity of the early Christians was a new feature in the pagan world, and must have aided powerfully in the spread of the Gospel. The care of the sick appeared to them as one of the works most pleasing to God; and many religious men and women made it their life's work.

There is no record of any hospital in Pagan Rome, but no doubt some existed, for with the establishment of Christianity by Constantine many were founded both at Constantinople and at Rome, and were on so great a scale that it is certain they were not the first. Many of them were, however, merely leper houses. In the IVth century, under Theodosius the Great, it is said that the number of hospitals was so great that one was attached to almost every church. Justinian established hospitals and almshouses, so that in his time charity was profuse and organised. His wife, the infamous Theodora, founded a penitentiary for fallen women. Many of the religious orders and of the secular priesthood devoted their lives to the relief of suffering, the redress of wrongs, and the care of the sick, including the insane. In the XIIth and XIIIth centuries again numerous hospitals were founded.

However, noble as were the Christian charities, they laboured under an essential defect in having substituted for educated physicians well-meaning but unskilful ecclesiastics. There was no professional education. The sick who were placed in the benevolent institutions were, at the best, rather under the care of kind nurses than under the advice of physicians. There was an almost universal reliance on miraculous interventions. To the shrines of saints crowds repaired as they had at one time to the temples of Æsculapius.

The early Middle Ages were marked by complete **intellectual stagnation** and lack of all progress. The darkness which hung like a pall over the human mind was due, partly to the indifference to worldly things engendered by Christianity, but in a large measure also to the ruin of intellectual life caused by the fall of the Roman Empire, and the low standard of civilisation of the invaders.

Rome was enfeebled long before the time of Constantine by its excessive materialism, which subordinated moral excellence to external grandeur and military glory. An over-centralised government found it impossible to maintain those

intimate and peaceful relations with distant possessions which were essential to the welfare of an empire so widely extended. The brutal games in the arena and the institution of slavery hastened a demoralisation, the seeds of which existed in the imperial system. Jealousy of the capital was aroused by the provinces being drained of money, which was brought to Rome and squandered by the idle rich. The unbounded luxury of the rich aroused the envy of the poor and fomented a dangerous opposition of classes.

At the end of the IVth century, according to St. Jerome's "Epistles," Rome had frightfully degenerated; effeminacy and indolence had replaced the former Roman virility, gluttony and extravagance knew no bounds; even the Christian clergy were under the corrupting influences of the times, but fortunately not all of them. There were some famous theologians and ministers of honest purpose and superior minds, who not only saw that the social state was rotten, but that the Church and contemporary Christianity itself needed reform. The exaltation of the monastic life was itself in the first instance a species of revolt and protest against the evils of the time; and was promoted by many, sincerely striving for better things; and among such persons we must undoubtedly class St. JEROME (346-420), who was an ecstatic religionist, a zealot, believing honestly in the return of Christ, and who held strong ascetic views.

The Barbarians who destroyed the Roman Empire cared nothing for literature or science, and the Greek tradition would have been lost had not the records been preserved in monasteries. The whole of Europe was almost without exception sunk in the darkest ignorance and the most wretched barbarism. Constant wars between the different countries and conflicts within these countries of factions and of princes striving for sovereign authority made life insecure, and no questions could be considered that did not relate to the fierce struggle for existence. But even at a later period, when the clouds began to lift and signs of returning light were undoubtedly to be discerned, the culture, such as it was, affected merely a fraction of a special class. The little learning there was, related only to such as were within the pale of the clergy, and even the clergy were for a long period not very materially superior, as a body, to the uninstructed laity.

Another reason for the darkness of the Middle Ages was that the rulers of the Church were under the impression that the religious life of Christendom was bound up, not only with certain spiritual truths, but with definite views as to the course of eternal nature. Their attempt to embrace all knowledge, both human and divine, and to make *ex cathedra* pronouncements upon subjects which could only be comprehended after long research, had obviously a paralysing effect. Consequently the free investigation of the world was possible only within the limits of fixed theological canons. **The sacred writings were asserted to contain whatever was necessary or useful for man to know.** Note the famous sentence of St. Augustine: "Nothing is to be accepted save on the authority of the Scripture, since greater is that authority than all the powers of the human mind." **A critical, impartial, and enquiring spirit was the worst form of vice.** It was a sin to doubt the opinions that had been instilled in childhood before they could be examined. Innovation of every kind was regarded as a crime; superior knowledge excited only terror and suspicion. If it was shown in speculation, it was called heresy. If it was shown in the study of nature, it was called magic. Too much prying into the secrets of nature was held to be dangerous both to body and soul. Science was limited to what was preserved of the knowledge of the ancients, and later to such investigations as: How to turn lead into gold, and how to prolong life indefinitely; and the problem of mind received mostly theological treatment on the authority of the Scriptures. It came to be the accepted idea that, as soon as a man conceived a wish to study the natural sciences, his first step must be a league with the devil. In 1163, Pope Alexander III., in connection with the Council of Tours, forbade "the study of physics or the laws of the world," adding that any person violating this rule "shall be avoided by all and excommunicated." However, this unreason was not all theological, for in later

centuries, when science had become secular, the same short-sightedness and cruelty were not uncommon in those entrusted with irresponsible power.

Christianity created a mental atmosphere in which the search for scientific truth was deemed futile. The prevailing state of knowledge, religious belief, the prevailing ideas as to the right conduct of life, the whole spirit of the age was determined by the idea that earthly life was a very brief and comparatively worthless part of man's entire existence ; and that his chief care must be for his soul, or that part of him which would exist eternally in a future world. The other belief was that the miseries of this life were all parts of a supernaturally ordained system of government, and were to be met with resignation, or, if relief from them was really desired, it was to be sought by supplication in prayer. The world was expected to be destroyed in the year 1000; therefore the last Judgment was at hand, and nothing mattered but the salvation of souls. Intellectual and social improvements seemed waste of energy under the circumstances, and the only wise and holy course for people was to retreat from the world to monasteries and nunneries, there to await the awful event. Life, in the Middle Ages, was very insecure, and this increased the religious tendency.

Mediæval Europe shows us the subordination of thought, literature, and art to the service of an all-powerful Church, the replacement of philosophy by **scholasticism,** and of science by mysticism. There were, however, some noteworthy philosophers among the ecclesiastics, both among the early Fathers and the Scholastics, whom it is our duty to mention.

PATRISTIC PHILOSOPHY

After the Christian religion had attained to recognised independence and supremacy in the Roman State, and the fundamental dogmas had been ecclesiastically sanctioned at the Council of Nice, in 325, Christian thought directed itself, on the one hand, to the more special, internal elaboration of the doctrines which had now been defined and agreed upon in general terms, and, on the other, to the work of demonstrating them on grounds either of Christian or of philosophical theology.

The psychology found in the writings of the Fathers has its root in the teaching of the New Testament, principally in that of **St. PAUL** (-65). Man is natural and spiritual. Within the natural man we find all the organs of the sensitive, appetitive, and rational life. There is no opposition between matter and mind. Man is simply a psychic creature. To this principle is added an ethical dualism ; for it is not reason that constitutes the immortal soul. Man as a creature is wholly mortal ; reason does not outlive the bodily life. The immortal is spiritual, another and a different principle wholly distinct from the psychic nature. The spirit is that part of man which enables him to draw near to God ; but this is not to be achieved by knowledge, and the vision of God is no longer a reward for intellectual perfection, but a prize of that high calling which is ours by virtue of the moral nature.

Other subjects of speculation of patristic philosophy were the creation of the world and the dogma of the resurrection of the body. In the dialogue which METHODIUS had with the physician AGLAOPHON in the latter's clinic (300 A.D.), Aglaophon attacked the doctrine of the resurrection of the body on the ground that the body is in a constant flux through the food it takes in; it is never the same, though it appears to be the same.

TERTULLIAN (*ca.* 160-220)

was one of the early ecclesiastical writers. In his treatise " De Anima " he explains that the soul is the breath of God. Man is by nature dual, a being composed of flesh

and soul. The soul is also dual, being at once a vital principle and a rational principle. The soul is superior to the intellect, for the intellect is its servant, the deputy through whom it does the work of feeling and motion. Man is animal in virtue of the soul; and he is spiritual in virtue of his share in the spirit of God. In accordance with the Bible, and in opposition to Plato, Tertullian asserts that the soul has a beginning. It is produced simultaneously with the body. In agreement with the Stoics, he maintains that it is **corporeal,** for affections of the body are felt by the soul (only a material soul can suffer in hell), and the soul moves the body—because of the interaction of soul and body. The soul has extension, for some persons have seen the soul with the eye of the spirit. The soul is "soft, transparent, and of an ethereal colour." The mind is a function of the soul; it is like the soul in being capable of suffering, that is of experiencing emotion. The soul is like the wind in an organ, not divided but distributed through all the parts; and it has its seat in the heart. Though actually simple, **the soul has a rational and an irrational part,** the latter infused by the devil. The soul is never separated from the body; it is always co-existent with the body though different in nature. As a deduction from this, Tertullian says that sleep affects only the body; it is suspension of the senses during which the soul remains active.

LACTANTIUS (*ca.* 240-330),

in opposition to Tertullian, held the soul to be **incorporeal.** It is imperceptible by the senses. It is a heavenly thing—a spirit like unto God, and created by God. There is therefore no possibility of pre-existence. The soul is unity, and on it depend all the activities of the living creature. The distinction of soul (anima) and mind (animus) is not an assertion of parts of the soul, but only a distinction between physical and psychical activities. **The soul cannot be divided.** We cannot speak of "parts" of the soul. While the soul can perform all the functions of life, its essential work is the intellectual activity. In this there are degrees: it increases and decreases as man grows from childhood through his prime to old age; the idiot has no intellect; in sleep the mind rests and in syncope it loses all power.

In man **the seat of the soul is in the whole body,** though the thinking soul is in the head, because the organs of sense are there, and not in the heart. The sense-organs are instruments which the mind uses. The eyes are windows through which the mind looks. The fact that two eyes give only one object is explained from the fact that the mind is a single thing. "Seeing double" is a result of the cessation of mental activity, *e.g.*, in drunkenness.

Affections belong to the soul as the senses do to the body. He divides them into those which pertain to God's nature—anger, graciousness, and sympathy—and those which do not. They are movements of the soul, natural tendencies, and not diseases of reason. They are not to be rooted out, for virtue is the right control of impulses. There is no profit in condemning desire and praising the will: it is better to desire the good than to will it without desire. Moderation is not virtue; he who runs in a wrong direction will not get to the right destination by merely running more slowly. The proper use of all emotional forces is the furtherance of the good life; some that have been reckoned vices are in this view to be regarded as virtues, *e.g.*, fear is a virtue when it is fear of God. Sympathy is not weakness but a bond of unity among men. Anger is justified when it is for the protection of what we have.

Animals are distinct from man in degree; man alone rises to the heights of reflective thought and religion. The animals have traces of other activities such as emotions and instincts, but not of the power that attains to a knowledge of God. Animals have only a principle of life, while man has a divine spirit. The animal soul

comes from the universal ether and is dissolved in death. **The human soul** is made by God and is capable of immortality, but it is **not immortal in itself.** A life devoted to bodily pleasure ends in death for the body and eternal death for the soul; a righteous life earns eternal life hereafter. The souls of the just are free from all feeling of pain hereafter: their existence is passionless. On the other hand, the eternal death of the unrighteous consists in perpetual endurance of torture. This conditional immortality is represented as a life of the spirit, the body ceases but the soul can still see, hear, and feel, retains the human form, in which it comes up for judgment at the resurrection.

ST. GREGORY OF NYSSA (331-396)

held that this world was created in one act of will, but only as a potential system. The diverse forms of being arise out of this by a process of development analogous to the unfolding of latent powers in the seed. God as pure spirit cannot come into contact with the material world directly. Man was created as mediator between God and matter. There are degrees in the natural world and a scale of perfection. Reason cannot be counted as the highest form of natural powers. It is something distinctly supernatural. Mind is the image of God; not the same, only identical in properties and qualities. The **soul** is invisible but can be known through its effect. The soul uses the senses to acquire knowledge which transcends the mere activities of sense. Mind is simple and a unity, though its functions are complex. The human mind is so constituted as to have a faculty of receiving divine influence and a tendency to seek after God. Owing to its nature the soul cannot be localised; it is not in one part of the body more than another, but penetrates the whole.

The soul has no parts, yet Gregory distinguished nutritive, sensitive, and rational activities, corresponding to the body, soul, and spirit. The rational nature is not equally present in all parts of the body. The higher nature uses the lower as its vehicle. In matter resides the vital power; in the vital dwells sensitive power, and to the sensitive power is united the rational. The sensitive soul is thus a medium, purer than flesh and grosser than the rational soul. The soul thus united with the body is the real source of all activities. The nutritive soul is a vital power, and not a substance, and is potentially present apart from the rational soul. So, too, is sensation potentially present. Soul is therefore a substance—living, rational, and capable of endowing the organic sensitive body with vital power and apprehension of sensible objects.

The **passions** are affections of the nature of the soul, but do not reach its substance or essence. Mind is not ruled by flesh, the reason is not the slave of the passions; on the contrary, mind is supreme in its own domain to accept or reject any external solicitation. The passions are given to man for a purpose. Originally the body was an image of the divine; through sin the passions entered into the world, and it is our business to restore the original state of perfection. Gregory definitely makes the mere affections **neutral**; ethical value attaches only to the use man makes of them. It follows that they are not to be rooted out but transformed.

NEMESIUS (*ca.* 340-400),

Bishop of Emesa in the reign of Theodosius, published in 381 a work, entitled *De Natura Hominis*, in which he tried to combine Greek philosophical doctrines with Christian dogmas. He borrowed from the Neo-Platonists their doctrine of the nature of the soul as an independent reality, from Galen his new physiological data, from the Stoics their system of the passions, from the Epicureans their theory of pleasure, from Aristotle his conception of the will, and finally—evidently from Poseidonios—the **localisation of mental functions in the brain.** It is the last which is of special interest to us. He states:

" The powers of the Soul are divided into these three : Phantasy, Judgment, and Memory. The instruments of the imagination are the front pans of the brain and the vital spirits which are in them. The instruments of cogitation are the middle pan of the brain and the vital spirits which are in it. The instruments used by the memory are the hinder brain-pan and the vital spirits there placed. If the former brain-pan be hurt, the senses are much hindered ; but the cogitation remains sound. If only the middle pan be harmed, the cogitation is maimed, but the seat of sense keeps the senses whole. If any hurt befall both the former and middle pan, both sense and cogitation decay. If the hinder pan only be disordered, the memory alone perishes, and neither sense nor cogitation receive harm. But if the former, the middle, and the hinder brain-pans be all together out of order, the party so disturbed is maimed in sense, in cogitation, and memory, all at once ; and the whole living creature is in danger of destruction. This is made evident also by many diseases, and accidents which are symptoms of diseases, and especially in frantic men."

Here we have an **insistence on pathological observations** on man for the discovery of the physiology of the brain by a layman, a recommendation which physicians of 1,550 years later are still somewhat neglecting, in favour of vivisection of animals.

Apollinarios of Laodicaea (-390) adopted the view of brain-functions of Nemesius; but whereas the latter located mental attributes in the substance of the brain, the former localised them in the cerebral ventricles.

Nemesius drew an ascending scale of organic beings and stated that **no sharp line can be drawn between the mental capacities of man and animals** ; the faculties are the same in both, and all men have the same faculties ; and he drew a clever distinction between Will and Choice : our will is unlimited, but our choice is limited.

ST. AUGUSTINE (354-430)

St. Augustine was the most learned man of the early Christians, the greatest of the Fathers, whose writings dominated thought for many centuries. He gathered into one the scattered results of what was best in Greek psychological thought. His version of Plato dominated thought until the thirteenth century.

The **soul** was to be approached and known directly through consciousness. It is immaterial in character and immortal. It is a substance or subject, and not a mere attribute of the body. It feels each affection of the body at that point where the affection takes place ; it is therefore wholly present both in the entire body and in each part of it, whereas the corporeal is with each of its parts only in one place. The soul has the power of knowing itself ; the faculties turn in upon themselves—self-contemplation ; we reflect upon our own states of mind. This is the key to divine knowledge ; for in reflecting upon ourselves we discover the characters of the spiritual principle and of God. This is the end of all knowledge. In answer to the sceptical questions of cultivated Romans as to the knowledge of God by revelation, St. Augustine replied that there are truths which are not limited by the accidents of space and time—truths which the mind does not create, but perceives as existing. Mathematical and moral truths are of this order. We must find the eternal home or base of these truths, and they point to the existence of an infinite and eternal intelligence.

In hunting out the impulses of his own mind, he discovered what a tremendous significance feeling has for the inner development of man. Resulting from such observation he found that the mental life was one of continual movement in the one spiritual principle, and showed itself in three fundamental functions : intellect, will, and self-conscious memory. The fundamental moving principle of the entire mental life was will. All passions are manifestations of the will. The cause of evil is to be found in the will, which turns aside from the higher to the inferior, or in the pride of those angels and men who turned away from God, who has absolute being, to themselves, whose being was limited. Not that the inferior as such is evil, but to decline to it from the higher is evil. Evil is not a substance or nature, but a marring of nature and of the good, a " defect," a " privation," or " loss of good."

Evil can only exist as an adjunct of good. An absolute good is possible, but absolute evil is impossible.

He held that **the soul acts upon the body from its seat, the brain,** which has three ventricles : the *anterior* is the nerve centre ; the *posterior* is the motor or memory centre ; and the *middle* ventricle is the seat of learning. The memory centre is required so that motions may be connected one with another, the past with the present. The memory centre is not itself memory. In addition to the five senses we have the sixth sense, the traditional " common sense," by which we know that we have two or more sensations at a time. The imagination is a faculty mediating between memory and understanding, not between sense and memory. Its material are memory images, just as sensation has the external objects for its material. For their psychic functions all parts are dependent on the soul. If the soul is not intent the effects of external agents are unnoticed.

Although the astronomical knowledge bequeathed to us by antiquity became gradually lost with the downfall of Rome, yet St. Augustine still held the belief that the earth was the centre of the universe and was isolated in space. He remarked that when the sun disappears from our sight, it lights other parts of the earth ; but he did not believe the antipodes to be inhabited by human beings, for it was impossible for man to cross the ocean to reach them, and they could not possibly be descendants of Adam, the common progenitor of mankind.

The doctrine of St. Augustine that the fœtus developed a soul in the second month, and was sexually differentiated in the fourth, later played an important part in legislation.

THE EARLY SCHOLASTICS

NOMINALISTS AND REALISTS

The Scholastics were theologians, who prosecuted philosophy wholly in the interests of the Church and whose aim was to reconcile faith and reason, and to give to the dogmas of Christianity a scientific form. Scholasticism was a blend of the old pagan philosophy with the new faith, the logic of Aristotle associated with the teaching of the Church, and by it Reason became subject to Authority, and was made the mere handmaid of Faith. Even when at last a revival of learning took place, empty scholastic subtleties and metaphysical mysticism engaged the whole attention of men, who rivalled one another in verbal disputations, without agreement in the meaning of the terms they used ; and, as if knowledge were nothing more than a process of ingenious excogitation, they made no attempt to observe the phenomena of nature and to search out the laws governing them.

Among the problems discussed were : What caused the creation of the stars on the fourth day ? Were beasts of prey and venomous animals created before, or after, the fall of Adam ? Why were only beasts and birds brought before Adam to be named, and not fishes and marine animals ? Why did the Creator not say " Be fruitful and multiply " to plants as well as animals ? One of the problems they set for solution was how to reconcile an omnipotent Justice with an unequal distribution of opportunity, and an omnipotent Love with the existence of suffering. Another query to be answered was : Is there a survival of the conscious ego—a perpetuation of the personality ? Then there were the controversies concerning the origin of the soul. Was the soul created by a divine act at the moment of conception, or was the soul passed on from parent to child, in a new individual form, all souls having been potentially created in the first man ? Another subject of controversy was the doctrine of the Trinity. Another problem was whether our general notions of such things as man, dog, table, have any objective reality. Those who considered that they did possess such objective reality were known as *Realists*, while their opponents were termed *Nominalists*.

Nominalism, as the conscious and distinct standpoint of the opponents of Realism, first appeared in embryo in the IXth and Xth centuries and more expanded in the second half of the XIth century (with which we shall deal in the next chapter), when a portion of the Scholastics ascribed to Aristotle the doctrine that logic has to do only with the right use of words, and that genera and species are only (subjective) collections of the various individuals designated by the same name, and disputed the interpretation which gave to universals a real existence.

The Nominalists affirmed that there were no general ideas; the Realists maintained that there were universal ideas to correspond with general terms. There was also an intermediate sect of scholastic philosophers, who took the name of Conceptualists.

The **Nominalists** affirmed that there were two classes of truths, respecting individual things or objects belonging to the same genus or order; namely, one class relating to individual objects, and their particular qualities or properties; the other class to general truths, which arose out of those qualities or circumstances, which all the things or objects possess in common. The words which are used to designate these general qualities or circumstances are called general terms; and the Nominalists declared that when men talk or reason about these general or common attributes of things, this general term *alone* is the only thing with which the mind is conversant.

The **Realists** denied this doctrine and maintained that, though these general terms were used in our descriptions of the similar properties or qualities of things, yet there was a general idea always present in the mind, when it thus characterised the common attributes which belonged to a particular genus. This general term was not a mere verbal instrument; but stood for a *real* permanent intellectual conception, which was always present to the mind, and to which the name of *general idea* was uniformly given.

The **Conceptualists** attempted to steer a middle course between these two opposite doctrines. They all, however, agreed with the Nominalists in denouncing general ideas or conceptions, such as the Realists considered them to be; but they still thought the mind had the power, when requisite to exercise it, of creating these general notions. They said there were no essences, or universal ideas, to agree with general terms, and that the mind could reason about classes of individuals without the mediation of language.

The famous Lord BACON (1561-1626) has given us the most scathing criticism of Scholasticism. He says:

"As many natural bodies, whilst they are still entire, are corrupted, and putrefy, so the solid knowledge of things often degenerates into subtle, vain, and silly speculations, which, although they may not seem altogether destitute of ingenuity, are insipid and useless. This kind of unsound learning which preys upon itself has often appeared, particularly among the Scholastics; who, having much leisure, quick parts, and little reading; being in mind as clearly confined to the writings of a few authors, and especially of their dictator Aristotle, as they are in body to the cells of their monasteries; and being, moreover, in a great measure, ignorant of the history both of nature and the world; out of very flimsy materials, but with the most rapid and violent motion of the shuttle of thought, they have woven those laborious webs which are preserved in their writings. The truth is, that the human mind, when it is employed upon external objects, is directed in its operations by the nature of the materials upon which its faculties are exercised; but if, like the spider, it draws its materials from within itself, it produces cobwebs of learning, wonderful indeed for the fineness of the threads and the delicacy of the workmanship, but of no real value or use."

Though the Scholastic philosophy presents, in many points of view, a lamentable instance of the weakness of human nature, yet it is not without some redeeming

qualities. It must always be borne in mind that one prime motive which lay beneath the surface of all metaphysical and theological controversy was an ardent desire for intellectual liberty and freedom of discussion. What many of the learned and able doctors of the Schools contended for was a perfect right for human reason to canvass and discuss the general principles of philosophy and religion, no matter to what result that investigation might lead. Scholasticism was essentially a theological controversy. The theories of the Nominalists and Realists would soon have been deprived of all interest, but for the constant supply of controversial matter which theology afforded. The theory of the Nominalists was considered more in unison with certain views of revealed truth ; and the ideas of the Realists decidedly in favour of an opposite conclusion. This was the real source of the long and bitter contest. The leading theological doctrines which were discussed through the medium of the Scholastic metaphysics were the Trinity, Predestination, Grace, Justification, and the Sacraments.

Pantheism simply identifies God with nature and natural forces. Now, in mediæval times the opposition between Theism and Pantheism took the form of a dispute between Realists and Nominalists. To the mediæval logician, Realism was just the opposite of our modern concept of a knowledge of material things. The Realists assumed, with Plato, that the idea is as actual as the thing itself and creative of it, whence it follows that all things proceed from the will of God. The Nominalists, on the other hand, affirmed that the form or idea is only a name or abstract conception, existing in the mind of the observer alone, and that God, therefore, exists impersonally in each and every object of the material world. To mediæval theologians, such pantheism as this could be no less than infidelity and unbelief, since it tended to dissolve the dogmas of faith and was subversive of the ideas of divine revelation and of personal immortality, the hope held out to the Christian.

JOHN SCOTUS, of Ireland (*ca.* 800-880),

was the first to raise the questions (1) whether genera and species, or the so-called universals, have a substantial existence or whether they exist solely in our thoughts ; (2) whether, supposing them to exist substantially, they are material or immaterial essences ; and (3) whether they exist apart from the objects perceptible by the senses or only in and with them. He held that true philosophy and true theology are identical. Faith belongs to the earlier stages of intellectual life and leads up to reason. The universe is the unfolding of God. Natural things have only a semblance of reality. His pantheistic speculations got him into trouble with Rome.

ROSCELLINUS (1050-1120),

Canon of Compiègne, applied the nominalistic doctrine to the dogma of the Trinity. He was accordingly required by the Ecclesiastical Council of Soissons (1092) to recant the offensive inference ; consequently, in the period immediately following, there were but few adherents to Nominalism who ventured openly to confess it. It was first renewed in the XIVth century, particularly by William of Occam (1280-1347). The most influential opponent of Roscellinus, among his contemporaries, was Archbishop Anselm, while Abélard sought to maintain an intermediate and conciliatory position.

ANSELM (1033-1109),

Archbishop of Canterbury, supported the Realistic position. God's existence is bound up with the true nature of the human mind. The idea of God involves the

reality of that idea. The rational and real are one—an idea which has its germ in Plato. Anselm affirmed repeatedly, as his fundamental principle, that knowledge must rest on faith, and not faith on a preceding knowledge developed out of doubt and speculation. Philosophy is strictly subordinated to theology. He required unconditional submission to the authority of the Church.

PETER ABÉLARD (1079-1142)

became the great leader in the intellectual movement of the age. He taught the view, intermediate between Nominalism and Realism, which has since been called *Conceptualism*, admitting that abstract ideas and general terms are not mere words, but are necessary conceptions of the similar qualities and mutual relations of the objects we classify. While he believed in the capacity of reason to compass all mysteries, he did not renounce the principle of the pre-eminence of faith. But he held that faith without knowledge lacks stability. Man believes not because of authority, but because of conviction. It is in the intention, not in the action, that moral good and evil reside. **The propensity to evil,** belonging to us in consequence of original sin, **is a natural disposition of the body and not in itself sin.** It is only the consenting to evil which is sin. The idea of sin, he affirms, implies not only a departure from what is morally good in itself, but at the same time a violence done to the sinner's own moral consciousness ; whatever, therefore, is not in conflict with this consciousness is not sin, although that which harmonises with one's own moral consciousness is not for that reason virtue, unless this consciousness is what it ought to be.

His work on the Trinity caused his disgrace. He was described as a rash innovator who explained divine things with the devil's daring, and sought to penetrate into the secrets of religion, setting his own private opinion above the united testimony of the Church.

BERNARD OF CLAIRVAUX (1091-1153),

the opponent of Abélard, regarded feeling as the pathway to knowledge, and contemplation as the secret of blessedness. There are three ways of grasping divine truths. The *first* is by the intellect, which is not possible in this life. The *second* is opinion, which is void of certainty. The *third* is faith, which proceeds from the heart and will, and anticipates the knowledge which will at last be clearly given to the mind.

PETER LOMBARD (1100-1164),

Bishop of Paris, explained the doctrines of the Church in methodical form, placing them on a metaphysical basis, supported by quotations from the Fathers. He did not escape accusation ; but his book, nevertheless, continued to be the text-book of theology for university teachers.

Bishop JOHN OF SALISBURY (1110-1180),

the celebrated friend of Thomas à Becket, in 1150, worked out a theory of the continuous development of knowledge, pointing out the transitions of function as they actually take place from sense perception to reason. First appears sensation, and in it the germ of judgment ; then imaging, with a further development of judgment in the direction of valuation of experience, from which arise pleasure and pain, the basis of desire. Out of imagination springs rational knowledge, and through it comes wisdom, the contemplation of God.

CHAPTER VI

ARAB PHILOSOPHY AND LATER SCHOLASTICS

THE Christian religion never established itself firmly among the peoples of Northern Africa, and when it was supplanted by a theology, the mysteries of which were beyond the understanding of ordinary men, and many of its clergy did not practice what they preached, there was a chance for a new prophet, and **MOHAMMED** (571-632) was the man. He preached a monotheism which wrenched from Christianity more than half of her possessions. Mohammedanism originated in Arabia, and soon spread by military conquest to Egypt and the remainder of Christian Africa, as well as Syria and Persia, and when the Moors conquered Spain, the Arabian crescent extended from the Bosphorus across Northern Africa to the Pyrenees.

Mohammed was eloquent in the pulpit and valiant in the field. He did not engage in vain metaphysics, but applied himself to improving the social conditions respecting personal cleanliness, sobriety, fasting, charity and prayer. To asceticism he opposed polygamy, and promised the most voluptuous means for its enjoyment in Paradise hereafter. The burden of the teaching of the Koran is the unity of God, and the duty of man to man. It contains poor philosophy, but abounds in excellent moral suggestions and precepts. It is full of maxims of which all men must approve. It betrays a human, though not an intellectual, origin. Paradise was declared to be as much for those who rightly use the pen as for those who gained the crown of martyrdom or who had fallen by the sword. "The world is sustained by four things: the learning of the wise, the justice of the great, the prayers of the good, and the valour of the brave." Like the Jewish religion, the Islamist repels all idea of associating another in the worship of God. There is no "Intercessor" between God and man, either to purge him of his sins or to reconcile him to an angry Deity. If they sin, they can obtain forgiveness by appealing direct to him and by "abandoning their evil ways."

At first the Koran was an obstacle to the advancement of learning, but its fatalism was soon mitigated, and it is remarkable how quickly the ferocious fanaticism of the Saracens was transformed into a passion for intellectual pursuits, and philosophy and science were cultivated, when the rest of the world was steeped in ignorance and barbarism. The Khalifs invited philosophers and cultivators of all the sciences, of whatever religion, to the Court of Bagdad; no mosque was to be built unless there was a school attached to it; libraries were established and the copying of manuscripts properly organised. For a trifling payment liberty was guaranteed to the Christian and the Jew and absolute security for their worship.

The Moors had conquered Spain in the VIIIth century, and the rise of the Arabian Empire, associated as it was with the revelation of a new religion which spread over a large surface of the globe, introduced a fresh element into the worn-out civilisation of the old world. An extensive commerce and a general love of industry created a wealth that astonished Europe. Their version of Aristotle, their medicine and

general culture exercised a widespread influence. As if by magic, **a splendid civilisation sprang into being.**

The Arabs had a national poesy and music. They were the inventors of the violin. On a Byzantine and Persian foundation they created **a new architecture** and ornamental art. **Philology** is a creation of the Arabs, and in lexicography they created a gigantic work which rivals the most modern dictionaries. They were **the most wonderful encyclopædists.** The most comprehensive histories emanated from their archives. They were the first to introduce bibliography as a systematic auxiliary science.

Their **cultivation of science** dates from their capture of Alexandria in 638. This was only six years after the death of the Prophet. They had not only become acquainted with, but correctly appreciated, the Greek scientific writers. The caliphs, in contrast to most of the Byzantine emperors, vied with each other in the promotion of science, and some of them even took part in the course of instruction. The Arabs were extremely well versed in **technology.** They were acquainted, *e.g.*, with the use of gunpowder and of artillery before the West. They derived from China a knowledge of the manufacture of paper, made woodcuts for the ornamentation of manuscripts; they also received from China the compass, which they improved and employed on journeys across the deserts.

The Arabs did much original work in astronomy. They ascertained the dimensions of the earth; they had registered or catalogued all the stars visible in their heavens, giving to those of the larger magnitudes the names they still bear on our maps and globes; they determined the true length of the year, discovered astronomical refraction, invented the pendulum clock, improved the photometry of the stars, ascertained the curvilinear path of a ray of light through the air, explained the phenomena of the horizontal sun and moon, and why we see these bodies before they have risen and after they have set; they measured the height of the atmosphere, determining it to be fifty-eight miles, gave the true theory of the twilight and of the twinkling of the stars. These astronomical studies were made, although their study of the heavenly bodies was mixed up with **astrology,** a kind of magic art by which they claimed to foretell what was going to happen by studying the stars.

Of **mathematicians,** one of the most celebrated was **MOHAMMED BEN MUSA,** who lived about 900. He is the earliest Arabian writer on algebra, *i.e.*, the working of sums by means of letters. He was the first to use the Indian (Arabic) numerals instead of the Roman.

ALHAZEN (-1038), an Arabian astronomer and mathematician living in Spain, made discoveries chiefly in optics, discovering laws of refraction and the magnifying by convex lenses. He recognised the duration in time of psychical processes, had the knowledge that between stimulus and sensation a certain time must elapse, due to the propagation of the excitation along the sensory nerve. He may therefore be regarded as the forerunner of experimental psychology.

The study of **chemistry,** which in Europe was considered an "occult science" and a "black art," was fostered and various discoveries were made.

From the VIIIth century to the XIIIth chemistry was cultivated with great assiduity by the Arabs in the academies which they established at Cordova and other cities of Spain; and it was from the latter region that the belief in **alchemy** spread to all the countries of Western Europe, gradually gaining strength up to perhaps the XVth century. It was during the XIIIth century that the doctrine of the single origin of all matter led to the consideration of the "philosopher's stone" and to the belief of the possibility of transmuting the baser metals into silver and gold (which, however, in the light of recent science appears perfectly possible), and there were not a few who even believed that this as yet non-existent stone possessed the power to increase longevity, to confer health, and to give a prosperous issue to one's undertakings. But although the persistent and wonderfully energetic activities of the alchemists failed to find the philosopher's stone, or to transmute the ordinary metals into precious, they placed in the hands of man the

key to a knowledge of chemistry, that branch of science which was destined in later years to play such an important part in pharmacy, in agriculture, and in other industries. Thus we owe to alchemists the discovery of many chemical substances, of many processes, and the invention of many apparatuses—indeed, the groundwork of modern chemistry.

The greatest of these Arabian alchemists was a man named **GEBER** or DJAFER (699-776) of Mesopotamia, who has been called the founder of chemistry. He discovered nitric acid and aqua regia, and described distillation, filtration, sublimation, water-baths, and other essentials of chemical procedure.

Among the Moors there were some prominent physicians and philosophers. Medicine had been almost entirely neglected in the early Middle Ages. There were few medical men of reputation, and of these a good many were of Jewish faith. The Arabs fostered the study of medicine both in the East and Spain. **Especially pharmacy made great progress.** They trusted nature and hygiene very little and were all for active treatment by drugs. Caliph EL RASCHID (786-802), who had founded a university at Bagdad, prohibited any person from practising medicine who had not passed a satisfactory examination. At Bagdad, Greek works were translated into Arabic, and in this manner the writings of Plato and Aristotle were secured. Arabian culture reached its zenith at the period of the greatest power and greatest wealth of the Caliphate in the IXth and Xth centuries.

The Arabians derived their knowledge of Greek medicine from the Nestorian monks, many practical details from the Jews, and their astrologic lore from Egypt and the Far East.

The **Nestorians** were the followers of NESTORIUS, Bishop of Antioch, called to Constantinople in 427 (died 440). He protested against the worship of the Virgin, and declared that Mary should be called not "Mother of God," but "Mother of Christ," and that in Christ the two natures, human and divine, must be carefully distinguished. Nestor rejected the base popular anthropomorphism, picturing God, Christ, the Virgin, and the Holy Ghost in human form and attires, looking upon it as little better than blasphemous, and pictured to himself an awful eternal Divinity, who pervaded the Universe and had none of the aspects or attributes of man. Nestor was exiled, but his overthrow and punishment by no means destroyed his opinions.

His followers emigrated to the Euphrates and established the Chaldean Church, and from their colleges they spread Nestor's tenets through Siberia, Arabia, India, Tartary, China, and Egypt. The Nestorians adopted the philosophy of Aristotle, and translated his works into Syrian and Persian. In connection with the Jews they founded the medical college of Djondesabour. Their missionaries disseminated the Nestorian form of Christianity to such an extent over Asia that its worshippers eventually outnumbered all the European Christians of the Greek and Roman churches combined. The Nestorians were banished in 439, and in 489 their school, at Edessa, where the Arabians also were educated as physicians, was dissolved. In 490 they founded a new school at Nisibis in Mesopotamia, which in the VIIIth century fell into the hands of the Arabians. These Nestorian schools were the first to require an examination before granting a certificate to practice, and also the first to separate pharmaceutics from medicine proper. The Nestorians found no difficulty in affiliating with their Saracen conquerors. Indeed, they became their educators, and it was partly by their influence that the Saracens became refined.

The Arabian physicians and philosophers accepted Aristotle's classification of the faculties and localised them in the brain, very much on the lines of Poseidonios. The importance of this historical attempt at brain localisation will be seen when we tell the history of similar attempts in the XIXth century. This early attempt at localising mental functions in the brain is generally ignored or dismissed in a few lines; but that it must have been originally based on some observed facts is evident from its acceptance by medical men for 1,300 years.

Aristotle, as we have seen, recognised besides the five outer senses three inner powers, namely (1) a *common sense* for the co-ordination of the various perceptions, and evolving from these (2) *phantasy*, the power of reproducing images, and (3) *memory*, the power of mind to store and retain images. He further distinguished (4) *opinion* from imagination, and (5) *reminiscence* from memory. The Arabian philosophers (as also the Patristic philosophers and Scholastics) located these five inner senses with slight variations, and their localisations, as has been already mentioned, continued to be reproduced till well-nigh the end of the XVIIIth century. Some of them (as Albertus Magnus) acknowledged only the first three faculties; others located all the five. Generally, *common sense* was located in the fore-part of the brain; *phantasy*, imagination, or cogitation, in the middle part of the brain; and *memory* in the posterior part of the brain. As **BURTON** (1576-1640) has put it in his most curious of books, "The Anatomy of Melancholy" (1621):

"Inner senses are three in number, so called because they be within the brain-pan, as common sense, phantasie, and memory. Of common sense the forepart of the brain is his organ or seat; of phantasie or imagination, which some call estimative or cogitative, his organ is the middle cell of the brain; and of memory, his seat and organ, the back part of the brain."

In the "Tesorretto" of BRUNETTO LATINI (1230-1294), the preceptor of Dante, published in the XIIIth century, the doctrine is taught in rhyme:

"Nel cappo son tre celle,
Ed io dirò di quelle,
Davanti è lo intelletto
E la forza d'apprendere
Quello che puote intendere.
In mezzo è la regione
E la discrezione
Che scherne buono e male.
E lo terno e l'iguale
Dirietro sta con gloria
La valente memoria,
Che ricordo e retiene
Quello ch'in essa viene."

The reason why the ancient philosophers, from whom the Arabs adopted this localisation, placed the faculties in certain cells, meaning cavities or ventricles, probably was to give more room for the pneuma, the gaseous substance, to expand. As we ordinarily carry the hand to the forehead when we think, and experience a peculiar sensation in that region, they made it the seat of common sense; they regarded our ideas as submitted to a kind of elaborative process in the middle portion of the brain, and laid them up in store in the posterior region. Some distinguished four regions, as follows: The *first* or anterior ventricle of the brain, which was supposed to look towards the front, was the ventricle of common sense; because from it the nerves of the five outer senses were presumed to branch off, and into it, by the aid of these nerves, all sensations were brought together. The *second* ventricle, connected by a minute opening with the first, was fixed upon as the seat of the imaginative faculty, because the impressions from the five outer senses are transmitted from the first ventricle into it, as a second stage in their progress through the brain. The *third* ventricle was the seat of the understanding; and the *fourth* was sacred to memory, because it was commodiously situated as a storehouse into which the conceptions of the mind, digested in the second ventricle, might be transmitted for retention and accumulation. Memory being located posteriorly,

the occiput used to be called the mnemonic bone; and many learned men thought that a very prominent occiput was a sure sign of an excellent memory.

As a matter of fact, the so-called *anterior* ventricle consists of two ventricles: the right and left lateral ventricles, which communicate with one another and are continuous with the third ventricle—called in ancient times the *middle* ventricle—by the Foramen of Monro; and the third ventricle communicates with the fourth ventricle—called by the ancients the *posterior* ventricle—by the Aqueduct of Sylvius.

The lateral ventricles are roofed over by the corpus collosum; the third is covered by the optic thalamus; and the fourth is situated between cerebellum and pons.

Possibly the idea of memory being related to the posterior part of the brain arose from the observation that *a blow on the occiput is frequently followed by loss of memory;* but in modern times this fact is explained on the theory of a contre-coup, a blow on the back part of the head causing the brain to impinge violently on the frontal bone, damaging the anterior brain cells, a region considered by a large number of observers to be related to the intellect and memory.

If the sense of sight and sense of hearing are stimulated at the same time, their effects somehow cohere in consciousness, and the knowledge of this fact inspired the hypothesis of a sensory centre to which the term **sensorium commune** or common sense was applied. By some this was regarded as the seat of the soul. As most parts of the brain are double, the localities to be selected were very limited, and only structures in the middle line could be chosen; as, for example, the pineal gland by Descartes, and, as late as the XIXth century, the optic thalamus by W. B. Carpenter and the pons cerebri by Herbert Spencer. But there is no sensorium commune. The tracts of fibres ascending to the brain from the sense organs pass to widely separated parts. No doubt the various functionally differentiated areas of the brain intercommunicate; when one part is stimulated, other parts, if not the whole brain, vibrate with it through so-called association centres. It is in this sense that the brain may be regarded as a unit.

The Arabian physicians laid stress on the importance of urine tests as an aid to diagnosis. They were the first to employ opium in the treatment of insanity. They were **accurate observers of the physiognomy of disease**; they discovered, *e.g.*, the peculiar shape of the nails in tuberculosis. They were the first to undertake operations for the removal of stone from the bladder and they introduced new methods in the amputation of limbs. They were the first exactly to observe and describe leprosy and the infectious fevers. **Arab women** were admitted to the practice of medicine and held appointments to the ladies of the Court. Women dentists were not uncommon, and, it is said, men preferred them for the delicacy of their touch, their toothache disappearing as if by magic. **The Moors built many hospitals and asylums,** and were the first to give practical instruction at the bedside of the patients. They were the first to employ dressing stations and field ambulances (transported by camels) on the field of battle.

RHAZES (850-932),

called the "Arabian Galen," was one of the most famous Arabian physicians and appears to have carried the **localisation of mental functions** into practice, for he is reported to have been a phrenologist of some skill. He was the first also to discriminate between measles and smallpox, to distinguish between febrile and non-febrile heat, and between the laryngeal and recurrent laryngeal nerves. It is related of him that, when asked to choose a site for a hospital, he hung up pieces of meat in various parts of the city, declaring that the one in which putrefaction last appeared would mark the most suitable position. Rhazes was a universal genius,

famous not only in medicine, but also in music, astronomy, mathematics, and chemistry. At the age of fifty, he was one of the most distinguished professors in the Academy of Bagdad, where students came from a great distance to listen to him. He directed the great hospital of that city.

AVICENNA (980-1037),

another famous physician, was a zealous **disciple of Aristotle,** and lost no opportunity of inculcating and expounding his doctrines. He qualified them, however, respecting his division of the vegetative, sensible and rational **soul.** He remarked that those distinctions indicate rather three modes of action than three distinct things.

The vegetative soul has three faculties : nutrition, augmentation, and generation ; the sensitive has two faculties : those of apprehension and motives ; the latter excites or produces motion and creates appetites. The faculty of apprehension is a compound one. It exercises itself both externally and internally. We commonly attach to it five external senses and five internal ones. The bodily or external senses embrace hearing, seeing, touching, tasting, and smelling ; the five internal senses are : (1) imagination (located in the frontal region) ; (2) vision or fantasy (located in the middle region of the brain) ; (3) cogitativa ; (4) æstimativa ; and (5) memory (located in the posterior region). The last faculty has the value of warning in the presence of good and ill. Sense knowledge issues in movement, and movement in turn contributes to rational knowledge, which is of the absolute. The rational soul, being a simple substance, is out of space and time, and independent of the body. Avicenna assumed three kinds of spirits in the body : natural, vital, and animal, each of these produced from the vapour of the blood.

Psychic alterations depend upon pathological changes in the proportional admixture of the brain. They may be divided into elementary intellectual disturbances (of imagination and memory) and real psychoses (melancholia, mania, and weak-mindedness). Intellectual disturbances arise from black bile and betray themselves through anxiety and sadness ; if yellow bile is the cause, confusion, irritability and violence arise. Abnormalities of the front part of the brain cause disturbance of the perceptive power (incorrect conception of things or hallucinations) ; weak-mindedness and imbecility depend upon abnormalities of the middle part ; failure of memory upon those of the posterior part of the brain.

Roger Bacon was to a great extent a follower of Avicenna.

AVERRHOES, of Cordova (1126-1198),

was **the most celebrated philosopher and physician,** who exercised the greatest influence upon his own time and succeeding ages. He was a religious free-thinker of a pantheistic kind, who, hiding himself behind the precepts of philosophy, awakened doubts as to the creed of the Church, which accordingly hated him bitterly and condemned his doctrine. He also suffered bitter persecution at the hands of his fellow-believers, being accused of cultivating the philosophy and science of antiquity to the prejudice of Mohammedan religion, and was deprived by Almansur of his dignities and banished.

He was **the trustiest follower of Aristotle** among all the Arabians. He translated his works from the Syrian into the Latin language, adding his own commentaries.

He denied to the human soul the passive reason or intellect as well as the active reason ; but memory and the power of sensory representation and a quasi-intelligence, which went by the name of *vis cogitativa,* in fact all but the capacity to form a pure abstract notion, were allowed it. Reason or intelligence was then a metaphysical entity, whose relation to individual human souls was purely external and accidental and temporary. The doctrine involved the **denial to the human**

soul of immortality and of any existence apart from the body; and this implication was explicitly taught by Averrhoes, though it was not accepted by all who professed themselves his disciples.

From the teachings of Averrhoes and Abélard sprang the materialism—school of Free Thinkers—which was condemned by the bishops of Paris in 1240, 1269, and 1277. This embraced such doctrines as these; what was contrary to the Catholic faith might yet be true in philosophy; that philosophers could not as such believe in the Trinity or the resurrection of the body; that authority is not a sufficient reason; that man may be saved by mere morality; that the world is eternal and creation impossible; and that human souls are united too closely for individual immortality. So bold was the new philosophy that Thomas Aquinas (see p. 104) was obliged to refute the proposition that miracles could not have happened, because any violation of the order of nature would imply that God acts against Himself and that He makes the universal good give way to that of individuals. In 1310, MARGARET PORETTA, one of the leaders of "Brothers and Sisters of the Free Spirit," was burned at Paris for teaching that the soul which is one with God is free from laws, and may indulge every inclination innocently. Seven years later, men and women were tried at Strassburg for holding that the Church and her sacraments are useless; that prayer and fasting check the progress of the soul; that the good man needs no priest; that it is better to follow the Inner Voice than the written Gospel; that there is no angel but virtue, and no devil but vice; and that there is no resurrection of the body, and no hell or purgatory, so that even Jews and Pagans are to be saved.

FOUNDATION OF UNIVERSITIES

Though a university was founded in the IXth century at **Salerno,** it was not until the Xth or XIth century that the beginnings of European medicine, as evidenced by a flourishing medical school with a recognised course of study and something of the nature of a diploma, became perceptible.

A candidate for graduation was required to present proof of majority, of legitimacy of birth, and of proper duration of preliminary study, including one year's study of anatomy, and was then examined publicly in the *Synopsis* of Galen, the *Aphorisms* of Hippocrates, or the *Canon* of Avicenna. On passing he swore to conform to all the regulations hitherto observed in medicine, to give gratuitous treatment to the poor and to expose all apothecaries detected in adulterating drugs. The degree conferred was that of "magister," the title of "doctor" being at that period employed almost exclusively to designate a public teacher or professor. Even the number of professional visits and the remuneration were fixed by law. Those who taught at Salerno were the first physicians in the Christian part of Western Europe who procured medicine a home in which scientific considerations alone prevailed, where the Church exercised no control whatever, and where all the different branches of the science were favoured to an equal degree.

Up to this time the Christian monasteries were the only schools where literature and science were cultivated; but the science pursued aimed at nothing higher than an acquaintance with the writings of Aristotle. As regards **medicine,** reliance was placed on faith, prayers, and fasting; and the sick could emulate the saints in their capacity for endurance of suffering. Therefore, before the foundation of the University of Salerno, and for some time afterwards, medicine was largely in the hands of Jewish and Arabian physicians.

Salerno declined in fame through the foundation of universities at Naples, Montpellier, Padua, Paris, and Bologna, which all entered into a contest for pre-eminence. **Montpellier,** as early as 1153, **was famous as a school of medicine.** Within the walls

of the city sojourned both Christians and Jews, the latter being subject directly to the civil authorities, and particularly esteemed as translators.

One of the most famous pupils of Montpellier was **JOHN OF GADDESDEN** (1280-1361), Physician-in-Ordinary to the King of England, professor in the University of Oxford, who wrote the famous treatise known as *Rosa Anglica* (1305-15). Gaddesden was perhaps the first formally to recommend the "**laying-on of hands**" by the king for the cure of scrofula, first performed by Edward the Confessor (1004-1066), whence comes the ancient name for this disease, *i.e.*, "King's Evil."

JEWISH PHYSICIANS

From the IXth century to the XIIIth the Jews shared with the clergy the monopoly of the healing art. Many of these studied under Arabian physicians, and, though the canons of the Church forbade them to minister to the ailments of Christians, they were still called upon in time of need, and even in many instances had access to the palaces of princes, archbishops and cardinals on account of their superior scientific knowledge. The Roman pontiffs themselves were, some of them, liberal-minded men of the world, who did not hesitate to employ talented Jewish physicians at need, and, in later times, did much to foster the arts and sciences, in Italy at least.

In the Xth, XIth and XIIth centuries, the majority of trained physicians in Europe were Jews. They combined with their professional skill a profound knowledge of theology, mathematics, astronomy, philosophy, and law. Famous among these was Rabbi **SOLOMON BEN ISAAC** (830-932), who was equally at home in writing commentaries on the Talmud as in giving instructions for great surgical operations, for example the Cæsarean section. He, it is said, was the greatest French physician of his age. He wrote, among other works, a treatise on dietetics.

Spain produced many distinguished Jews; for example, **EBUH ZOHR** (1113-1162) also called AVENZOAR, physician to the Court of Seville. Besides being a very learned man, master of several languages, he composed treatises on the cure of disease, and held correct views on the origin and nature of certain fevers. Another was **BEN EZRA** (1093-1167), a Jew of Toledo, who was at once a physician, philosopher, mathematician, astronomer, critic, and poet.

Rabbi **MOSES BEN MAIMON,** a Jewish physician and philosopher, known all over Europe as MAIMONIDES (1135-1204), after embracing Mohammedanism, emigrated from Cordova to Egypt, and there became physician to the celebrated Sultan SALADIN (1138-1193). He wrote a book on poisons and their antidotes, and one on personal hygiene, and was famous as a philosophic champion of reason. Even miracles, though not always traceable to their immediate causes, he believed, must be based on the physical and everlasting laws of nature. He pronounced for the freedom of the will, and held that Providence reigns in a broad manner over humanity, but he utterly denied the working of Providence in the particular events which befall the individual, who is subject above all to the great physical laws, and must learn to understand and obey them. The soul, and the soul alone, is immortal. The reward of virtue consists in the soul's bliss in a world to come; while the punishment of vice is the loss of the soul.

Fearing that the Jewish physicians gained too powerful an influence, the Councils of Béziers (1246) and Alby (1254) prohibited all Christians from resorting to the services of the Israelite physicians. This not proving effective, the Council of Venice (1267) and the Faculty of Paris (1301) published decrees prohibiting either man or woman of the Jewish religion from practising medicine upon any person of the Catholic religion. After a similar course was also taken in Spain, the School of Salerno utilised them as teachers until it had developed enough home-grown talent

to get along without them. The same thing was true of Montpellier, which was closed to the Jews in 1301. At that time, a great Jew, **PROFATIUS** (-1308), whose astronomical researches were favourably alluded to by Copernicus, was at the head of the university of Montpellier. It is said that it was the antagonism of the clergy to him that led to the banishment of all the Jews from France in 1306. The historians of this event describe it as a heart-rending spectacle to see so many learned men, professors and doctors of the faculty, who had adorned and benefited France, wanderers without a country or asylum.

Although the different emperors continued to retain Jews as their body physicians, yet up to the time of the French Revolution they were not allowed to study at the European universities, and being, moreover, excluded from the liberal professions, played little part in medicine during this period. It is not recorded whether they were compelled to wear a yellow mark (Jew stain) upon their clothing, like the other Jews in those ages, but it is quite probable, and would agree with the spirit of mediæval fanaticism.

In the Middle Ages there was much persecution of the Jews. They were generally accused of having desecrated the holy places of the Christians, of having poisoned the wells, whenever epidemics, which were frequent, took place. But the fact was that the Jews would not drink cistern water, but flowing water only; hence they were less affected by the epidemics. No doubt, when subjected to torture, some made a false confession to be relieved of their agony, and thus confirmed the prevailing suspicion. The Jews, observing more careful sanitary rules and more constant abstinence from dangerous foods, escaped the epidemics with a smaller percentage of disease; but the public, unable to understand so simple a cause, jumped to the conclusion that their immunity resulted from protection by Satan and that the pestilence had been caused by them. Many thousands of Jews, at the time of the Black Death in Germany and France, perished by being burned alive. Sometimes a feeling spread among the people that the Almighty was filled with wrath at the toleration of his enemies, and might be propitiated by their destruction. Then the Jews were plundered, tortured, and murdered by tens of thousands. In the reign of Ferdinand and Isabella, after several random massacres and much persecution, the unconverted Jews of Spain were in 1489 penned into Ghettos, and were in 1492 expelled bodily from the country. Portugal and other Christian countries took the same step a few years later. After the expulsion of the Jews came the **turn of the Moors,** in 1502, whose last hold in Spain—Granada—had been overthrown in 1492. They were deprived of all exterior practice of their religion, harried, persecuted, compulsorily baptised, and at length in the opening years of the XVIIth century, under Philip III., the whole race was expelled—a million of the most industrious inhabitants of Spain.

At the end of the XVIIIth century the Jews were again allowed to enter universities and to practice medicine in France, Germany, and Austria, though the clergy vigorously protested, as they did a century before, when they declared that it was " better to die with Christ than to be cured by Jews, who were aided by the devil." Jews were not admitted to the full right of citizenship till 1858.

LATER SCHOLASTICS

With the introduction into the Christian schools of the writings of Aristotle through the medium of Arabian commentators about the end of the XIIth century commences the later, more psychological, period of Scholasticism. Not that these translations from the Arabic versions of Aristotle met with general acceptance, for their derivation from infidel sources roused a prejudice against them; and also because Aristotle appeared to deny the soul's immortality which Plato had upheld. The adherents of Aristotle were divided into two parties, one of which relied on the naturalistic interpretation of the Greek exegete, **ALEXANDER OF APHRODISIAS** (about 200 A.D.), the other on the pantheistic interpretation of the Arabian commentator **AVERRHOES.** The conflict over the question of **immortality,** carried on especially in Padua, was the culmination of the battle. The Alexandrists asserted

that, according to Aristotle, the soul was mortal; the Averrhoists, that the rational part which is common to all men was immortal; while to this were added the further questions, whether and how the Aristotelian view could be reconciled with the Church doctrine, which demanded a continued personal existence. Accordingly for some time the Augustine version of Platonism still dominated religious thought. Nevertheless, a great revolution was already in progress. As a result of the capture of Constantinople by the Crusaders in 1204 the **Greek manuscripts of Aristotle's writings were brought to Paris,** and subsequently translated into Latin under the direction of **ST. THOMAS AQUINAS,** whose editing made the philosophy acceptable to catholic theologians.

ALBERTUS MAGNUS (1193-1280),

Bishop of Ratisbon, was more of a scientist than metaphysician. He was **a profound student of Aristotle,** definitely enunciated the doctrine of "creation out of nothing" which broke once for all with theories of emanation and of the eternal existence of matter. Matter was the product of a divine "fiat"—whether intellectual or volitional, opinions differed. **The human soul** was included in the act of creation, but it was made in the likeness of God. That is, it was rational and personal. He held revelation to be above reason, but not contrary to reason. He denied the world-soul, and the emanation of the soul from God. The soul is a simple, indivisible, unchangeable substance, which contains the principle of different faculties. The connecting medium of soul and body was the most imperfect part of the body.

As regards the different faculties of the soul, he looked upon the *sensus communis* as partly a particular sense which receives the forms of sensual objects, and partly as the common fundamental sense, the point of union of the sensations (consciousness). The mere capacity to receive impressions and forms of sensible objects is passive. The active power is distinguished in memory, imagination, and poetical force, which depend upon an internal spiritual organ. **He designed a sort of phrenological head,** locating in different parts of the brain the seats of these faculties.

Albertus Magnus is said to have based his localisation on a work by **CONSTABULUS** (COSTA BEN LUCA)—who, however, appears to have lived later—entitled *De Differentia Spiritus et Animæ.* He distinguished three brain cells or cavities (cellulæ or concavitates) with subdivisions. The first cellula has three parts: in the most anterior portion, where the senses terminate in a centre and thus form an organ common to them all, is the *common sense;* in the middle portion is the faculty of *imagination* or *cogitation;* and in the most posterior part the faculty of *phantasy* or *vis æstimativa*—the seat of the poetical faculty, and, when injured, mania and rage are the result. These faculties form the "intellectus" or reason, and Albertus justified this localisation in the front part of the brain because this part feels "soft." The middle cellula, according to him, was really no ventricle at all, but merely a passage for the "spiritus." The front part of the third cellula is the seat of *memory* and *reminiscence;* and the posterior part, on account of its "dryness," is designed for "motion." (For a detailed account of these localisations see A. SCHNEIDER: *Psychologie Alberts des Grossen,* 2 volumes, 1903-6.)

Albertus was one of the most renowned scholars and scientists of the XIIIth century. He boldly and repeatedly proclaimed and upheld the rights of observation, experience and induction, thus directing the attention of his contemporaries towards the facts of Nature. It was said of him that "he was great in magic, greater in philosophy, greatest in theology." He interested himself in the functions of plants, was well acquainted with what is called the sleep of flowers, studied their opening and closing, and understood that the sap is diminished in volume by evaporation from the leaves. He was the first to use the word "affinity" in its modern acceptation. He was also great as a chemist and made several lasting

discoveries. He held the view that there was human life at the antipodes; and he noted the influence of mountains, seas, and forests upon races and products, thus furnishing the germs of physical geography.

Though Albertus's main effort was to Christianise science, he was dealt with by the authorities of the Dominican order, subjected to suspicion and indignity; and only escaped persecution for sorcery by suppressing, like many others, the avowal of his convictions and yielding to the ecclesiastical spirit of the time, working finally in theological channels by scholastic methods.

ST. THOMAS AQUINAS (1226-1274)

was Albertus's most famous pupil. **He adopted the doctrines of Aristotle,** of which he was the translator from the original Greek, and opposing the teaching of Averrhoes, **made them harmonise with Christian dogmas.**

As a philosopher, Aquinas set out from the principle of the demonstration of the infinite by means of the finite. He declared that reason can perceive and prove God through his works, for the existence of God is demonstrated by its effects—the invisible God is seen in his visible effects. And, indeed, Aquinas, after Albertus Magnus, gave final expression to **the distinction between natural and revealed theology**; natural theology simply signifying the doctrine of God, as established without revelation, and to be found in the philosophy of Aristotle. In the case of natural religion, Aquinas took reason to be parallel with revelation in its working; whereas, in revealed religion, reason has merely ancillary functions, and works in subordination to revelation.

He argued that movement involved the existence of a Prime Mover—not in the physical sense of Aristotle, but as the active initiator or cause of all movement, bodily and spiritual. God moves the will of man as universal mover, and without this universal motion man cannot will anything; but at the same time man determines for himself by application of his reason to a particular volition.

In respect of the Divine relation to evil, Aquinas taught that the sinful act is both being and act, and that God is, no doubt, the cause of all action *considered as act*. But then, says he, sin is more than being and act; it is a defect—springing from free-will as its cause, and not to be referred to God. That is to say, he makes God the cause of the act where there is sin, but not the cause of the sin, since he is not the cause of the defect which there is in the act.

The embryo, from the beginning of its life, possesses an individual soul which is, however, only a vegetative soul. This soul disappears to make room for another, which is at once vegetative and sensitive; finally, the latter, in its turn, yields in place to an intellectual soul which comprises within itself the two others, and it is not till then that the animal becomes man. The rational soul is a principle which has its form entirely within itself; it is not, like the sensitive and animal souls, subject to stimulation from the external world to which it reacts. The rational soul, like God and the angels, is pure form, and as such is immortal. The intrinsic independence of the organism which the soul shows, even while united with the body and conditioned by the health or disease of the imagination or memory, by the very fact of its being the exclusive subject of its own higher functions, is the proof of spirituality and the pledge of immortality. Although **Aquinas attributed immortality to the whole of the human soul, including the vegetative and sensitive powers,** he maintained that the souls of animals are inseparable from their bodies and that they perish with them.

The lower soul is a sort of form which inheres in matter and constitutes the principle of vital organisation. The active reason or pure form, however, exists only along with the passive reason, and is always personal. Within the function of knowledge, the *rôle* of active reason is to reach general or abstract concepts, the logical species or kinds which underlie sense-percepts and images. Sensation itself is not due to the transfer of material images or effluvia, but is in principle a mental

or spiritual impression. Man's cognitive power—like the soul from which it emanates—partakes of a double character, material and immaterial. All knowledge begins from the data of sensuous perception. Aquinas distinctly says that our knowledge comes first from the senses, but maintains that this does not mean that our sense-cognition is the complete and perfect cause of our knowledge, but rather that it supplies the material of the cause. He discards the notion of innate ideas, and holds to the objective value of our knowledge. The universe was for him mirrored, ideally and materially, in the mind of man, just as the likeness of a person is on a photographic plate.

In his treatise "On the Powers of the Soul" **Aquinas locates the intellectual faculties in the brain after the accepted Arabian fashion,** of which we have already given examples.

He distinguished the **practical** from the **contemplative** life and developed a theory of the mutual relation of reason and will. Each is dependent upon the other: knowledge is instrumental to action, and action contributes to knowledge. He regarded the four principal virtues—temperance, fortitude, wisdom, justice—as **acquired** virtues, which lead to natural happiness; while the **theological** virtues—faith, hope, and love—are divinely inspired and lead to supernatural bliss.

He **classified the passions** as follows: (1) the concupiscent appetites, which are love—hatred, desire—aversion, joy—sadness; (2) the irascible appetites, which are hope—despair, courage—fear, and anger.

In the first place, an object excites in us either love or hatred, according as it is suitable or repugnant to our nature. Love gives birth to desire, hatred to aversion; and we feel joy or sadness according to the success of our efforts. So much for the concupiscent appetites. As for the irascible appetites, if the obstacles which separate us from good can be surmounted, we experience hope; in the contrary case, despair. When threatened by an evil we are able to avert we feel courage. In face of an inevitable evil we feel fear. An evil which has befallen us may excite anger, if vengeance or resistance are still possible; but when the desired good is attained we feel no passion corresponding to this anger.

Aquinas next considers the different forms and degrees of these master passions. He makes a distinction between *amor*, which is love based on a sensuous desire; *dilectio*, in which reason and will have a part; and finally *caritas*, which is love in the highest or Christian sense of the word. In connection with hatred, he remarks, like Aristotle, that it owes its existence entirely to love, and if it seems to be more violent it is only by a pure illusion. Again, like his master, he regards activity as the chief source of joy. He distinguishes two kinds of fear: one which arises from a feeling of personal weakness, the other from the idea of an invincible power in the object. To the first class belong the fear of work, the fear of failure, the fear of deserved blame. The second class includes admiration, amazement, and terror.

Roger Bacon, of whom we shall speak directly, had initiated the experimental method, but **Aquinas brought science again under the sway of theological methods and ecclesiastical control.** He insisted that the forces of the body are independent of its physical organisation, and that therefore these forces are to be studied by the scholastic philosophy and the theological method, instead of by researches into the structure of the body. The ecclesiastical power of the time hailed him as a deliverer for laying the foundations for a "sanctified science"; but the result of this great man's compromise was to close for ages that path in science which above all others leads to discoveries of value—the experimental method.

DUNS SCOTUS (1265-1308),

a Franciscan friar, reasserted vigorously the subjective point of view and insisted upon the **primacy of the will.** Creation is an act of the divine will, and the world is

constantly renewed by the continuing will of God. Further, the individual will is behind knowledge, even knowledge of self. The end of existence is the Good, which is reached by will; intelligence is instrumental, the servant of action. Sin is a perversion of will, causing intellectual blindness, and sin is possible because the will is free. A "suggestion" or "first thought" enters consciousness, serving as stimulus to the will; the will responds to it, embracing or rejecting it; it thus becomes a "second thought." It is this second thought, the object of will, to which the agent's freedom and responsibility attach. **Good and evil do not belong to things in themselves, but to the use made of them** in the voluntary "second thought" of the agent.

Duns Scotus, following St. Augustine, distinguished the **emotions or passions** as a fundamental class of phenomena. Before him the Scholastic leaders had looked upon feeling as a modification of impulse and desire, following the Aristotelian division.

Aquinas and Scotus were the heads of **two great conflicting schools** which discussed the psychological question whether among the powers of the soul the higher dignity belongs to the intellect or to the will. The adherents of Aquinas were for the former, the adherents of Scotus for the latter.

The followers of Aquinas held that the intellect not only apprehends the idea of good, but also in each individual case recognises what is good, and thereby determines the will. The will naturally strives for that which is known to be good, and it is, therefore, dependent upon the intellect. But, said their opponents, this theory of determinism takes from man all moral responsibility and deprives him of freedom of will. Responsibility can only be preserved if it is acknowledged that the intellect exercises no compulsion over the will. The intellect may indeed present various objects to the will, but the possibility of choice and power of action remain with the will. So far, indeed, from the will being determined by the intellect, the followers of Scotus maintained that the will determines the development of the intellectual activities.

Later, the discussion was raised to a theological one, as to will and intellect in God.

Duns Scotus made the categorical statement of the doctrine of the **Immaculate Conception**; Thomas Aquinas denied it. But the doctrine was gaining ground, and in 1387 the University of Paris condemned one of its members because he taught that the Virgin Mary, like other descendants of Adam, was born in original sin; and the university expelled the Dominicans, who were fierce opponents of the doctrine of the Immaculate Conception. But in 1483, Pope Sixtus IV. published a Bull threatening with excommunication anyone making charges of heresy against either the advocates or the impugners of the doctrine, for the reason that the point had not yet been decided by the Apostolic See. Pope Paul V., in 1617, also forbade all public disputations on the subject, and Gregory XV., in 1622, prohibited also private discussions. Not until Pius IX., in 1854, was the doctrine accepted officially, when it became heresy to deny it.

WILLIAM OF OCCAM (1280-1347)

An interesting variation upon the discussion of Realism and Nominalism arose regarding the **relation of the faculties to the "inner sense" or consciousness as a whole.** Aristotle had asserted the oneness of mental function in the common sense, the Platonic "parts" or divisions of the soul being merely powers or activities of the one conscious principle. This became one of the burning questions of the late Scholasticism. Occam adopted the theory of the Nominalists, and maintained that general ideas could not have an existence independent of external things, and

of the Deity. He denied the plurality of the powers of the soul, holding to the unity of understanding and will, as well as of that of the vegetative and sensitive soul. He maintained that all the "representations"—sense perceptions, memories, concepts, etc.—were merely mental signs or symbols of varying orders, arising at different stages of mental function; they were not pictures of different realities perceived by fundamentally different faculties or powers, but merely different directions in which the soul is active.

His whole system of thought was anti-papal, for he denied the reality of abstractions more boldly than had yet been done, contending that even the existence of God could not be proved by reason, or admitted on any other basis than faith. That there is one First Cause seemed to him no more self-evident than that there is an endless chain of causes. The so-called universals, or general terms, have no reality, he said, either in the mind or out of it; for we know only particulars, and these merely so far as they affect us personally, and thus all inferences, even those leading to belief in God, become too uncertain for philosophy.

So far Scholasticism.

MASTER ECKHART (1260-1327)

When Scholasticism had passed its period of bloom, there grew up on German soil a peculiar branch of **mysticism.** It was not the Church and its teaching, but Christianity, as they understood it, that the mystics tried to advance by edifying speculation and to render comprehensible by the transcendent use of the reason. The author and perfector of this entire development was Master John Eckhart. The nature of his speculations was essentially influenced by the fact that he regarded himself as a servant rather of Christian truth than of the Church. He addressed himself above all to the Christian people, not to the schools, and viewed scientific knowledge chiefly with an eye to its morally edifying power. Scholasticism had for its object the advancement of the Church and its doctrine; **Eckhart tried to promote the spiritual welfare of Christians** and to point out the nearest way to union with God.

John Eckhart was enabled by his study of Greek philosophy, the Bible, the Fathers, and the Scholastics to develop about 1300, in Cologne, a system in which he proclaimed the soul's essential goodness and that salvation could come only through the soul's rising independently into oneness with God, and that this could be done by each soul as soon as she pleased. "Fasting and scourging profit nothing; love is the essence of goodness, as selfishness is of sin. . . . God loves every soul and keeps no one from Him; only they who choose it remain in outer darkness. . . . All that comes to pass is according to His will; nothing that is done should be regretted; but even sin must have been a part of His plan; for if there had been no sin, there could be no salvation. . . . The visible world is a copy of the invisible and ideal, which we know through powers transcending those of observation or reasoning."

ROGER BACON (1214-1294),

the Franciscan friar, another pupil of Albertus Magnus, was **a forerunner of the great scientific discoverers who were to come,** and is not to be confounded with Francis Bacon, Lord Verulam.

In an age when theological subtilising was alone thought to give the title of a scholar, he insisted on *real* reasoning and the aid of natural science by mathematics; in an age when experimenting was sure to cost a man his reputation, and was likely to cost him his life, he insisted on experimenting. Roger Bacon laid down the principle that **only by careful observation and experimental demonstration could**

any real knowledge with regard to natural phenomena be obtained. He not only laid down the principle, but, in contrast to his later namesake, he followed the route himself.

There are three methods of acquiring knowledge : *per actoritatem et rationem et experientiam.* But authority is unsatisfactory without reasoning ; and even reasoning does not secure the tranquil possession of truth unless experience confirms its findings. Experience is thus the sole source of certitude.

He started out with the principle that there are **four grounds of human ignorance.** " These are : (1) trust in adequate authority ; (2) that force of custom which leads men to accept too unquestioningly what has been accepted before their time ; (3) the placing of confidence in the opinion of the inexperienced ; and (4) the hiding of one's own ignorance with the parade of superficial knowledge."

It is said that he was the first man to refer to gunpowder (1267), the manufacture of which was discovered in 1336 ; but gunpowder was known to the Arabs and by them introduced into Europe. He did, however, study explosives, and besides learning many things about them, realised how much might be accomplished by their use in aftertime. He foresaw the application of such a force for transportation, especially navigation and motor carriages. He knew that air was necessary to support a fire and that there was a gas which would extinguish flame. As a matter of fact, he predicted as early as 1240 that " one day ships will go on the waters without sails, and carriages run on the roads without horses, and people will make machines to fly in the air."

He was not, as is sometimes claimed for him, either the inventor of the telescope or of the theory of the lenses. He did more, however, than perhaps anyone else to make the principles of lenses clear and to establish them on a mathematical basis. He taught, moreover, the principle of the aberration of light, and that light did not travel instantaneously, but had a definite rate of motion, though this was extremely rapid.

Roger Bacon seems to have embraced all the subjects of learning : metaphysics, languages, natural philosophy, and theology. His chief title to fame rests on the efforts he made **to free the human mind from entangling error** and to set it on the right path for attaining truth, rather than on specific contributions to science as such. His shrewd common sense **opposed Scholasticism** with all its might. In his opinion, it had falsified philosophy, theology, and natural science by the respect given to worthless authorities, and by clinging to deeply-rooted prejudices. In order to renew the sciences and re-establish them on a sound basis, investigation must everywhere go back to their origins ; thus, in language to Greek and Oriental idioms, in theology to Holy Scripture, and in natural science to observation. **He maintained that mathematics were the basis of natural science, and that experiment was the only means of discovering the processes of nature.** Still, even he could not shake himself free from the beliefs of his time. Although he possessed an extensive knowledge of physics and chemistry, he retained his faith in the " elixir vitæ," alchemy, and astrology.

It is interesting also to observe that **he rejected,** as a principle of explanation, **the notion of faculties,** supposed to be independent forces, distinct from the soul. As regards **brain function** he held the popular view.

To the anima sensitiva belong, in addition to the five senses, the sensus communis, by means of which every sensation is first made our own ; the vis imaginativa, which fixes the sensations, and the vis æstimativa, which shows itself among brutes as the power of scent, and finally the vis memorativa. The last two faculties reside in the back part, the first two in the front of the brain. In the centre of the brain is

enthroned the vis cogitativa, with which the anima rationalis is joined, but that only in man.

Roger Bacon was attacked as an "infidel" and "atheist" by the Franciscan Order, to which he belonged, and was accused of magical practices and of a commerce with Satan. In his defence he added fuel to the flame by showing that **much which is ascribed to demons results from natural means.** His writings were condemned as containing dangerous and suspected novelties, and he was committed to prison in 1278, where he remained for fourteen years, until he was liberated by the intercession of his friends because his health gave way.

PETER OF ABANO (1250-1315)

was at the head of the medical school of Padua. In **physical and chemical knowledge** he far surpassed his contemporaries. He knew that the atmosphere had weight and that the equator was inhabited. He recognised the brain as the **origin of the nerves** and the heart as the **starting-point of the blood-vessels.** He had audacious theological views; for example, he denied the existence of the devil and of miracles, but he was a believer in astrology and attempted to cast horoscopes. He was suspected as a heretic, and at the age of eighty he was accused of magic; but he died before his trial was concluded, so the inquisitors were obliged to content themselves with having his bones dug up after his death and burnt after a public sentence of condemnation, declaring him eternally infamous, and depriving his heirs of his great wealth, which was confiscated for the benefit of the Church.

JOANNES ACTUARIUS (1250-1300),

a physician, made use in the psychiatric portions of his work of the then current **doctrine of localisation of mental functions** in separate portions of the brain.

The divine in man is the soul. The organ of the soul is the pneuma and is converted in the heart into the vital spirit and distributed by means of the arteries through the entire body. The greatest transformation occurs in the brain, where the soul-spirit takes its origin. Just as in plants the sap undergoes changes in all parts, so does the pneuma undergo transformations in every portion of the body, and its different functions are conditioned by the varying structure of the organs, as light takes the colour of the particular glass it shines through.

Mental activities are distinguished by him as perception, imagination, judgment, understanding, and reason. Reason is assigned the highest place and is least bound up with the pneuma; the power of imagination is subordinated to the other mental faculties.

BERNARD GORDON (-1310

a Scotch physician, professor at Montpellier in 1296, reproduced the greater part of Aristotle's ideas in a work entitled "Affectus Præter Naturam Curandi Methodus." In 1305 he published "Lilium Medicinæ," in which he showed himself a sort of "**phrenological**" **spiritualist.** He held that the brain had no power to make us acquainted with the external world. Another higher and heavenly power, called *intellect*, is necessary to the operation of thought; the power which *makes use of the organs*, but is altogether independent of them. These organs are:

Common sense resides in the anterior part of the anterior ventricle, which takes cognisance of the various forms or images received through the five senses, and passes judgment upon them; the posterior part of the same ventricle is destined

for the phantasy : it preserves the impressions received from the five senses of which phantasy acts as a kind of storehouse. Imagination resides in the anterior part of the second ventricle ; this faculty is always active, and produces chimeras during sleep as well as when we are awake. It is distinguished by two species. When the product of imagination is conformable to reason, and agrees with objects which possess a real existence, etc., the faculty is called cogitation ; when, on the contrary, it does not coincide with our sensorial perceptions, but is influenced by the faculty called "æstimativa," the denomination "imaginativa" is preserved, because the ideas thus conceived are false and probably impossible. Gordon placed the faculty æstimativa in the posterior part of the middle ventricle, and attributed to it the function of judging impressions which are not received through the medium of the senses, such as friendship, etc. This faculty instructs the lamb that its enemy is the wolf which it never saw before ; it is an instinct governing the action of animals, as reason governs those of man. When the latter is guided by instinct, he is a mere animal. Gordon places memory in the third or posterior ventricle, which, he says, performs three functions, viz., imagination, cogitation, and memory. All these are natural, and corruptible, dependent on their several organs. These different faculties may become imperfect when their respective organs are diseased, and, being distinct, one may be weakened or destroyed while the other is preserved. In some persons the imagination alone is modified, while the other faculties remain intact, and vice versa. Above all there is placed a divine faculty, incorruptible, and intellectual, which is not furnished with any organ of communication with the external world.

These primary organs are material and corruptible ; for the operations of thought is necessary a higher and heavenly power, called intellect, which makes use of the organs, but is altogether independent of them.

CHAPTER VII

RENAISSANCE AND REFORMATION

In the Middle Ages a large part of the lives of the people was occupied by the Church.

The chief industry was agriculture, and not only was one-third, or more, of all the land in the hands of the Church, but at every harvest the husbandman had to set apart one-tenth as tribute to the Church. The priest combined in himself all the learned professions, and no undertaking of importance could be effected without him. At any rate in rural districts, he was not only the priest but the only available physician and lawyer. He heard his parishioner's confession, drew up his last will, and proved the will in the ecclesiastical court. Slowly and gradually Europe came under the absolute domination of the Church, until in the XIIth century the individual reason was wholly subordinated, independent judgment was extinguished, and almost every form of intellectual activity was crushed. The minds of men were turned from the study and improvement and regard for this world to the contemplation of a future state of existence in another world that is to come.

Various factors helped to break down the barriers hitherto imposed upon the free exercise of reason.

One was the **taking of Constantinople by the Turks** in 1453. It brought newly-found treasures of Greek learning, which disclosed that there had once been an epoch in which mankind had lived an open, free, and joyous life, untrammelled by the authority of kings and unfettered by the ordinances of priests; when men had used all their faculties without fear or reproof, not restricted to certain paths or bound to set formulas, but freely seeking for knowledge in every field of speculation and for beauty in all the realms of fancy.

The effect was that **great men now devoted themselves to linguistic studies,** to the best models and examples alike of thought and expression, the noblest and most inspired ideas of the most outstanding men, and they found this perfection in the literatures of Greece and Rome, and directed all their energies to the revival of these, and to living again and thinking again the best ideas of classic antiquity. The ground was already prepared by two masters in literature—**DANTE** (1265-1321) and **PETRARCH** (1304-1374)—who stood on the borderland between the scholastic age and the great movement which we call the Renaissance. With the revival of learning came **a renewed study of Plato,** which constituted a most striking feature of the time. Simultaneously there appeared **a galaxy of great painters,** who have never been rivalled in the history of the world—Perugino, Leonardo da Vinci, Michel Angelo, Titian, Raphael, Dürer, and Holbein—all contemporaries living in the XVth century. There was a general efflorescence of the beautiful; but most of the painters of the period were still devoting themselves to religious subjects. The treatise by ALBRECHT DÜRER (1471-1528) on human proportion, "De simmetria," Nuremberg, 1532, deserves special mention, as being the first application of anthropometry to æsthetics.

First there was this æsthetic revival, and then followed an intellectual one. The

latter was aided greatly by the **invention of printing** (1440), which opened the world of books to non-academic readers, vastly widening the possibilities of independent thought. The printing-press changed the conditions of life, and **literature became the common property of all.**

What the great men of the Italian Renaissance did not perceive was that classical learning, even if we include in it philosophy as well as literature, and mathematics as well as philosophy, does not by any means exhaust the capacity of human faculty. It would have been indeed marvellous if, in an age when astronomical science, founded in genuine and, on the whole, exact observation of Nature thousands of years ago in Chaldæa, and methodised, though erroneously, by Ptolemy, had degenerated into astrology; when chemistry, whatever there may have been of it, had passed into the visionary search for the philosopher's stone; when biology, pursued at last on a basis of extensive observation by Aristotle, had become absolutely inept, and a mere repetition of verbiage attributed—and often ignorantly attributed—to the ancients; when anatomy, founded at least on something like personal observation in Galen's time, and carefully pursued by Erasistratos and others in the Alexandrian School, had altogether perished, and was, indeed, forbidden by authority; and when the science and art of medicine, so necessary at all times for the preservation of life and health, had become a mere craft, which instead of studying how to improve sanitation, sought for the "elixir of life"—in such an age as this, it would have been more than human if the pioneers of the Renaissance had ever thought of placing the discipline of science, or of any kind of observation of Nature, upon their programme of an all-round education of human faculty.

It was safe enough to denounce, or to ridicule, the pseudo-sciences of the time; and this the humanists did, and did effectually, especially as regards astrology. From Petrarch onwards they made open war on this flourishing imposture. **PETRARCH** (1304-1374) was the great opponent of Scholasticism and the chief founder of scientific criticism; he attacked logic and dialectics as not being philosophy, but only its instruments. But the discipline of true science, or of natural and physical phenomena, was a very different thing from this negative attitude towards its counterfeits; this may, however, be placed to the credit of the humanists of the Renaissance Period.

A notable exception was **LEONARDO DA VINCI** (1452-1519). Long before Bacon, he laid down the maxim that **experience and observation** must be the foundation of all reasoning in science; that **experiment** is the only interpreter of nature, and is essential to the ascertainment of laws. Unlike Bacon, he points out the supreme advantage of mathematics. He was great in physics, was an engineer, mathematician, and artist. He discovered several laws of forces, foreshadowed some of the great conclusions of modern geology, explained the reflection of light by the moon, excelled as a painter, sculptor, architect and engineer, and was thoroughly versed in astronomy, anatomy and chemistry of his time. He recognised that fossils were animals which once lived. With him commenced the movement in Natural Philosophy.

A great factor of enlightenment was the **discovery of new regions of the earth.** This disturbed the belief of the origin of mankind in Paradise. Other nations came into sight, ignorant of the old traditions, and the common cradle of mankind came to be placed far beyond the extremest limits of historical remembrance. The discovery of America in 1492 by **COLUMBUS** (1446-1506)—who was excommunicated and branded as a heretic for advancing the theory that the earth is spherical, and not an extended plane—and the subsequent geographical discoveries, gave men for the first time a fairly complete notion of the planet which they inhabit. Circumnavigators—**MAGELLAN** in 1521—proved that it is really a globe of comparatively small size, and not a flat plane. Maps of the world, wonderfully exact considering the novelty of the information which they embodied, were engraved as early as 1507.

The independent invention of the compass by **FLAVIO GIOJA** in 1302 (who was

the first to use it in a ship) had rendered long voyages less dangerous and more frequent, and these opened up to trade regions hitherto inaccessible or unknown and attracted interest toward commerce as a means of pecuniary gain. Material prosperity increased with the increased industrial and commercial activity. The increased wealth permitted of the adornment of life by the arts of peace. There grew up a secular form of culture, as distinguished from the previously prevailing religious type.

Another powerful influence towards intellectual emancipation was **the secession of the Protestants from the Roman Church** in 1517, which in the sphere of religion established the right of man to private judgment and abrogated the authority of Popes and Councils. The reformers gave up transubstantiation, the worship of the Virgin Mary and the Saints, the veneration of relics, and faith in daily miracles. But they still adhered to the belief in demoniacal possession and the verbal inspiration of the religious writings.

MARTIN LUTHER (1483-1546) did not attack the authority of the Church ; he only thought its authority was being abused, particularly by the sale of indulgences for sins of every kind, for the dead as well as the living ; a practice which in his opinion was fatal to moral and religious responsibility. When he protested against the authority of the ecclesiastical hierarchy of the Pope and the Councils, he found sympathisers in the whole of Germany. He was declared a heretic and placed under the Imperial Ban (1521) ; but the Ban proved ineffectual. The Elector of Saxony and a vast number of people supported him. The result was that the supremacy of the Papal and Imperial authority was broken, and Luther was able to build up an Independent Church. The independence, thus begun, spread throughout Northern Europe, and kings and peoples came to recognise no supreme authority but God and their consciences ; and the voice of God to which they submitted was found by them in the Bible. Faith, and the authority of the Bible, were the main pillars of the new movement. The narratives and dogmas which the Sacred Book contains became religion in the minds of the Reformers. The issue of the Reformation was the acceptance by all the Protestant Churches of the dogma that **the Bible is a sufficient guide for every Christian man.** The authority thus imputed to the Scriptures was not restricted to matters of purely religious or moral kind ; it extended over philosophical speculation, and to the interpretation of Nature. The Reformers would tolerate no science that was not in accordance with Genesis. The fatal maxim that the Bible contained the sum and substance of all knowledge, useful or possible to man, was strictly insisted upon.

Rome met the Reformation with four new weapons : a counter-reformation, an increased vigour in the Inquisition, the institution of the Jesuits, and a greater embellishment of worship.

To extirpate religious dissent the Papal government established a tribunal for punishment—the **Inquisition** (founded by Gregory IX. about 1233 and fully established by a Bull of Innocent IV. in 1252), and as a means of detection—the **auricular confession,** which was established in 1215 and now increased in power. Summoned before the dread Tribunal on the confession of some domestic spy, the suspected person was simply informed that he was accused of heresy. No accuser was named, but torture was resorted to. The thumb-screw, the stretching-rope, the boot and wedge, or other engines of torture soon supplied that defect, and, innocent or guilty, he accused himself. It is said that in 300 years the Inquisition punished 340,000 persons, and of these nearly 32,000 had been burnt alive.

In 1559 Pope Paul IV. instituted the Congregation of the **Index Expurgatorius** for the examination of books and the decision whether people may be permitted to read them. This index is still in force.

With the Reformation man awakened to a consciousness of himself. He

realised his individual worth and became aware of his spiritual nature. Man became convinced that within himself the work of salvation must be accomplished. The Bible was translated into the language of the people and by means of the newly-invented printing-press the humblest peasant could read and examine it for himself. After this, knowledge was no longer pursued in the interests of a Church or class, but for its own sake.

It was in England during the lifetime of Queen Elizabeth (1533-1603) that government for the first time in any European country was carried on without the active co-operation of ecclesiastical authority; and it was also during her great reign that there culminated the great growth of that splendid literature which was to stimulate and increase the national spirit of liberty and inquiry. Besides such a genius in literature as Shakespeare, there were illustrious men in statesmanship, in commerce, in philosophy and science. There was Bacon, who threw off the yoke of Aristotle and Plato, which for centuries had weighed on mankind, and who, though not an investigator himself, imbued with the true spirit, was teaching with his pen how men should seek truth for themselves. Then there were Raleigh, Frobisher, and Drake, who in a large and literal sense, unchecked and uninfluenced by the geography of ages, fearlessly put to sea, and rested not until they had made an unknown world their own. There were Harvey, Newton, and a number of other scientific men. Indeed, the whole country in the Elizabethan era was emancipating itself from an intellectual and spiritual thraldom.

Another great factor that contributed to man's enlightenment was that **astronomy,** by its discoveries, upset men's notions both of the heavens and of the earth. The heavens, which had been regarded as the visible dwelling-place of the gods, were resolved into the immensity of an airy firmament in which imagination could no longer fix the home of supersensuous beings, and the earth, the sole stage of life and history, was transformed into one of the smallest parts of the boundless universe.

To the early Christians heaven and hell appeared very real indeed. The only hell of Jesus was exclusion from heaven; but gradually hell became a place of physical torments, an ocean of incandescent matter buried in the depths of the earth. On the other hand, heaven was also a definite locality, situated above the clouds, above the firmament, that vast, solid vault, set with stars, which forms the throne of the Deity.

In the Middle Ages the imagination of poets and preachers enlarged freely upon the theme of the infinite variety of the material agonies of hell, and they were able to show that the punishments could be graduated to suit various degrees of culpability. It served even as a pretext for **traffic in indulgences,** which gave rise to innumerable abuses. Even the virtue of charity degenerated, and was in many cases less the fruit of sympathy than the desire of the giver's spiritual benefit.

ASTRONOMICAL DISCOVERIES

The material conception of heaven and hell remained unshaken so long as the earth was regarded as the centre of the universe, and man was imagined to be the sole possible example of intelligent corporeal beings. But time came when the heavenly vault was opened; new worlds appeared to the terrified gaze of the people, and the earth was deposed from its long unquestioned primacy; the queen of the universe became a petty satellite of the sun, lost in the throng of its sister planets. The sun itself was but a puny star flung carelessly among a million others in the same nebula and whirled like them by some superior power towards an unknown goal.

Astronomical science further showed that **the world is ruled by natural law,** and

not by supernatural will. It proved also that the reign of reason dominates the dominion of the imagination; for astronomical science, fathoming the abysses of space, measured magnitudes, computed distances, and calculated results that are utterly beyond the realisation of the human imagination. Astronomical science, in showing the stability of our solar system, contributed also to destroying the disastrous influence of the belief that the judgment day was at hand.

Again, astronomical discovery, in encouraging a love of inquiry in the spirit of truth, has both invigorated culture and reformed education. Previously to the growth of astronomical science and the subsidiary sciences to which it led, the principal branches of the higher academic culture consisted in the study of the mythology, the history, and the literature of classical antiquity, the verbal logic of Aristotle, and the theology and metaphysics of the early Christian ages, usually accompanied by a course of mathematics, though, respecting the utility of mathematics a difference of opinion actually prevailed. That intellectual refinement and fastidious taste were produced by the discipline of these studies is undoubted. They were, however, not rarely accompanied by a want of appreciation of the truths of nature, by a tendency to believe whatever was inculcated by authority, and by an inordinate reverence for whatever was old. The essence of such a curriculum might almost be summarised in a single phrase—**the cultivation of credulity.**

One of the effects of the universal credulity in the Middle Ages was an enormous increase of the wealth of the clergy by the legacies of the terror-stricken victims. It must not be assumed, however, that people were more credulous in those times than at the present day, at least apart from the prevailing ignorance compared to our modern knowledge of scientific facts; for the difference is not so much in the amount of the credulity, as in the direction which it takes. Men are always prepared to accept, on very slight evidence, what they believe exceedingly probable.

COPERNICUS (1473-1543)

propounded his geometrical conception, based upon the supposition of the earth's double motion, its rotation on its axis, and its translation through space in an orbit round the sun. He supposed the planets to move in circles round the sun; but they move in ovals of peculiar mathematical form, as discovered later by Kepler.

The idea that the earth was the centre of the universe was so firmly rooted that it was blasphemy to deny it. Though Copernicus lectured in Rome (1500) before Pope Alexander VI., the Borgia, he dared not publish his book on "The Revolution of the Celestial Bodies," which was printed only a few days before his death, in 1543. And though it was dedicated to and graciously accepted by Pope Paul III., it raised a storm from both Catholics and Protestants. His system was condemned by a decree of Pope Paul V. in 1616, which was not revoked till 1818 by Pius VII. The Protestants imitated the Catholic example.

MARTIN LUTHER said: "People gave ear to an upstart astrologer who strove to show that the earth revolves, not the heavens or the firmament, the sun and the moon. This fool wishes to reverse the entire science of astronomy; but Sacred Scripture tells us that Joshua commanded the sun to stand still, and not the earth."

MELANCHTHON, in his treatise on the *Elements of Physics*, published six years after Copernicus' death, says: "The eyes are witnesses that the heavens revolve in the space of 24 hours. But certain men, either from the love of novelty, or to make a display of ingenuity, have concluded that the earth moves. Now, it is a want of honesty and decency to assert such notions publicly, and the example is pernicious. It is the part of a good mind to accept the truth as revealed by God and to acquiesce in it." He suggests the severest measures to restrain such impious teachings as those of Copernicus.

CALVIN wanted to know who would place the authority of Copernicus above that of the Holy Spirit.

Even Lord BACON, the great philosopher, did not acknowledge the Copernican system.

GIORDANO BRUNO (1548-1600),

a Dominican friar, was the first to draw revolutionary inferences from the Copernican theory. He anticipated modern astronomy in conceiving the stars as so many suns dispersed without assignable limits through space, and each surrounded by inhabited planets. The conceptions of an evolutionary process in nature and of the origin of worlds from nebulæ were tentatively propounded by him. When people said he should not spread the Copernican system because it was contrary to the Bible, he answered boldly that **the Bible was meant to teach man how to love God and live rightly, and not to settle questions of science.**

Bruno rehabilitated **atomism.** A number of monads, or rather a continuous portion of the ether surrounding and interpenetrating a group of atoms, endows them with the forms and qualities of elementary bodies, ascending gradually through vegetable and animal organisations to human beings. But the animating process does not stop with man. The earth, with the other planets, the sun, and all the stars, are also monads on the largest scale, with reasonable souls, just as Aristotle thought. Beyond and above all these partial unities is the Monas Monadum—the Supreme Unity, the Infinite God, who is the soul of the infinite universe.

Bruno, disagreeing with the authorities, left Italy, and when he returned after many wanderings he was betrayed to the Inquisition, imprisoned in 1593, and burnt alive in 1600; a fate shared by **VERGILIUS,** Bishop of Salzburg, who, having asserted the existence of the antipodes, was declared a heretic by the Archbishop of Metz and burnt in 1555.

TYCHO BRAHE (1546-1601)

added another mass of astronomical observations. He made a new catalogue of the stars and determined that comets are beyond the moon. He was the first to expose the universal superstition that comets were messengers of ill-fortune.

GALILEO (1564-1642)

is another mathematician and astronomer familiar to everybody. He further explained the Copernican System, being helped by his adaptation of the telescope, invented in 1609, with the aid of which he discovered the satellites of Jupiter and the inequalities on the surface of the moon. He also discovered the principle of the pendulum (1583) and of the rate of falling bodies (1589).

Arguing his case on theological as well as on scientific grounds, and declaring that the Scriptures were not intended as a scientific authority, that the Bible was intended to teach men how to go to heaven and not how the heavens go, Galileo was, by order of the Pope, cast into a dungeon and brought before the Inquisition. A Council of seven cardinals pronounced against him, that to maintain the sun to be immovable and without local motion, in the centre of the world, is an absurd proposition, false in philosophy, heretical in religion, and contrary to the testimony of Holy Scripture; and it is equally absurd and false in philosophy to assert that the earth is not immovable in the centre of the world, and considered theologically equally erroneous and heretical. Probably, if Galileo's discoveries could have been disproved and his reasonings refuted, he would have escaped persecution. His

subsequent recantation is too well known to need description. He was an old man, in weak health, and it is not surprising that, with the possibility of the stake before him, he should yield to superior force. He was again received favourably by the Pope Urban VIII. in 1624, but committed another indiscretion by publishing his famous dialogue in defiance of the authorities; and knowing that his judges had themselves doubts as to the geocentric system, but thought it in the interest of the Church to maintain popular belief, he was again venturesome, and published in 1632 "The System of the World," in which he tried to establish the truth of the Copernican doctrine. He was again summoned before the Inquisition, and was made to abjure the heliocentric doctrine before an assembly of cardinals. He was kept for a short time in the prison of the Inquisition and then in his own house, until he became blind in 1637, when the ecclesiastical authorities relaxed the regulations and permitted the visits of his friends. He died in 1642, the prisoner of the Inquisition. He was not allowed to make a will, and he was denied the right of burial in consecrated ground. Only in the XIXth century was a monument erected to his memory.

Hydraulics was created by **BENEDETTO CASTELLI** (1577-1644); hydrostatics by **TORRICELLI** (1608-1647), of Florence, who invented the barometer (1643). Both were pupils of Galileo. **OTTO GUERICKE** (1602-1686), a German physicist, invented the air-pump (1650) and made the first electrical machine.

JOHANNES KEPLER (1571-1630),

a pupil of Tycho Brahe, is the father of modern astronomy. He discovered various laws of the movement of the planets, known as Kepler's Laws (1609 and 1617). His first work in 1604 was on Optics. He discovered that the crystalline lens was not the seat of vision, as had been supposed, but that its function, like that of other lenses, is the refraction of light. He observed that the image of objects is depicted upon the retina, and with **CHRISTOPHER SCHEINER** (1575-1650) demonstrated that the expansion of the optic nerve in the retina is the essential part in the organ of sight.

It is said that while his mind had a strong grasp of positive scientific truth, it also had an irresistible tendency towards mystical speculation. He is reputed to have been an astrologer as well as an astronomer, and to have believed the stars were guided by angels. If so, this detracts as little from his great merit as it does from the work of those modern scientists who are devotees to spiritualism.

SIR ISAAC NEWTON (1642-1727)

published his immortal book "Principia" in the year 1687. His chief discovery was that of the Law or Principle of Universal Gravitation in 1666; and that comets move around the sun in elongated ellipses and their return could be calculated exactly. He also proved that light is made up of differently coloured rays and that these rays are differently refracted in passing through a prism.

Newton's sincere faith did not avert from him the reproach that his theory of gravitation depreciated the divine agency and limited its providential action. He was also most violently opposed for his discovery of the composition of light (1671). His discoveries were long excluded from the University of Cambridge, of which he was a member, and were introduced through stratagem only by Dr. Samuel Clarke (1675-1729) explaining them in notes, without any appearance of argument or controversy, to the book of Descartes, used as a text-book by all the tutors.

THE EFFECT ON PHILOSOPHY

The first important result in the field of philosophy of the renewed connection of

Western Europe with Greece was the **introduction of the Platonic and Neo-Platonic philosophies into the West,** and the attempt by means of these to supplant the scholastic Aristotelian philosophy. We are still without great productions—the great philosophic age, as we shall see, commenced a century later—but there were several minor philosophers who prepared the ground for the great men who were to follow.

PETRUS POMPANATIUS (1462-1525),

physician, and professor of philosophy at Bologna and Padua, the author of "De Immortalitate Animi" (1516)—as explained by A. H. Douglas, Cambridge, 1910—rejected the doctrine of Averrhoes that reason is one divine light which shines in upon the souls of men, and rejected just as positively the Thomist conception of the soul as a self-subsistent and separable form or a spiritual substance capable of existing after the death of the body. He explicitly **taught the mortality of the human soul,** since the human reason depends on sense and imagery for its objects and the intellectual soul is one with the sensitive and vegetative soul, being merely the same soul under a different aspect. He quoted the commentator **Alexander of Aphrodisias** as the authority for his doctrines; that is to say, he rejected monopsychism, and declared the soul simply to be not immortal "according to Aristotle." He refuted the arguments for immortality by sound common sense and by moral considerations. Pompanatius protested that he had no doubt of the immortality of the soul, since it is plainly taught, not only by the Bible, which is above all human reason, but by the incontrovertible Thomas Aquinas, and that he was only acting as a questioner, seeking to bring truth into full light, when he states such objections as the following: "If the soul's independence of the senses in some respects proves her immortality, so does her dependence in others disprove it. And there are more of her faculties which imply mortality than immortality, as may be seen in the low mental condition of savages, as well as of women generally. Nor can we prove that the soul is able to think without the body, a capacity expressly denied by Aristotle, or understand her connection with the body excepting by assuming her materiality. Finally, since each soul is admitted to have a beginning, she cannot be a partaker of eternity, wherein is neither beginning nor end, but must be finite in her end as well as in her beginning." After giving these and similar objections at some length, Pompanatius set forth his own view, that "the soul may be called immortal in so far as she is a form of pure thought, which latter is independent of sensation, and therefore both immaterial and eternal, but that she is mortal in reality, since she is affected by the mortality of the body, which is necessarily with her, not as the subject, but yet as the object, of her acts.'

We must know that according to Plato and Aristotle the legislator is a physician of the soul, and as the legislator is more concerned to make men virtuous than to make them enlightened, he must adapt himself to their different natures. The less noble requires rewards and punishments. But some cannot be kept in check by these, and it is for them that immortality has been invented. As the physician says what is not true, so acts the founder of a religion, and is completely justified in so acting, his final end being regarded as a purely political one.

As MACHIAVELLI said: "The princes of a republic or kingdom must maintain the pillars of the religion they hold. If this is done, it will be an easy thing for them to keep their State religion, and themselves in prosperity and unity. And everything that favours their interest, and even although they hold it to be false, they must favour and assist, and must do so all the more, the more prudent and politic they are."

To the objection that *if our souls were mortal there could be no just ruler of the world,* Pompanatius replied: "The true reward of virtue is virtue itself, which

makes men happy; for human nature can have nothing higher than virtue, since it alone makes man secure and free from all disturbances. In the virtuous man all is in harmony; he has nothing to fear or hope, and remains unmoved in fortune or misfortune. To the vicious man vice itself is punishment. He trusts nobody; he has no rest, waking or sleeping."

Spiritual apparitions are explained by Pompanatius to be the delusions of the excited fancy or the deceptions of priests. **The "possessed" are sick.** In conclusion, he protests with great energy against those persons who maintain that vicious and guilty men commonly deny the immortality of the soul, while good and upright men believe it. On the contrary, he says, it is quite obvious that many vicious persons believe in immortality, and at the same time allow themselves to be carried away by their passions, while many righteous and noble men have held the soul to be mortal. In a similar spirit Pompanatius wrote of the freedom of the will, and boldly set forth its inconsistencies.

LUDOVICO VIVES (1492-1540),

a Spaniard, proclaimed the independence of mental phenomena, considered as the matter of psychology, and **protested against the metaphysical point of view,** with its empty discussions of the essence of the soul. In his work, *De anima et vita* (1538), he expressed the **futility of inquiring what the soul itself is,** but regarded it as important to discover what its activities and properties are. The forms and substances of the older philosophy are not things but merely logical inventions. **The task of psychology is to study mental phenomena and their connections**; we can dispense with speculations concerning the nature and "essence" of the soul. He regarded the soul as the principle, not only of conscious life, but of life in general; the heart is the centre of its vital or vegetative activity, the brain of its intellectual activity. The souls of plants and animals are generated by the power of matter; human souls only are immediately created by God. He was also an early investigator of the laws of association of ideas. His psychology, especially in the doctrine of the impulses and the emotions, abounds in subtle observations and happy appreciations of character.

Vives must be regarded as the most important philosophical reformer of this period and as a forerunner of Descartes and of Bacon. His whole life was an uninterrupted and successful struggle against Scholasticism. With regard to Aristotle, his view was that the genuine disciples of his spirit should go beyond him, and interrogate nature herself, as the ancients had done. **Not by blind traditions, nor subtle hypotheses, is nature to be known, but through direct investigation by the method of experiment.**

The great Italian Humanists were for the most part Platonists. It was PHILIP MELANCHTHON who presented the most decided example for the reform of philosophy on the old foundation of Aristotle. He gave out openly that he intended to introduce into philosophy, by going back to the genuine writings of Aristotle, a reform like that intended for theology by Luther in going back to the Bible. On the other hand, LUTHER declared that the study of Aristotle was wholly useless. His vilification of the Greek philosopher knew no bounds. Aristotle was "a devil, a prince of darkness, a beast, a public and professed liar, a most horrid impostor on mankind."

PIERRE DE LA RAMÉE (1515-1572),

known as Peter Ramus, a prominent French Humanist, wrote in 1543 a protest **against the exaggerated estimation of Aristotle's philosophy.** He attacked the Aristotelian logic as unnatural and useless, and attempted a new logic of his own,

which gained considerable acceptance, especially in Germany; whereupon the French Parliament, under Francis I., condemned him for all time as "insolent, impudent, and a liar," suppressed his books, and prohibited him from copying them, because he had publicly disputed the doctrines of Aristotle; and further to attack these doctrines was rendered by legislative enactment punishable by the galleys. His enemies raised the cry of secretly espousing Protestant doctrines, and, in consequence of this imputation, he was assassinated at the great massacre of St. Bartholomew.

GERONIMO CARDANO (1501-1576)

was an Italian physician who disputed Galen's localisation of mental functions. In 1545, he became the founder of Algebra, and did much to inaugurate scientific methods of thought by his works *De Subtilitate Rerum* and *De Varietate Rerum*, which appeared respectively in 1551 and 1552, and represent the world as the result of natural forces, acting according to fixed laws. Some dim ideas of spontaneous variation and natural selection have been found in these books.

Cardano revived the Epicurean theory of pleasure, which had been forgotten in the Middle Ages. Good things please us the more when they come after the less good; for every sensation implies a change, and every change is from one opposite to another. If it is from good to evil the result is sadness; if it is from evil to good the result is pleasure. Evil must therefore have preceded. Who takes pleasure in eating unless he is hungry, in drinking without being thirsty? Unlike Epicurus, he declared that we must seek as much as possible the causes of suffering, so as to experience in their sensation the largest sum of pleasure. **MONTAIGNE** (1533-1592), too, seems to have shared the view of Epicurus.

JACOB BOEHME (1575-1624)

was a German **mystic.** His doctrine is chiefly concerned with the problem of the **origin of evil.** All light needs darkness and all good evil in order to appear and to become knowable. Everything becomes perceptible through the opposite alone: gentleness through sternness, love through anger, affirmation through negation. Without evil there would be no life, no movement, no distinctions, no revelation; all would be unqualified uniform nothingness. And as in nature nothing exists in which good and evil do not reside, so in God, besides power or the good, a contrary exists, without which he would remain unknown to himself. Heaven and hell are not future conditions but are experienced here on earth; he who instead of subduing animality becomes enamoured of it, stands under the wrath of God; whereas he who abjures self dwells in the joyous kingdom of mercy. He alone truly believes who himself becomes Christ, who repeats in himself what Christ suffered and attained.

MEDIÆVAL MEDICINE

The Lateran Council, about the beginning of the XIIIth century, forbade physicians, under pain of excommunication, to undertake medical treatment without calling in ecclesiastical advice. This order was renewed by Pope Pius V. (1504-1572), who ruled that all doctors before administering treatment are to call in "a physician of the soul," on the ground, as he declares, that "bodily infirmity frequently arises from sin"; and if at the end of three days the patient had not made confession to a priest, the medical man should cease his treatment, under pain of being deprived of his right to practice, and of expulsion from the faculty if he were a professor.

The prevalent **faith in miraculous healing** also tended to check progress in medical science. These miracles were not necessarily fraudulent, but were most probably due, as we now know, to the power of "suggestion." There were some distinguished physicians, as we have shown, but there were **no qualified surgeons**; for, for a thousand years, the practice of surgery was considered dishonourable by the Church. This stigma attaching to the surgical profession was removed only in 1406 by Emperor Wenzel of Germany. The effect of this widespread ecclesiastical opposition was that surgery was given up to the lowest class of nomadic charlatans, and later was taken up by the Barbers.

French surgery advanced with the establishment of the College of St. Côme in the middle of the XIIIth century, which in 1713 became the *Académie de Chirurgie*. **LANFRANCHI** (-1300) of Milan, author of the "Grande Chirurgie," was the first to describe concussion of the brain, and his chapter on the symptoms of fracture of the skull is accounted a classic. **HENRI DE MONDEVILLE** (1260-1320) was another eminent contemporary surgeon, who anticipated the aseptic treatment of wounds.

Owing to the crowded condition and the **lack of sanitation** in the walled mediæval towns, within which the dead were buried, and which were without courtyards or gardens, and owing to the squalor, misrule and gross immorality occasioned by the many wars and by the general superstition, ignorance and uncleanliness of the masses, epidemic diseases were common.

JOHN GADDESDEN (1280-1361), about the year 1350, referring to the perils of travel from shipwreck and robbers, warns also against the innumerable dangers of infection at insanitary inns. Besides giving directions as to cosmetics—perfumes being needed to overcome the odours—he urges the need of frequent baths and the importance of cleanly underclothing. ERASMUS, one hundred and fifty years later, gave a picture of the dirt that prevailed in the houses of noblemen. Still later, the famous Dr. JOHNSON said he had no passion for clean linen; and even the fine gentlemen of his day were far from scrupulously clean in their persons. What must have been the condition of the poorer classes, badly fed, ill-clad, and living in hovels? But dirt was not universal. France, Italy, and Germany had public bathing-places. In Paris alone there were at that time twenty-six such establishments.

As a curiosity we may also mention that the *fork*, though known at the end of the XIVth century, was not in popular use until the beginning of the XVIIth century. In ancient times and throughout the Middle Ages people, high and low, ate with their fingers. Considering the other uses to which the fingers are put, it is surprising that eating manners took so long to improve.

A great social change was brought about by the introduction of *hot drinks*. Towards the middle of the XVIth century the Spaniards imported chocolate from Mexico; at the beginning of the XVIIth century tea was introduced from China and Japan; and about the middle of the XVIIth century coffee began to pour in from Turkey. The discovery of the circulation of the blood produced an exaggerated estimate of hot drinks, but it had one great effect: it reduced the amount of drunkenness.

Leprosy appeared in Northern Europe in the VIth and VIIth centuries, and its spread in connection with the Crusades was appalling, reaching its full height in the XIIIth century.

The **Plague** raged violently in the VIth century throughout the reign of the Emperor Justinian (483-565), and extended almost to the whole of the then known world. It devastated Paris in 1553 and 1580, and London in 1665. The Black Death from the year 1348 onwards is reported to have swept off the fourth part of the then existing population. These great epidemics were considered punishments

for the wickedness of man. That sin caused them is certain, but it was sin against sanitation.

Syphilis, a contagious disease not yet known by that name, accounts of which were published towards the end of the XVth and during the early part of the XVIth century, was first observed in 1494, soon after the arrival of Charles VIII.'s army at Naples, when an epidemic spread amongst the French soldiers, therefore the name *morbus gallicus* or the "French disease." It spread among all classes with rapidity all over Europe, and is a significant illustration of the fearful immorality of the time. The word "syphilis" is first mentioned by **FRACASTORO** (1484-1553), a physician of Verona, who published in 1530 a Latin poem bearing the title "Syphilis sive morbus gallicus." Doubtless a good deal of what was called "leprosy" in early times was in reality syphilis.

One of the reasons of the enormous spread of venereal disease was probably the vast preponderance of women, as a result of the constant wars. It is said that during the Crusades there were seven women to one man. As in the great European war just concluded, morality sank very low.

It is interesting to note, too, that in the early Christian era **woman** was regarded as the supreme temptress. In the later Middle Ages, however, marriage assumed a mystical significance, and woman was elevated to the pedestal of a chivalrous ideal. A passion for romance appeared, which no knight was without. As the refrain of a French ballad of the XIVth century puts it: "En ciel un dieu, en terre une déesse." The courtly love had a refining influence on manners, but apparently not upon morals. Another reason for the elevation of women and the exaltation of the sex instinct was the dissemination of Oriental sensual stories, partly *via* Constantinople, partly through the spread of Arab literature from Spain, by travelling singers, the Troubadours, wandering from castle to castle and village to village. These stories and songs resembled the tales of "Thousand and One Nights," only in European garb. The position of women and morals of the time are well illustrated in Boccaccio's "Decamerone," which would never have ranked as a "classical" work if judged only by the nature of its contents.

Another interesting observation is that, whereas the Greeks held the drama in highest esteem, the **theatre** was unequivocally condemned by the Christians of the Middle Ages, and all professional actors were pronounced to be in a condition of mortal sin, and were, therefore, doomed, if they died in their profession, to eternal perdition. The sacraments were denied to actors who refused to repudiate their profession, and, in France at least, their burial was as the burial of a dog. (Bossuet: "Réflexions sur la Comedie.") MOLIÈRE (1622-1673), whose plays were continually cited as among the most signal instances of the depravity of the theatre, was the object of special denunciation; and when he died, it was only with extreme difficulty that permission could be obtained to bury him in consecrated ground. The religious mind of RACINE (1639-1699) recoiled before the Censure. He ceased to write for the stage when in the zenith of his powers, and an extraordinary epitaph, while recording his virtues, acknowledges that there was one stain upon his memory—he had been a dramatic poet. Nevertheless, the theatre steadily advanced, although the law in England pronounced actors vagabonds and the law in France infamous, and consequently excluded them from every form of public honour and employment.

Uneducated people, even at the present day, frequently take religious teaching too literally. What must have been the state of mind in the Middle Ages! **People then not only believed in angels and devils, but they saw them.** Hallucinations were taken for realities. Angelic visions were explained as the result of an intimate communion with the Deity, and the individuals in whom they occurred were correspondingly revered and esteemed. Others whose utterances and deeds were suspicious of evil were thought to be possessed by the agents of the dark world, and were subjected to exorcism and other ceremonials; and, if this treatment failed to procure a cure, they were cast into dungeons, or ostracised from society. The belief in diabolical agency was an ever-present terror during the Middle Ages, and probably

produced more lamentable effects on human happiness than any other theological belief. From this fatal superstition arose the witchcraft delusion, which acquired a fresh intensity from the religious excitement attendant on the Reformation. Even such an able writer as THOMAS AQUINAS (1224-1274) assures us that diseases and tempests are the direct acts of Satan; that he can transport men at his pleasure through the air, and that he can transform them into any shape.

The **belief in witchcraft** is probably a relic of the past of the ancient inhabitants of Central Europe, for it was known and tolerated during the first eight centuries or punished with a fine only, as in France. Its history is the blackest in the annals of Christendom, unless that of heresy and the Inquisition be blacker.

It was based on Ex. xxii. 18: "Thou shalt not suffer a witch to live"; and on Lev. xx. 27: "A man also or a woman that hath a familiar spirit, or that is a wizard, shall surely be put to death: they shall stone them with stones; their blood shall be upon them." Here is the Divine sanction to which appeal has ever been made, especially by priestly fanatics, in justification of their action in compassing the death of multitudes of hapless victims for crimes which they not only did not, but could not, commit.

It was only in the IXth century, when the devil was supposed to appear at the revels of witches, that the Church began to take serious notice of these practices; but the condemnation of witches to the stake in any considerable number followed only after the institution of the **Inquisition** in 1183 by Pope Innocent III. The number of victims increased in the XIVth century and reached its greatest height in the XVIth century after the famous Bull of Pope Innocent VIII. in 1484, when witch-burning became almost an industry for some two hundred years, Catholics and Protestants rivalling one another in murdering old and young women. Both innocent and guilty were condemned to the flames; perfectly sane persons were made to suffer in common with those poor hallucinated insane who were but too ready to confess to diabolical practices. The famous efforts of James I. to carry out the Biblical command, "Thou shalt not suffer a witch to live," were outdone by the zeal of the Puritans under the Commonwealth to suppress the wicked old women who had commerce with Satan.

LLORENTE, who had free access to the Archives of the Spanish Inquisition, assures us in his "Histoire de l'Inquisition" that by that tribunal alone more than 31,000 persons were burnt, and more than 290,000 persons condemned to punishments less severe than death. Further, the execution for "Anabaptist errors" of 30,000 persons in Holland and Friesland is mentioned in the official report of the Venetian ambassador at the Court of Charles V. For many years Cologne burnt its three hundred witches annually, and other German and French cities a similar number. The number executed in England during the first eighty years of the XVIIth century has been estimated at five hundred annually, and altogether some forty thousand. Probably in those days insanity raged terribly, considering the absurd demoniacal beliefs that were then held; and what is also probable, the minds of the insane fastened on the delusions of the time.

We have it on the authority of Sir Walter Scott and Lecky, the historian, that, except for political purposes, no person was put to death for witchcraft in the "dark ages"; it was not until the dark ages had passed away, until the XVth and XVIth centuries, the boasted age of Reformation in religion, in medicine, and in philosophy, that witches, or 'persons who had entered into compact with Satan," were put to death, and had tortures worse than death inflicted upon them. With the laws passed against witchcraft in 1736 its punishment by death gradually died out.

One of the methods of ascertaining the guilt of suspected persons was to tie up their bodies and throw them into the river: if they floated, they were guilty; but if they sank, they were innocent.

JULIUS WEYER (1515-1588) in his work " De præstigiis Dæmonum," Bâsle, 1563, showed that the witches were usually women suffering from melancholia and hysteria, having a distorted imagination; while G. CARDANO (1501-1576) denied the assumption, for witches, he held, often act with a good deal of judgment.

LUDOVICO VIVES (1492-1540) protested against the diabolical barbarity, the employment of torture to extract confessions of guilt from the accused. Torture was not entirely suppressed till the time of the French Revolution at the end of the XVIIIth century.

The victims who died for heresy were not, like those who died for witchcraft, solitary and doting women, but were usually men in the midst of active life, and often in the first flush of youthful enthusiasm, and it was believed that this was only the prelude of eternal agonies hereafter. It was the invariable rule to confiscate the entire property of the impenitent, and his children were thus left absolutely destitute, and with a stigma upon them that in the XVth and XVIth centuries was sufficient to shut them out of respectable society.

In the later Middle Ages psychogenic epidemics of a hysteriform character were also common, arising from a fear of witches, ghosts, and spells. The best known is the **Dancing Mania** of 1021, 1237, 1278, 1375 and 1418, called St. Vitus's Dance, St. Vitus being regarded as the Patron Saint of the unfortunate persons who were afflicted with the plague. **PARACELSUS** (1493-1541) was the first who bade people to regard these diseases as inflicted neither by saints nor demons, and explaining that the " dancing possession " is simply a form of disease, of which the cure may be effected by proper remedies and regimen. But the idea was resisted.

An example that may be quoted as evidence of the widespread demoniacal belief is that of no less a man than **AMBROISE PARÉ** (1510-1590), the father of French surgery, who wrote: " The demons are able to assume whatever form they choose, and that suddenly. One sees them often transform themselves into serpents, toads, screech-owls, crows, goats, asses, dogs, cats, wolves, bulls; they change themselves into men, and also into angels of light. They howl at night and make noises like the clanking of chains . . . they move the benches and tables about, lull the children to sleep, turn the pages of books, count money, and throw dishes to the floor."

As we have said already, in the Middle Ages the body was of no account; **the soul and its future was all that people cared for.** It is extraordinary to what discipline and torture people could subject their bodies, and we can only explain their extraordinary endurance on the principle of auto-suggestion, *i.e.*, having their mind concentrated on a certain notion, the body became anæsthetic. This indifference to physical conditions had, however, a sad consequence. Not only were men able to inflict hardships and cruelties on themselves, but they inflicted them on others, and crowds went to witness with apparent pleasure and relish scenes—tortures, mutilations, executions—of which it is sickening to read.

In accordance with current beliefs **abnormal mental symptoms were ascribed to supernatural operations,** divine or diabolical, as the case might be—more often the latter.

LUTHER was quite sure that insanity was caused by Satan, and he exorcised sufferers. CALVIN was equally certain of a personal devil. The same servitude to the mere letter of Scripture which led JOHN WESLEY, the famous preacher (whose strength and beauty of character made his influence in this respect all the more unfortunate), to declare that " to give up witchcraft is to give up the Bible," controlled him in regard to insanity. He insisted, on the authority of the Old Testament, that bodily diseases are sometimes caused by devils, and, upon the authority of the New Testament, that the gods of the heathen are demons. He believed that dreams, while in some cases caused by bodily conditions and passions,

are shown by Scripture to be also caused by occult powers of evil. He cites a physician as testimony that " most lunatics are really demoniacs."

It was the natural result of such views of insanity that men should treat those whom they believed to have the devil in them as they would have treated the devil, could they have had the good fortune to lay hold of him. As Maudsley has said : " The tortures which the insane person suffered from the devils that had entered into him were less than those inflicted by the devils who took charge of him."

The treatment of the insane in the Middle Ages, especially in the XIVth and XVth centuries, was chiefly in the hands of monks. The scant references to mental disorders in the writings of the physicians who flourished in these centuries show how little attention they paid to them. For the milder cases **the monastic establishments were sanctuaries in which these unfortunate beings could find refuge** from the jarring influences of active life, and protection in some degree from the stones, sticks, and death by fire, which was the common mode of treatment resulting from the popular abhorrence and dread the people had of them, holding them to be of a different species to the rest of mankind—" a set of animals, or positive incarnation of devils, who had taken on human guise."

The story of the Belgian village asylum of Gheel, still in existence, shows that as early as the VIIth century the custom had arisen of sending mad persons for cure to the shrines of saints. In the XIIth century we find madmen being taken to St. Bartholomew's in London, and wonderful cures are recorded as having taken place there. **The first custodial institution entirely for the cure of the insane was founded in Florence in 1389.** Bethlem Hospital in London was founded in 1247 as a monastery in Bishopsgate, and was handed over for the use of insane in 1403. Asylums were also founded at Valencia in 1409, at Saragossa in 1425, at Seville and Valladolid in 1436, and at Toledo in 1483. In 1660 the Hôtel de Dieu in Paris was opened.

To some hospitals, long before they ceased to be altogether ecclesiastical establishments, there were attached chambers, or cells, into which lunatics were received. But unless the provision which was thus made in these earlier times was much better than the condition in which these places were found in the XVIIIth century would seem to indicate, the benefit of the charity was conferred more on the public which was relieved from the presence of the patients than upon the patients themselves. They were usually confined in a dungeon, where they lay chained on straw, naked, tormented and beaten by inhuman gaolers and keepers. Their food was thrown in, and straw raked out through the bars. Sightseers went to see them, as they went to see the wild beasts, for amusement. The patients were cowed by the whip or other instruments of punishment, and were more neglected and worse treated than if they had been wild beasts.

In 1547 Bedlam became a lunatic asylum unconnected with ecclesiastical administration. This change to lay management does not seem to have been any advantage to the unfortunate inmates, for we find it reported fifty years after the change that the condition of the hospital was too loathsome for anyone to enter. The place was really a horrible prison, and not a hospital in any sense of the word. (See Chapter VI.)

Though the belief of possession by the devil had long subsided, the practice of ill-treating the insane, as we shall see further on, persisted till the beginning of the XIXth century. Still, there were physicians who held enlightened views on the subject.

F. PLATER (1536-1614),

professor at Bâsle, made some progress in psychiatry in pointing to the **hereditary transmission** of mental defects and in insisting on a careful **clinical study,** besides attempting a **classification of mental disorders,** though a rather primitive one. How

the religious belief of the time affected even so clever a man is shown by his reference to a female patient, of whom he says she was tempted by the devil to kill her sleeping husband, whom she really loved, and that he, Plater, cured her "with the help of God" by means of bleeding and salutary exhortations. Another case which he interpreted in the same way was that of a mother who, during two pregnancies, struggled against an almost irresistible impulse to kill her child. Whereas the famous **JAC. SYLVIUS** (1478-1555) remarked of insanity that "in some cases scolding is required, in others blows and shackles," Plater insists, in opposition to him, upon psychical treatment.

W. F. HILDANUS (1560-1634), in his book entitled "Observations," cites cranial injuries as a frequent cause of insanity. **GREGOR HORST** (1578-1636), professor at Wittenberg, called attention to the frequency of religious melancholia among monks, and ascribed it to their fastings and general manner of living.

DANIEL SENNERT (1572-1637),

another Wittenberg professor, appears to have been a man who, although he could not free himself from the prevalent belief in witches, wrote sensibly on the various forms of insanity ("Practical Medicine," 1628). He attempted to modernise the ancient humoral theory and appears to have suspected mania to be of toxic origin. The primary seat of mental derangement was regarded by him to be in the heart, *i.e.*, the blood circulation; the brain, in his opinion, was affected secondarily only: *Cordis enim temperis corrupta corrumpit temperiem cerebri.* For this reason he suggested the employment of such drugs as influence the circulation. He believed hereditary melancholia to be the most unfavourable form of mental derangement.

Sennert distinguished two great divisions of insanity: melancholia and mania.

Melancholia he defined as "delirium or deprival of imagination and reason, without fever, with fear and sadness, arising from dark and melancholy animal spirits, and occasioning corresponding phantoms."

Mania he described as delirium without fever, a deprival of imagination and reason, without fear, but, on the contrary, with audacity, anger, and ferocity, and arising from a fervent and fiery disposition. The maniac, he tells us, imagines things which are not, and knows no distinction between what is honest and shameful, good and bad, friendly and inimical. "This malady," he says, "must have a specific and obscure cause somewhat resembling poisons, and be of such nature that it may be produced by certain venomous substances. Some of these, in fact, induce delirium, and it is beyond dispute that numbers of persons have become maniacal through drinking certain philtres." Notwithstanding this, he speaks of "demoniacal mania," and asserts that patients suffering from this malady evacuate stones, iron, living animals, etc., which could not be produced in a healthy body, but were caused by demons. These demons, however, can be driven out of the system, for he says: "One must not think that demoniacal mania is inaccessible to remedial agents. The treatment should produce such an effect in the patients that the demons finding them no longer suitable for their domination will abandon them of themselves."

We see here for the first time an attempt to combat supernatural powers by natural means; though apparently these consisted with him chiefly of the customary remedies—bleeding and purging.

ZACCUTUS LUSITANUS (1575-1642), of Lisbon, a Jewish physician who had to flee from Spain and settled in Amsterdam in 1625, applied psychotherapy for obsessions.

LAZARUS RIVERIUS (1589-1655), professor at Montpellier, in his "Praxis Medica," argued that since hydrophobia resembles mania and comes from the poison of a dog, so mania itself may be due to some poison formed in the body; thus he arrived at a similar conclusion to Sennert.

WOLFGANG HÖFER (1614-1681), in his work "Hercules medicus" (Vienna, 1657), is the first to describe cretinism.

JOHANN JACOB WALDSCHMIDT (1644-1687) thought that mania and melancholia originated in abnormal fermentations in the body.

TH. BONET (1620-1689),

who wrote the first work on pathological anatomy, showed that progress was made a few years later, and that he, in any case, freed himself from the chains of superstition and fear. He was probably the first to make minute observations on the brains of insane "(Sepulchretum, sive anatomia practica ex cadaveribus," Geneva, 1679); only he made the mistake of regarding the pathological conditions as the *cause* of the mental derangement. He declared:

"I attach no significance, or next to none, to the art of magic, but attribute all rare and unusual occurrences to nature and to the presence of diseases which we do not sufficiently understand. Hypochondriacal patients experience many discomforts which they assign to supernatural causes; herein, therefore, they discover miracles and lay the blame for their ills on the shoulders of demons or magicians. Human credulity yields so readily before those who dread names that their influence in controlling our destiny is acknowledged."

He died of hydrophobia.

THEOPHRASTUS PARACELSUS (1493-1541)

One great obstacle to progress in the XVIth century was the failure of either the Renaissance or the Reformation to do more than substitute the authority of ancient for mediæval literature. The Bible was thought infallible in religion, Aristotle in philosophy, Galen in medicine, Ptolemy in astronomy, and Justinian in legislation. Every path to greater knowledge was blocked by some old book. Mysticism was trying to pull down some of these idols, though only to set up others. What the age most needed was to see that facts are more instructive than books.

First to show the advantage of direct observation over mere reading were the physicians. Among the most famous innovators of the century was Paracelsus, a Swiss contemporary of Luther. He did a great deal for chemistry, medicine, and science in general. Chemistry was for long regarded as one of the "seven devilish arts." A Papal Bull of 1317 strongly condemned the practice of alchemy, in which modern chemistry found its origin. During the XIVth and XVth centuries many chemists were punished as sorcerers, while as late as in 1624 Parliament prohibited chemical studies.

Paracelsus was the author of the three principles, salt, sulphur, and mercury, which replaced the ancient doctrine of the four elements and prepared the way for a **true science of chemistry.** But the salt, sulphur, and mercury, he tells his disciples, were not the visible bodies which we call by these names, but certain invisible, astral, or sidereal elements, and were analogous to the three worlds, the elemental or terrestrial, the astral or celestial, and the spiritual or divine, and these again correspond to the elements of man: Body, Spirit, and Soul. His idea of the existence of an "archæus," a power which presides over all physiological actions as well as over all the operations of medicinal drugs, resembles very closely the "vital force" or "animism" so strongly championed by **STAHL** in the XVIIth century. Paracelsus was the originator of specific remedies and the first publicly to announce the "quintessences," *i.e.*, the **active principles of drugs.** He was also the first to assert the plurality of the races of mankind and explained the Mosaic cosmogeny as having been written "theologically—for the weaker brethren."

All the lectures on medical subjects had hitherto been delivered in the Latin tongue, which hampered the lecturers in the full expression of their thoughts and the students in properly understanding them. Paracelsus tried to break this objectionable custom; his example, however, was not followed, and the practice was continued for at least two centuries longer. The advantage was that Latin was an international language for all learned men, and that it distinguished physicians from the quacks.

The influence of Paracelsus was far-reaching, and his real services were great. Far in advance of his time, he discarded Galenism and taught physicians to accept chemical therapeutics; he attacked witchcraft and the strolling mountebanks who butchered the body in lieu of surgical procedure, and he opposed the silly uromancy and uroscopy. He discovered miners' disease, was the first to establish a correlation between cretinism and endemic goitre, introduced mineral baths, and was one of the first to analyse them. He distinguished functional from organic nervous disorders and treated them by psycho-therapeutic methods. He made uncompromising attacks upon the prejudices of his age, and his strong mixtures, his alchemy and astrology, procured him everlasting notoriety and the vigorous opposition of his scientific contemporaries. Still, the result was that the Hippocratic method of the minute observation and recording of facts, together with experimentation, was revived, and the medical sciences gradually emerged from the débris of fifteen hundred years.

ANATOMY IN THE MIDDLE AGES

The difficulties under which medical science laboured in the Middle Ages may be estimated from the fact that dissection was forbidden by the clergy, because of the sanctity of the human body and its resurrection, though we do not find this pious objection interfering with such mutilation when effected by means of the rack and wheel and other cruel methods of killing supposed malefactors. True, it is said that the Bull of Boniface VIII. in 1300 against the cutting up of dead bodies was not intended against legitimate anatomical studies, but it was universally and constantly construed to prohibit dissection for this purpose. Even when special licences were granted for dissection, the thoracic and abdominal cavities alone were opened, while the cranial cavity was left untouched in obedience to popular prejudice; and the operation was performed, as a rule, by the barbers, while the learned professor of anatomy merely explained the exposed, but not dissected parts. The subjects were executed felons. The first anatomical theatres were opened at Paris and Montpellier in 1551; but some time before that date anatomy had made great strides.

For eight hundred years—that is, from the VIIth to the XIVth century—the centre for the study of medicine was at Salerno. Neither the Arabians nor the Jews did anything for anatomy. In 1231 Frederick II., Emperor of Germany and King of the two Sicilies, encouraged the study of human anatomy by ordering that a body should be anatomised at Salerno at least once in five years. Physicians and surgeons of the kingdom were required to be present. In 1308 the rulers of Venice gave permission to the Medical College for the dissection of a body once a year.

MUNDINUS (1275-1327),

whose real name was LUIGI MONDINI DE LUZZI, was famous as an anatomist. In 1315 he publicly dissected two female bodies in the presence of a crowd of students at Bologna. His example, however, does not seem to have been followed. He shortly afterwards (1316) published a treatise on anatomy, which became a text-book

in the medical schools for nearly three centuries. It appeared in print in 1478. It was compiled largely from the writings of Galen and Avicenna. At the end of the XVIth century it was still the only text-book used in the University of Padua, and it was probably the first anatomical treatise illustrated by woodcuts. It was held in such esteem, that deviations from his descriptions were considered abnormal. As to the work itself, it is full of preconceived opinions and theories. Of course he held the universal belief in animal spirits (which he believed to pass to the middle ventricle by a worm-like passage—vermis), but he was original in one respect, anticipating a modern view, in teaching that **cellules exist in the brain, each of which is the seat of a particular intellectual faculty.**

After Mundinus, dissecting gained a firmer foothold as a mode of instruction, and public dissections were decreed in the Universities of Montpellier in 1366, at Venice in 1368, at Florence in 1388, at Vienna in 1404, Bologna 1405, Padua 1429, Paris 1478.

JAC. BERENGARIO DA CARPI (1470-1530) is said to have dissected more than one hundred human bodies. He corrected Mondino's book, and wrote an excellent treatise on head injuries : " Tractatus de fractura calvariæ s. cranii " (1518).

MAGNUS HUNDT (1449-1519), Rector of Leipsic University, was one of the last famous scholastics. His text-book on anatomy is considered **the first sound one,** and one not without interest even at the present day. It was illustrated with woodcuts. Hundt was the first mediæval author to make use of the term **anthropology.**

JACOBINUS SYLVIUS (1478-1555), whose real name was JACQUES DUBOIS, was **the first regular teacher of anatomy from the human body** and the first to study the bloodvessels by means of coloured injections. He dissected a great number of animals and as many human bodies as he could procure. Unfortunately, he subordinated all his own research to the authority of Galen.

ANDREAS VESALIUS (1514-1564),

a pupil of Jacques Sylvius, born at Louvain, became professor at Padua, the centre of the great European revival of learning and of the greatest intellectual freedom of the time. Venice was then mistress of Padua and in every way fostered its university. It was under the protection of the enlightened Venetian Senate that Vesalius enjoyed those unique opportunities for the study of anatomy which enabled him, in 1543, to publish his work on the structure of the human body, " De corporis humani fabrica," Bâsle, 1543, a work that broke the medical slumber of more than a thousand years. Hitherto Galen, who had never dissected a human body, was regarded as an absolute authority. There were dissectors and dissections before Vesalius, but **he alone made anatomy a living, working science.**

Vesalius gave a more perfect description of the heart, but he still believed that blood was formed in the liver ; and as regards the brain, he confined himself to representing it as the central organ of sensation and movement. The question of the significance of the same for the activity of the soul he abandoned to the philosophers ; but he was **the first to draw attention to the difference between the grey and white matter of the brain** and to describe the five ventricles.

Vesalius, while he took a materialistic view of the nature of the soul, distinguished three souls : the vital, the natural, and the chief soul, each of which was but the sum of the spirit of corresponding function, and he assigned to the brain the chief soul, the sum of the animal spirits, whose functions were distinctly mental. The natural spirit was made by the liver, and from the vital spirits, which were made by the heart and utilised in the bodily functions generally, the brain elaborated the animal spirits in its ventricles and influenced the muscles and other organs by sending them out along the nerves. He was clear that the soul was engendered in and by the brain, but beyond that he knew nothing. Vivisection taught him that

when the brain is removed, sensation and movement are lost; but it taught him little more than this.

Vesalius insisted upon the **essential similarity of the brains of men and animals,** and observed that "**the mass of the brain attains its highest dimensions in man,** whom we know to be the most perfect animal, and that his brain is found to be bigger than that of three oxen; and that in proportion to the size of the body, first the ape, and next the dog exhibit a large brain, suggesting that animals excel in the size of their brain in proportion as they seem the more openly and clearly to be endowed with the faculties of the chief soul, *i.e.*, mental powers."

Vesalius referred to Aristotle's division of the mental powers adopted by the theologians (Thomas Aquinas, Duns Scotus, Albertus Magnus, and others), according to which "imagination" and "judgment" were placed in the second ventricle, and "memory" in the third, and confutes the hypothesis by the fact that **the parts of the brain to which the rational faculties are given by the theologians are found in the lower animals to correspond very nearly to the same parts in man.** (Liber VII. cap. I. and cap. VI. "Ventriculorum usus"). On the other hand, Vesalius still clung to the opinion, universal in his time, that the air we breathe, penetrating through the Eustachian tubes, is, by a rarefying process, rendered fit for the brain, and enters into the first and second ventricles, and forms the **animal spirits.** These pass into the third ventricle, and into the posterior (cerebellar) ventricle, from which a portion of them is transmitted into the medulla oblongata, and into the nerves springing from it.

Vesalius was a pioneer in **ethnic craniology,** observing the shape of the heads of the different races and nations, and he taught that the pressure on the pliable head in infancy determined its shape in adult years;. an erroneous notion still held by some anatomists, as will be shown later.

"It appears," he remarks, "that **most nations have something peculiar in the shape of the head.** The crania of the Genoese and, still more remarkable, those of the Greeks and the Turks, are globular in form. This shape, which they esteem elegant and well adapted to their practice of enveloping the head in the folds of their turbans, is often produced by the midwives at the solicitation of the mother." And he further observes, "that the Germans have generally a flattened occiput and a broad head because the children are always laid on their backs in the cradles; and that the Belgians have a more oblong form because the children are allowed to sleep on their sides."

In 1544, a year after the publication of his great work, Vesalius was driven by the hostility of the medical profession to burn his manuscripts and relinquish original work. He then became physician to Charles V. and Philip II. at Madrid, and was condemned by the Inquisition on suspicion; but escaped, only to suffer shipwreck on an island, where he died in misery. According to Sir Michael Foster (*Lectures on the History of Physiology*, 1901), Vesalius left Madrid in 1564 because he was wearied by the Court and harassed by the Church, and therefore wanted to change his mode of life.

MICHAEL SERVETUS (1509-1553)

was a theologian, philosopher and physician, and a sceptic in all three. The fal and original sin had no part in his theology; and speaking of "touching for the evil,' he remarked that in France he saw the King touch many, but "I did not see any cured." In 1536 Servetus was working at anatomy under Vesalius and Sylvius ir Paris. Unfortunately he had astrological leanings and got into trouble on accoun of this heresy. In this respect we must not forget that even up to very recent time

the moon was credited with having influence on insane and epileptics. Servetus started practice as a physician in Vienna, where he published another unorthodox theological work, which turned the friendship of Calvin into enmity against him. It is in this work that Servetus describes the **circulation of the blood** (at least, of the pulmonary circulation) accurately. He was thus a forerunner of Harvey. He believed the choroid plexus was the organ destined to secrete the animal spirits, that the fourth ventricle was the seat of memory, and that the habitation of the soul was in the aqueduct of Sylvius.

He was seized and tried for heresy, and having escaped, he was burnt in effigy along with his books. He was discovered in Geneva one evening attending Church service, was followed up, and cast into gaol, and sentenced to be put to death without shedding of blood. He suffered the long-drawn agony without recantation, and was burnt at the stake.

Other famous anatomists of the time were **EUSTACHIUS** (1510-1574), professor of anatomy at Rome, who published a set of superb plates, "Tabulæ Anatomicæ," in 1552; **FALLOPIUS** (1523-1562), of Modena, lecturer of anatomy at Padua, a pupil of Vesalius, who, in his work "Observationes Anatomicæ" (1561), denied Galen's statement that the brain is moved by a systole and diastole, since he had never witnessed the movement, either in animals or in wounded men; and **VAROLIUS** (1543-1575), who was professor of anatomy at Bologna and physician to the Pope, and wrote: *spiritus animalis residet in substantia cerebri.* He described as a deception the doctrine that the spirit could reside in the brain cavities, since they do not contain air but water, and the water has no other purpose than to carry away the effete substances formed in the brain in the act of thinking. Pons Varolii —a well-known structure of the brain—bears his name.

PIETRO DE MONTAGNA,

an Italian surgeon, published in 1491 a work which contains an engraving of the head, in which are represented *sensus communis cellula imaginativa, cellula astimativa seu cogitativa, cellula memorativa et cellula rationalis.* **LELIÈVRE,** in a surgical work in 1500, and **JOHN ROHAN DE ROTHAN** reproduced this engraving.

GEORGE REISCH (1470-1525),

Gregorius Rischius Carthusianus, was Prior of the Carthusian convent at Freyburg in Breisgau, and enjoyed great authority under Maximilian I., whose father confessor he was. The celebrated Johann Eck, the most violent opponent of the Reformation, went to Freiburg to study mathematics under Reisch. His chief work, "Margarita Philosophica," published in 1503, although consisting of only one volume, is a cyclopædia in miniature, and was in fact published later under the title of "Encyclopædia." It is also illustrated with anatomical woodcuts, one of which represents *the human head mapped out like a phrenological bust* of the present day. (Chapter: De potentiis animæ sensitivæ.) This engraving has been attributed to Baptista Porta, whose work was not published till 1586. It was copied before that (1562) by **LUDOVICO DOLCI** (1508-1568) of Venice, in a work entitled "Dialogo di M. Lodovico Dolce, nel quale si ragiona del modo di accrescere e conservar la memoria," which revived the doctrines of Gordon on the nature of the brain and the mental faculties, and treats of the methods of increasing and preserving the memory.

Reisch says the number of the internal senses is five: common sense, cogitation, estimation, phantasy or imagination, and memory. The common sense is in the first portion of the anterior ventricle, as is also the power of imagination. In the middle ventricle is the æstimativa; and in the posterior, the memorativa.

JUAN HUARTE (1530-1592),

a Spaniard, contemporary of Henry IV., in a work dated 1575, and entitled "Examination of the Spirits with respect to their aptitudes for the Sciences," wrote: "Every man is born with a kind of particular disposition; **each disposition and aptitude corresponds with a particular form of head.**"

In a memorial to Philip II. of Spain he pleaded for **vocational guidance.** He wrote:

"As I have frequently remarked, the mind of man is very narrow and circumscribed, and when it attempts to do more than one thing at once, it only embarrasses itself. I have always thought it never could thoroughly know two arts or professions; and when this was attempted, one of the two was sure to be imperfectly understood. Thus it seems to me, that it is requisite to set apart a number of sagacious and learned men, to examine, and investigate into, the mental qualifications and capabilities of young persons; in order to oblige them to make a choice of such sciences and professions, as would be most in accordance with their intellectual constitutions; and not to leave the matter to their own choice or direction. For in general cases, this choice will necessarily be an injudicious one, and will induce them to give a preference to some line of life which will prove less advantageous and useful to them, than if they were under the direction of suitable and qualified counsellors. It would happen from all this, Sire, that you would have better workmen, and more finished workmanship, throughout your dominions, and persons who know better, than those at present, how to unite nature with art. I should also wish the learned academies of your kingdom to be placed under a similar regulation; for, as constituted at present, all students go from one faculty of learning to another without their understanding Latin well; so, in like manner, examinations should be instituted to ascertain that when any one wished to study logic, or philosophy, or medicine, or theology, or law, he had that peculiar constitution or aptitude of mind fitted for that particular profession."

Here we have the first mention of a "vocational guidance," only that Huarte thought it a sufficient guide to examine the minds of candidates as regards the powers of memory, understanding, and imagination.

The doctrine of **temperaments** is discussed by Huarte. He showed the connection between bodily conformation and intellectual vigour. He promulgated a curious doctrine, that the various degrees of heat, moisture, and dryness fully account for all the intellectual varieties and powers of man.

BERNARDINO TELESIO (1508-1588),

in *De Rerum Natura* (1586), taught that the *soul* was the subtlest form of matter, a very delicate substance, enclosed within the nervous system, and therefore eluding our senses. Its seat is chiefly the brain, but it extends also to the spinal cord, the nerves, arteries, veins, and the covering membranes of the internal organs, all of which he believed to have cavities or ventricles like the brain, enclosing this fine, very mobile spirit. Recognising that the nervous system is in close connection with soul-life, he acknowledged that the soul in man differs only in degree from the soul in animals. He assumed beside the material soul in man, a divine non-corporeal soul directly implanted by God, which united with the material soul. This was probably a concession to the orthodox teaching of the Church.

GIOVANNI BAPTISTA PORTA (1536-1615),

of Naples, was, to judge from his numerous works, **a most erudite physiognomist,** deeply read in the works of his predecessors. His chief book—De Humana Physiognomia—published in 1586, was translated into many languages. He closely

followed Aristotle, and Avicenna, and considered that the human face should be compared with that of animals. No part of the human body was ignored by him. The woodcut representing the human head, with the distribution of the mental faculties, is, as already stated, taken from the *Margarita Philosophica* of Reisch without acknowledgment. Porta is frequently mentioned as if he had been a predecessor of Gall, but there is little resemblance between their teaching.

In his work on Physiognomy he gives a curious catalogue of the instincts common to man and animals. Several human heads are compared with those of animals. A round head indicates a want of memory and wisdom ; when the anterior portion is flattened, perception and memory are feeble ; on the contrary, if the posterior part is but little developed, the memory and energy suffer ; if the middle part, reason and reflection are but slightly marked.

The Marquis MASCORDI, chief justice of the Criminal Court at Naples from 1778-1782, had studied deeply the work of Porta. Whenever a criminal condemned to death on sufficient testimony persisted in protesting his innocence, the Marquis summoned him before him, examined attentively his head, and then passed a final judgment, of which the two following are examples :

(1) *Auditis testibus pro et contra, vise facie et examinate capite, ad furcas damnamus.*

(2) *Auditus testibus pro et contra, reo ad denegandum obstinatio, visa facie et examinato capite, non ad furcas, sed ad catemas damnamus.* (*Lancet*, November 10, 1832.)

Porta's book on meteorology was the first in which sound ideas were broached on this subject ; his researches in optics gave the world the camera obscura (1588) ; in chemistry he seems to have been the first to show how to reduce the metallic oxides, and thus to have laid the foundation of several important industries.

NIC. TULPIUS, (1593-1678) made famous by Rembrandt's picture "The Anatomist," **JOHN VESLING** (1598-1649), **CHARLES DRELINCOURT** (1633-1679), **THÉOPHILE BONET** (1620-1689), as well as **THOMAS WILLIS** (1622-1675) with whom we shall deal in Chap. X., located the soul in the cerebellum, having observed that severe injury of the cerebellum causes the vital functions to cease, while injury of the cerebrum has no such consequences. Not until **ALBRECHT v. HALLER** (1708-1777), **J. G. ZINN** (1727-1759) and **A. C. LORRY** (1725-1783), was it shown that vital functions are not connected with mental processes and that these observers must have injured with the cerebellum the neighbouring medulla oblongata, which contains the centres for respiration and circulation. (The importance of the medulla was finally settled by **LE GALLOIS** in 1812.) Yet **MICH. MALACARNE** (1744-1816) still asserted that the number of mental functions depended on the number of layers of the cerebellum. On the other hand, **ARCHANGELO PICCOLOMINI** (1526-1605) and **FRIEDRICH HOFFMANN** (1660-1742) confusing, like the others, vital with mental functions, located the soul in the medulla oblongata.

SECTION III.

VIEWS OF THE SOUL, MIND, AND BRAIN, XVIth to XVIIIth Century

CHAPTER VIII

ENGLISH PHILOSOPHY TO THE END OF THE XVIIIth CENTURY

FRANCIS BACON, Lord Verulam (1561-1626),

LORD CHANCELLOR of England in the reign of Queen Elizabeth, is usually called the father of the empirical scientific method.

The publication of his "Essays" in the year 1597, the work by which he is still most popularly known, brought him into considerable notice both in England and abroad. In 1605 he produced one of his most celebrated works, viz., his two books on the "Proficience and Advancement of Learning," a profound and comprehensive survey of the existing state and deficiencies of all the various branches of human knowledge. In 1620 Bacon surprised and delighted the learned world by the publication of the great work from which his philosophic fame has chiefly descended to our time, the "Novum Organum Scientiarum," *i.e.*, a new instrument or method for interpreting nature.

Bacon discovered, or for the first time logically formulated, the **inductive law** of scientific discovery, a law withdrawing the mind from seeking theological or metaphysical explanations for the things of this life, and setting the landmarks of science within the limits of experience, as boundaries prescribed by Nature herself to human inquiry. From faith and belief man was to turn to doubt and inquiry; and, by the use of his own senses and reasoning faculties in the observation and interrogation of Nature by experiment, man was to acquire a knowledge of the actual world in which he lived.

Bacon taught that man was no longer to look to a supernatural world, and spend his time in the barren contemplation of it—that is to say, instead of constructing a world from his own conceptions, **man was to consult experience and observation,** so that he might have facts and not opinions to reason about. He was to concentrate his mind on the natural world as his actual dwelling-place, and whilst here to regard it as his real home. He was to rouse himself from a supine resignation to the evils of this life, and he was energetically to seek the diminution of human sorrows and the increase of human happiness, not in soliciting the supernatural, or appealing to Providence through prayer, but by making free use of his own intelligence; *first*, in acquiring a knowledge of, and interpreting nature, that is, tracing effects to their natural causes in order to discover their laws of action; and *second*, in rationally regulating and improving his life in obedience to the laws of nature.

Bacon threw off the yoke of Aristotle and Plato, which for centuries had weighed on mankind. His work consisted in an attempt at restoring knowledge to the path of fact and to the service of utility. He pointed out **the various hindrances under which the pursuit of truth is prone to labour.** The mind must be purified of all preconceptions, prejudices or "idols," and it must proceed by a gradual method of observation and induction from particular to more general facts. The causes of error in all human speculations are: (1) the Idols of the Tribe; that disposition in the human mind to generalise too rapidly, and without a due regard to the number and well authenticated nature of particular facts; (2) the Idols of the Den, grounded on the natural and constitutional differences amongst men, joined to particular kinds of education, habits, stations of life, and so forth, which affect the judgment, and lead men to form wrong conclusions on many subjects; (3) the Idols of the Forum, which arise from the imperfections of language, and its wilful perversion for interested purposes; (4) the Idols of the Theatre, arising from attachments to particular systems or schools of philosophy, fettering the human mind from one generation to another.

In his *Novum Organum* (1620) Bacon declared that the "corruption of philosophy from superstition and theology introduced the greatest amount of evil both into whole systems of philosophy and into their parts." He denounced those who "have endeavoured to found a natural philosophy on the books of Genesis and Job and other Sacred Scriptures, so 'seeking the living among the dead.'" He speaks of the result as "an unwholesome mixture of things human and divine; not merely phantastic philosophy, but heretical religion." Religious controversies, says Bacon, are pernicious. Let religion remain untouched, but let it not—after the manner of the Scholastics—be mixed up with science. The mingling of science with religion leads to unbelief; and the mingling of religion with science to extravagance. The mind must be freed from superstition and from prejudice of every kind, in order that, as a perfect mirror, it may so apprehend things as they are. Knowledge must be in harmony with experience. It should set out with **observation and experiment,** whence through induction it should rise methodically first to propositions of inferior, and to others of higher, generality, in order finally from these to redescend to the particular, and to arrive at discoveries which shall increase the power of man over nature. He attempted to limit and define philosophy, and to formulate a sound experimental method whereby the sum of knowledge might be augmented. This programme was of service, of course, to all sciences alike, mental as well as physical. His great merit was that he "led forth the sciences from their house of bondage"; that he directed the minds of men away from mere verbal disputations to the discovery of truth by observation and experiment; that he incited men to develop the industrial arts and to acquire knowledge and apply it "to the glory of God and the relief of man's estate."

In many parts of the writings of Bacon we find striking evidence of the firm persuasion that the mental faculties and powers of man were very different in their nature from those possessed by the brute creation. This difference was not one of degree but of kind.

He died suddenly, at the age of sixty-six, from an attack of bronchitis, consequent upon his having incautiously experimented with snow in the open air, to ascertain whether the effect of intense cold could preserve from putrefaction the flesh of a dead fowl. It was the initial experiment in a process that has resulted in our day in bringing millions of tons of frozen provisions to the market of England from distances of thousands of miles, yet preserved in their purity through lengthened periods of time.

Though great as a philosopher and lawyer, Bacon apparently was a seeker after wealth and power. The contrast between the records of his character and of his writings has never been explained.

THOMAS HOBBES (1588-1679)

shared with Bacon the belief that all knowledge comes from experience, besides making it clearer than his predecessor that experience of the world comes through the external senses alone. He is connected with Gassendi by his **mathematical and physical interpretation of nature.**

The honour is awarded to Hobbes of having been the first writer on mind who maintained that our sensations do not correspond with the qualities of external objects: for example, "that the said image or colour is but an apparition unto us of the **motion, agitation, or alteration which the object worketh in the brain,** or spirits, or some internal substance in the head." In the "Meditations" of Descartes the same proposition is laid down.

During his residence abroad Hobbes had become acquainted with the physical philosophy of Galileo—the theory that regards every change in the external or phenomenal world as a mere rearrangement of matter and motion, matter being an aggregate of independent molecules held together by mechanical pressure and impact. The component parts of this aggregate become known to us by the impression their movements produce on our senses, traces of which are preserved in memory, and subsequently recalled by association. Language consists of signs conventionally affixed to such images; only the signs, standing as they do for all objects of a certain sort, have a universal value, not possessed by the original sensations, through which reasoning becomes possible.

Hobbes attempted to discover what was the essential nature of man. As a result of his psychological analysis of human nature, he reached the conclusion that **all man's desires are essentially directed towards his own preservation and happiness,** and what are apparently unselfish emotions are to be analysed and explained in terms of this self-regarding tendency. He found it necessary to deny that man is naturally a social animal, and to assert the primacy of man's egotistic tendencies. He classified human emotions and sentiments on the basis of the wider distinction between appetite and aversion, common also to animals. But "curiosity," Hobbes erroneously assumed, is an emotion "found in no other living creature but man." He distinguished within emotional life three innate conditions of attraction—pleasure, love, and desire—and three of repulsion—pain, aversion, and fear. The play of these, and of the emotions derived from them through association of ideas, is ruled by the striving toward power and honour, or ultimately toward self-preservation, a tendency shared by all men with all other beings. There is **no disinterested passion** for Hobbes.

He lays down clearly the principle of **utilitarianism,** and from it deduces his main dogmas. Sensation is the criterion of good; pleasure is a motion "helping vital action," a motion which appears in consciousness under the form of desire. The value of things is measured by the desire they engender, and their comparative excellence by the intensity of this desire. Again, it is in desire, and not in possession, that the good lies. Conduct should be regulated with the view to the useful, for a thing may not in itself be good which yet becomes so because it is conducive to happiness. Thus power may in itself not be delightful, but it has the effect of making others peaceably disposed towards us; it protects us against envy and malice; it compels respect; it wins for us good-will and love, and all these advantages make it desirable and good. The interest by which our actions should be guided is always individual interest. The instinctive hatred which men bear to their fellow-creatures may be veiled by politeness and education, but cannot be obliterated. But our hatred for others flows from self-love. As soon as our fellowmen serve our interest they become lovable. We may act benevolently towards others because it is an egotistical, and therefore a natural, action to feel that we have the power to make not only our own happiness but that of others. Pity for

others in their misfortune is the fear we have that the like calamity may befall ourselves. His doctrine is one of exclusive egoism.

Every man regards his neighbours with fear and suspicion. This condition leads men to enter with one another into a kind of treaty or contract, in which **each renounces his freedom and limits his desires, on the understanding that all do the same.** This social contract becomes the original foundation of the State's constitution. Right and wrong, good and evil, virtue and vice, have no meaning in themselves. They are only constitutional ideas which exist by the supreme will of the government. There is only one standard for the worth of actions, and that is public law. Religion is the child of fear, duty the offspring of self-interest, and both are the creatures of law, the artificial appointments of political expediency. Might is right, with Hobbes, and the sovereign is all-powerful.

JOHN LOCKE (1632-1704),

a physician by calling, used the method of observation and induction, and based his hypotheses on the study of children, animals, and primitive man.

He discarded the artificial dualism between the consciousness and the external world in favour of another dualistic conception, which consisted in distinguishing the **inner** from the **outer sense**; the former affording us cognition of our inner or psychic actions, the latter of external objects. He begins his "Essay concerning Human Understanding," 1690, with a vigorous polemic against the doctrine of innate ideas. Whatever a man knows, or can in any way conceive, is dependent on experience. All our ideas refer either to external data of sensation or internal operations of reflection.

To Locke, the world of objects revealed through sensation and reflection was no illusion, no creation of our own. We find it there, changing, when it changes, without, or even very much against, our will. Locke's view was that it consists of material bodies, some animated, and some not. And matter, the supposed substance of body, is made known to us by impressions on our organs of sense. But when we try to think of matter apart from these sensible qualities and the relations between them it vanishes into an empty abstraction.

The fundamental process of external perception is *sensation*, that of the spirit *reflection*, all perceptions and ideas of the external world being derived from sensation; in other words: **no knowledge without experience.** Hobbes merely assumed this; Locke supports his case by a formidable array of proofs. According to him, the mind begins with external sensations, and then by means of its faculties of perception, retention or memory, contemplation (comparison and reflection), and imagination, it executes all the particular operations of thinking and volition.

To Locke, reflection was largely a passive power: reflective *upon* the course or flow of our ideas, not itself determining this flow or course to be what it is. Reflection was an "inner sense." The actual flow of ideas was due to the laws of association.

Locke almost wholly ignored the emotional side of human nature in his psychology as in his educational theory. Even the feelings and moral principles result mediately from the understanding. Intellectual and moral principles are recognised by mankind only by some, and by those only as the result of teaching. Just as there are **no innate ideas,** so there are **no innate moral principles.**

According to Locke, "the **passions** are modes of pleasure and pain, resulting in our minds from various considerations of good and evil." While reflecting on the pleasure which a thing that is present or absent may give us, we have the idea of

what we call love. On the other hand, reflection on the pain which a thing present or absent may cause in us produces the idea of what is called hatred. Joy, sadness, hope, fear, despair, anger, envy, are all, in like manner, modes of pleasure and pain and different forms of the uneasiness which is caused by the absence of a good or the presence of an evil. These divers passions are often mixed in life.

Locke uses the term "faculties," for it would be affectation for the philosopher to wish to deviate in his speech from common usage and to strike the well-known powers from his vocabulary. Still, he should not forget that they are not active persons or agents, but simply attach to active persons. Understanding would indeed be impossible if there were no faculty of understanding; however, it is not this faculty which works upon another faculty, for example, upon that of will. "It is the mind that operates and exerts these powers; it is the man that does the action; it is the agent that has power or is able to do." First comes the thought, then the action.

The **will**, according to him, is the faculty of choosing from several thoughts or motions, and liberty is the possibility of putting into execution the thoughts or motions chosen by the will. "We are endowed with a power to suspend any particular desire, and keep it from determining the will and engaging us in action." We can compare our desires and calculate their consequences. The choice will be determined by our desire to avoid pain and desire for happiness. "In this lies the liberty a man has." Freedom has to do with action, not with will. A man is not free to will and not to will. So far as a man's power of acting in accordance with his own thought extends, so far is he free. It is plain that Locke did not go to the root of the matter; he does not tell us how our desires and impulses arise. We are free to choose between a number of desires—on that point we are all agreed—but these desires arise from and are dependent upon our organisation. The gratification of these pre-organised desires gives us pleasure, and that is why we think we have chosen them of our own accord.

According to Locke, it is "a certain and evident truth that there is an eternal, most powerful, and most knowing being, which whether anyone will please to call God it matters not." We have no innate ideas or direct intuition of the Almighty, but our experience proves to demonstration his existence. Locke refused toleration to atheists on the ground that their denial of a divine lawgiver and judge destroys the basis of morality. For him morality is constituted by the will of God. Revealed religion is to him the only sure ground for the belief in the soul.

The consequences of Locke's *tabula rasa* doctrine that all knowledge is derived from experience was shown by the celebrated Dr. JOHNSON. This shrewd literary and observing man considered the gift of genius as a thing that, when once existing, might be directed any way. Newton, he thought, might have been a Shakespeare. For, said he, a man who can run fifty miles to the south, can run fifty miles to the north.

ANDREW BAXTER (1686-1750)

The freedom and activity consequent upon the political revolution of 1688, and the influence of Locke's Essay, as also of the new physics, were manifest in the variety of directions taken by philosophical investigation. One of the most conspicuous of these directions was towards *materialism*. Discussions and controversies in respect to the nature and immortality of the soul began in the XVIIth century, and were prosecuted during the greater part of the XVIIIth. Among the many writers who wrote on this subject we may mention, in 1704, **WILLIAM COWARD** (1656-1725); in 1708, **HENRY DODWELL** (1641-1711); and in 1737, Andrew Baxter, with his work, "Inquiry into the Nature of the Human Soul." Baxter ascribed all the imperfections of the human soul to its mechanical connection with the body,

and on this supposition he attempted to show that the mistakes and mental delusions which arise from dreaming, spectral illusions, drunkenness, etc., are derivable from this source. In his "Essay on Dreaming" he affirmed that it is not the soul itself which is the cause, but some "living intelligent cause" which tampers with the brain, and **anticipated the modern explanation of the origin of illusions and hallucinations.** He said:

"It requires but a greater degree of the same power to make delusory impressions upon the sensorium, while real external objects are making true impressions upon it, than it would require to make the same impressions while no other impression from external objects is made upon it at the same time. If one is made to see in his sleep a man pursuing him with a drawn sword, there are certain proper **vibrations excited in the optic nerves,** or such **impressions made upon that part of the brain upon which the optic nerves act,** as if these vibrations were excited in them; and if the same vibrations are more powerfully excited in the optic nerves while the eyes are open, than those excited by external objects then acting, the man pursuing with the drawn sword will still appear, even though the eyes are open. And thus by easy steps we see that **dreaming may degenerate into possession**; and that the cause and nature of both is the same, differing in degree, for dreaming is but possession in sleep. . . . What is said with respect to the objects of sight is easily applicable to those of hearing. . . . The more pregnant instances, where people are subjected to illusions of the fancy, and such things as disorder their imaginations, generally happen after the brain hath been discomposed with anger, fear, disappointment, or other violent passions."

ANTHONY ASHLEY COOPER, **EARL OF SHAFTESBURY** (1671-1713)

arranged the **affections,** not according to their different modes, but according to the objects towards which they are directed. He discovered in man self-regarding impulses and their opposites—benevolent or social impulses, which cause us to love the happiness of others for its own sake, and without any regard to our own. To these two classes of impulses he added rational or reflective tendencies, which imply reason; these consist in the sense of esteem or contempt which we feel in the presence of moral beauty or ugliness, and have for their object human actions, or rather, the thoughts or affections which are their source. When we imagine an action we experience a feeling which is either agreeable or painful, as when we hear a harmony or a discord. We distinguish good from evil by a kind of delicate sense, an **innate moral sense,** whose existence manifests itself in our rational impulses; a sense which finds more sweetness in the subtle joys of self-sacrifice than in the brutal satisfaction of egoism. By trusting to its guidance we shall find happiness without seeking it. These impulses not only give rise to judgments, but also intervene as determining forces, as springs of action. Virtue consists in the harmony between our personal and benevolent impulses, induced by our rational impulses. Virtue and happiness are identical. It does not appear that Shaftesbury recognised that there are men born without this innate moral sense, and those who possess it are not all endowed with it to the same degree. Indeed, in most men, life is a battle between the egoistic tendencies and the moral sense.

GEORGE BERKELEY (1684-1753),

Bishop, born in Ireland, spent some years in London in that brilliant literary circle of Addison, Swift, Steele, Pope, and others. He represented in his writings orthodox Christianity as opposed to the "mathematical atheism" of his age.

According to Berkeley, **there are no abstract ideas**—*i.e.*, no thoughts unassociated with some mental image besides a mere word; and matter or inanimate substance would be such an idea, therefore it does not exist. There is nothing but mind and its contents—ideas—or what we call states of consciousness. Even the earth, the

sea, the heavens themselves, and all that they contain, are merely impressions on the sensorium. The **unreality of material things** is stated by him very clearly in the opening words of his "Principles of Human Knowledge" (1710):

"It is evident to any one who takes a survey of the objects of human knowledge that they are either ideas actually imprinted upon the senses, or else such as are perceived by attending to the passions and operations of the mind; or, lastly, ideas formed by help of memory and imagination. . . . But besides all that endless variety of ideas or objects of knowledge, there is likewise something which knows or perceives them, and exercises diverse operations, as willing, imagining, remembering, about them. This perceiving, active being is what I call Mind, Spirit, Soul, or Myself. . . . That neither our thoughts, nor passions, nor ideas formed by the imagination, exist without the mind, is what everybody will allow. And it seems no less evident that the various sensations, or ideas, imprinted on the senses, however blended or combined together, cannot exist otherwise than in a mind perceiving them."

Whence, then, come the objects of our consciousness, and whither do they go when we cease to perceive them? Berkeley replies that all things subsist in the consciousness of God, and by their subsistence his existence is proved. Man knew because God knew. His omniscience was the original of our knowledge, his ideas the archetypes of ours. Our ideas, indeed, were a sort of divine speech, nature a visual language spoken by God and interpreted by man. The direct apprehension of reality that is not ourselves only becomes possible through what would be called in modern language a subjective participation in the divine consciousness, more feebly reflected, it would seem, in the memories, imaginations, and reasonings of our finite minds.

The **soul**, according to Berkeley, is a simple active being revealed to us through experience, but not perceived in any concrete experience. It is a concept drawn from the mental life. Nothing exists except spirits; the other existences, whose essence is to be perceived, are maintained by the perception of God, who is the true cause of their appearance to us. When perceiving, mind is reason; when acting, it is will.

Berkeley, in his "Theory of Vision" (1709), attempts to prove that extension is not a real attribute of things in themselves, but an intellectual construction, or what Locke would have called an "idea of reflection." Till then people had thought that its objectivity was firmly established by the concurrent testimony of two senses, sight and touch. Berkeley shows, on the contrary, that visible and tangible extension are not the same thing, that the sensations—or, as he calls them, the ideas—of sight and touch are two different languages whose words we learn by experience to interpret in terms of each other without their being necessarily connected.

BISHOP BUTLER (1692-1752)

The leading principle which pervades all the speculations of J. Butler (1736) is that there is a more exact **correspondence between the natural world and the constitution of man** than is commonly imagined. We perceive that his inward frame displays a striking agreement with his bodily form; and both harmonise with the physical arrangements of the universe. Our various passions, feelings, and emotions are peculiarly adapted to our condition. When we submit our constitution to examination, and pay attention to what our consciousness indicates, we recognise a remarkable fitness between the external senses and various bodies and elements around us. We see a complicated system of organs and instruments suited to accomplish certain fixed ends or purposes. The eye is made to see, the palate to taste, and the ear to hear; and when we look at the intimations which we have of external things, in and through these varied channels, and compare them with the

hidden and internal faculties of the soul, we perceive a radical conformity to a high principle of order and system. Human nature is not a simple or uniform element, but a combination of many things, which blend and harmonise for a definite end. The body is an aggregate of different senses, organs, and functions; and our intellectual nature is compounded of a number of instincts, judgments, passions, emotions, and propensities. Over all these numerous parts and offices of thought and feeling there presides a ruling power which is uniform in its nature and influence among all classes of men, and whose especial province it is to exercise a controlling authority over all these faculties—and this power is the act of *reflection*. It goes under various other designations, but of its existence and influence we can entertain no doubt whatever. It is our constant guide, monitor, and judge.

Butler observes: "That which renders beings capable of moral government, is their having a moral nature, and moral faculties of perception and action. Brute creatures are impressed and educated by various instincts and propensities; so also are we. But in addition to these, we have a capacity of *reflecting* upon actions and characters, and making them objects of our thought."

Conscience, as understood by Butler, is not the enlightened and educated conscience of the man who has reflected on the origin and consequences of human actions, but the untutored conscience of any ordinary unreflecting person—in fact, of the "plain, honest man."

That the conscience admits of education, and that the uneducated conscience is a very inadequate guide, are considerations of which Butler takes no heed. He fails to see that, in the case of ordinary men, the conscience is simply the aggregate of those moral ideas and feelings which have been derived partly from personal experience, partly from the accumulated experience of mankind, transmitted from age to age, and impressed on the individual by the various influences which together constitute his education, *e.g.*, parental authority, influence of friends and society, law and religious instruction. The decisions of reason are often out of harmony with those of conscience, as it exists in its unenlightened form.

Butler confined himself to introspection. He made no attempt to compare human nature under a variety of circumstances, in different times and nations, and the like.

FRANCIS HUTCHESON (1694-1746)

made a not quite successful attempt to distinguish between instinct, affection, and passion, and discussed the **function of the instincts** in determining conduct, and their relation to reason ("Essay on the Nature and Conduct of the Passions," 1728). Hobbes had maintained that all our actions have their ultimate source in self-love. In opposition to this, it was maintained by Hutcheson that **many of our actions spring solely from a regard to others,** and that, in fact, this is the case with all those of which, on reflection, we approve. The only quality, either in our own actions or in those of others, which commends itself to our approbation is their benevolence or unselfishness. His general position was that, "Though we have instincts determining us to desire ends, without supposing any previous reasoning, yet it is by the use of our reason that we find out the means of attaining our ends." Reason itself can never determine any end. "No reason can excite to action previously to some end, and no end can be proposed without some instinct or affection." He explained the nature of instinct:

"We may further observe something in our nature determining us very frequently to action, distinct from both sensation and desire, if by desire we mean a

distinct inclination to something apprehended as good, either public or private, or as the means of avoiding evil, viz., a certain propensity of instinct to objects and actions, without any conception of them as good, or as the means of preventing evil . . . Thus in *anger*, beside the intention of removing the uneasy sensation from the injury received; beside the desire of obtaining a reparation of it and security for the future, which are some sort of Goods, intended by men when they are calm, as well as during the passion, there is in the passionate person a propensity to occasion misery to the offended, even when there is no intention of any good to be obtained, or evil avoided, by this violence. And it is principally this propensity which we denote by the name of anger. . . . This part of our constitution is as intelligible as many others universally observed and acknowledged; such as these, that danger of falling makes us stretch out our hands; noise makes us wink; that a child is determined to suck, many other animals to rise up and walk; some to run into water, before they can have any notion of good to be obtained or evil avoided by these means." (*Essay on the Nature and Conduct of the Passions*, 1728.)

Hutcheson arranged the "natural powers" in six classes: (1) the external senses; (2) the "internal sense," which determines the pleasures arising from the perception of "regular, harmonious, uniform objects, as also from grandeur and novelty." (3) The "public sense," which determines us "to be pleased with the happiness of others and to be uneasy at their misery." It gives rise to the "desire for company," and apparently underlies "benevolence and compassion," and corresponds to our gregarious instinct. (4) The "moral sense," which determines the perception of virtue and vice in ourselves or others. (5) The "sense of honour," which makes us pleased at the approbation of others and ashamed at their condemnation. (6) The sense of the ridiculous.

Desires and aversions fall into similar classes. Desires and aversions are determined by apprehended good and evil. They may be divided as primary or secondary, according as they are directed towards ends determined by "natural propensities" or affections, or towards ends which merely serve as means for the attaining of primary ends. In the latter category he would place such desires as the desire for wealth and power.

Desire is generally accompanied by an uneasy sensation, but the desire is not a desire simply to remove the uneasiness. Further there is a pleasant sensation attending the gratification of desire, in addition to the satisfaction obtained from the object itself of the desire, but "desire doth never arise from a view of obtaining that sensation of joy, connected with the success or gratification of the desire." In the case of the appetites, these are always characterised by the fact that there is "uneasy sensation" antecedently to "any opinion of good in the object." They are instincts. The object is esteemed good because it allays the pain or uneasiness, but it is "desired" prior to its being experienced as "good."

Hutcheson drew a sharp distinction between egoism and benevolence. We desire the happiness of others as directly as our own. Benevolence is an ultimate feeling. Besides these two affections, we find within us the primary idea of the moral good. And this simple quality of moral goodness can only be perceived by a special sense. This is the **moral sense**, whose perceptions, like all sensible perception, are accompanied by pleasure and pain. Adapted to the perception of a quality which is to be found in our intentions and acts only, our moral sense is not an external but an internal sense. Moreover, Hutcheson saw goodness in those actions only which tend to the happiness of others; universal benevolence constitutes moral excellence.

He placed fear in the same category with anger. He also recognised what we call the gregarious instinct as of the same order, but he enumerated it among the "appetites."

WILLIAM CULLEN (1712-1790),

physician and later Professor of Chemistry, was a follower of Locke. In his work, "On the Derangements of the Intellectual Functions," he dealt with the **relation of mind and brain** and had some significant observations to make:

"Judgment is determined by sensation, and volition is the effect of judgment. Moreover, the relation which exists between sensation and volition is always effected by means of the brain and an act of judgment, and one can therefore hardly doubt that this act of judgment depends on certain movements which take place in the brain and on various modifications of these movements. As to the nature of these phenomena we are still in ignorance. It has not been possible to demonstrate that any part whatsoever of the brain is more concerned than any other in the act of judgment. We have no idea of the part taken in this operation by the different portions of the brain. Our data being thus limited, it is obviously very difficult to determine the particular cerebral conditions underlying the various states of our intellectual functions. These physiologic considerations should precede, however, the examination of the derangement of the functions of the intelligence. Although **each portion of the brain doubtless has a special significance of its own,** it is, nevertheless, necessary for the organ to act together as a whole in order that the judgment may remain intact." Cullen, in his "First Lines of the Practice of Physik" (London, 1777), dealt with paranoic forms of insanity, called by him "Vesaniæ."

DAVID HUME (1711-1776),

philosopher and historian, born at Edinburgh, published two great works, "Treatise of Human Nature," 1739, and "Enquiry Concerning Human Understanding," 1747. He accepted, like Berkeley, only what is immediately revealed to our senses, but he asks, if we have no experience of an external world and the existence of matter apart from perception, must not the spiritual world be denied as well? If we can know nothing but what the senses reveal, there is no room for a knowledge of mind.

He divided the contents of consciousness into two classes, impressions and ideas —the second being copies of the first, and distinguished from them by their relative faintness. From these perceptions (which he called thoughts), Descartes had passed by an immediate inference to the ego or self, which he affirmed as the primary fact of consciousness, whereas Hume did not grant the existence of the metaphysical self—of a simple and continued substance, as distinguished from particular states of consciousness. We are, he declared, "nothing but a bundle of different perceptions, which succeed each other with an inconceivable rapidity, and are in a perpetual flux and movement." He distinguished among impressions the first data of experience, "inner" and "outer" impressions. Inner impressions were those of the inner sphere itself, such as pleasures, pains, efforts, etc.; and outer impressions were those received by the senses and having the imprint of externality. All possible materials of knowledge, of experience throughout, arise in impressions; and since the term sensation is commonly used for such first data of knowledge, "sensationalism" became the term applied to the resulting theory of knowledge.

The course of ideas—their flow, connection, composition—was ruled by the principle of **association.**

Three cases of association were recognised: the cases of "resemblance," "contiguity" in space and time, and "cause and effect." Things repeatedly and invariably associated together become parts of one whole over which "habit" overflows, and to which habit gives the sanction of a universal and necessary connection. By "habit," said Hume, the associated impressions and ideas are bound into aggregates and wholes, to which belief and custom attach. All necessity

attaching to the course of events, either internal or external, is due to habit. What we are in the habit of finding we take to be true and necessary. We have no final certainty of anything. Reason furnishes no assured test of thought or action. Custom is our only guarantee, and probability our only guide in life.

If we know only states of consciousness, we know nothing of a mind, soul, or God underlying them. Evidence is reduced to a stream or bundle of disconnected perceptions. We can no more deduce God from them than material objects. The existence of the soul is merely a tradition which has been uncritically accepted, and no demonstration of its existence ever had been, or could be, made.

Hume's method is wholly inductive, but, instead of appealing solely to self-introspection, it is **based on the observation and comparison of various types of character** and sentiment, collected from the different ages and countries of the world as well as on the registration of individual experiences. Whereas hitherto there had been a prevailing disposition to study principally, or even exclusively, the understanding, Hume's works make decisive progress in recognising the **importance of the affective qualities.**

Hume did not, like nearly all his predecessors and contemporaries, find the determining grounds of volition in ideas, but in the feelings. Impassive reason can never itself become a motive. It is only capable of influencing the will indirectly, through the aid of some affection. Abstract relations of ideas, and facts as well, leave us entirely indifferent so long as they fail to acquire an emotional value through their relation to our state of mind. Reason is not motive for action, but has merely the function of directing the "impulse received from appetite or inclination." The sole determining motives are the passions. Passions may be calm or violent, and it is when the motive is of the calm kind that we are deceived into thinking that the motive is reason.

When we speak of a victory of reason over passion it is nothing but a conquest of one passion by another, *i.e.*, of a violent passion by a calm one. That which is commonly called reason here is nothing but one of those general calm affections (*e.g.*, the love of life) which direct the will to a distant good, without exciting any sensible emotion in the mind; by passion we commonly understand the violent passions only, which engender a marked disturbance in the soul and the production of which requires a certain propinquity of the object. A man is said to be industrious "from reason," when a calm desire for money makes him laborious. It is a mistake to consider all violent passions powerful and all calm ones weak. The prevalence of calm affections constitutes the essence of strength of mind. Reason is thus a slave of the passions.

Hume thus distinguished **calm passions** (including beauty and deformity) and **violent passions** (love and hatred, grief and joy, pride and humility). Next he divided them into *direct* or simple and *indirect* or complex passions. The direct arise from pleasure and pain, and include desire and aversion, grief and joy, hope and fear; these passions become indirect and complex as the object of the passion is either oneself (pleasure and pain becoming pride and humility) or some other person (pleasure and pain becoming love and hate).

Moral distinctions are determined by our sense of the agreeable and the disagreeable. We approve such traits of character as are immediately agreeable or useful, either to the person himself or to others. If the moral value of actions is thus made to depend on their effects, we cannot dispense with the assistance of reason in judging moral questions, since it alone can inform us concerning these results of action. Reason, however, is not sufficient to determine us to praise or blame. Nothing but a sentiment can induce us to give the preference to beneficial and useful tendencies over pernicious ones. This feeling is evidently no other than satisfaction in the happiness of men and uneasiness in view of their misery—in short, it is **sympathy.** Hume defined sympathy as that propensity we have "to

receive by communication" the "inclinations and sentiments" of others, *i.e.*, suggestibility; but in the case of opinions, he distinguished between the effects of sympathy and those of "authority." Upon this sympathy he based the various phenomena arising really from the gregarious instinct.

By means of the imagination we enter into the experience of others and participate in their joy and sorrow. Whatever depresses or rejoices them, whatever inspires them with pride, fills us with similar emotions. From the habit of sympathetically passing moral judgment on the actions of others, and of seeing our own judged by them, is developed the further one of keeping a constant watch over ourselves and of considering our dispositions and deeds from the standpoint of the good of others. This custom is called **conscience.** Allied to this is the love of reputation, which constantly leads us to ask, How will our behaviour appear in the eyes of those with whom we associate?

In order that an action may gain the approval of the spectator two other things are required besides its salutary effects: it must be a mark of character, of a permanent disposition, and it must proceed from disinterested motives. Hume is obliged by this latter position to show that disinterested benevolence actually exists, that the unselfish affections do not secretly spring from self-love. To cite only one of the thousand examples of benevolence in which no discernible interest is concerned, we desire happiness for our friends even when we have no expectation of participating in it. The accounts of human selfishness are greatly overdrawn. Because virtue, in the outcome, produces inner satisfaction and it is praised by others, it does not follow that it is practised merely for the sake of these agreeable consequences.

Only after we have experienced the pleasure which comes from the satisfaction of an original motive (*e.g.*, ambition), can this become the object of a conscious reflective search after pleasure, or of egoism. Power brings no enjoyment to the man by nature devoid of ambition, and he who is naturally ambitious does not desire fame because it affords him pleasure, but conversely, fame affords him pleasure because he desires it. The case is the same with benevolence as with the love of fame. It is implanted in the constitution of our minds as an original impulse immediately directed toward the happiness of other men. After it has been exercised, and its exercise rewarded, it is indeed possible for the expectation of the agreeable consequences to lead us to the repetition of beneficent acts. But the original motive is not an egoistic regard for useful consequences.

The advent of Hume denoted the period which initiated the discussion of the **mental powers of animals.** Descartes had tried to prove that the bodies of men and animals are machines actuated by springs like watches, but that man possessed in addition a soul, wholly different in its properties from his body, and apparently incapable of being acted upon by it. Man only can think; animals are capable only of physical sensations, and have no consciousness. Animals were supposed to act from "blind instinct," a supposition which was still held in the last century and helped to strengthen the conviction that the mental processes of animals are unsearchable. Hume appealed to the observation of domesticated and other animals of high grade. The facts seemed to him to show that **animals as well as men are endowed with reason** and able to draw inferences; he did not, however, credit them with the power of framing general statements, holding that experience operates on them, as on children and the generality of mankind, by "custom" alone. He saw no ground for drawing a line between the mental powers of man and those of the higher animals, though he attributed to man a power of demonstrative reasoning to which animals do not attain. In this he substantially agreed with Aristotle.

DAVID HARTLEY (1705-1757),

physician and philosopher, a contemporary of Hume, devoted himself to discovering

the principle of the connection of ideas. This he found to consist in the **laws of association,** to which feeling and willing, as derivative faculties, were both subject. He explained complex psychic phenomena and even the most elevated thoughts and feelings by means of the association of sensations and simple perceptions. To this psychological association corresponds the physiological phenomenon of **brain vibrations,** and Hartley realised that these notions, which at first were accompanied by full consciousness, become, through repetition, unconscious or automatic.

In his "Observations on Man" (1749) he developed a moral philosophy, consisting of two parts :

(1) Of an attempt to trace the genesis of the several principles which supply the motives of action. These are, according to the order in which he placed them, imagination, ambition, self-interest, sympathy, theopathy, and the moral sense.

(2) An attempt to regulate and adjust these various principles by a careful estimate of the nature and amount of pleasure which each of them, when made an object of pursuit, is calculated to produce either by itself or in combination with others, and by this method to frame a rule of life. The first part is mainly psychological, the second strictly moral.

All these principles are traced ultimately to **sensation.** They are all factitious, and are all of them the result of a constant repetition of sensations blended together, and combined, as it were, into a new entity by means of association. Sensation is the common foundation of them all, and each in its turn, when sufficiently generated, contributes to generate and fashion all the rest. Let sensation, *e.g.*, generate imagination ; then will sensation and imagination together generate ambition, or love of honour and consideration ; sensation, imagination, ambition, and self-interest will generate sympathy ; sensation, imagination, ambition, self-interest, and sympathy will generate theopathy ; and all these together constitute the moral sense. The pleasures of sensation are alone original, the others are factitious. In this way we advance from the organic and bodily to the imaginative and intellectual, and from the intellectual to the moral and the spiritual pleasures. As we advance we become less and less selfish, more and more spiritual ; we forget ourselves more and more, until all regard for self is lost in the love of others, and eminently in the love of God, and in admiration of those moral attributes which he alone exhibits in perfection. In Hartley's language, we begin with self-love and end with self-annihilation. He does not deny the existence of purely disinterested actions or feelings, but he maintains that they have, in the progress of the individual's life, been transmitted, by means of association, out of acts and feelings which were at first purely self-regarding.

THOMAS REID (1710-1796),

the Scotch professor, author of "Inquiry into the Human Mind," 1764, was roused by Hume's philosophy to the philosophy of "Common Sense."

The theory that we do not perceive objects immediately, but only through ideas, Reid held to be a fiction. His own theory is that of immediate perception. We do not start with ideas, but with judgments. There is at first a sensation, and the sensation "suggests" a perception. Every perception is or involves a "judgment." **Common sense** is the criterion of knowledge or ultimate appeal. The principles of common sense relate to "contingent truths" and "necessary truths." Among the first, he placed the existence of everything of which we are conscious—that things are what we perceive them to be; the freedom of the will ; the life and intelligence of our fellow-men ; and the uniformity of nature. Among the second he placed all mathematical truths and logical axioms, and all principles of moral and metaphysical truths.

Reid ("Essays on the Active Powers of the Human Mind," 1788) divided the "**active powers**" into three groups : mechanical principles of action (habit, instinct) ; animal principles (appetites, desires, affections) ; and rational principles. Under

instinct in its mechanical sense Reid included mainly what we prefer to call reflexes; but he included also imitation, and even "instinctive" belief, which plays an important part in the education of the child.

He recognised that there are two elements or constituents of human nature which determine human conduct, and which have been known by mankind in all ages as "passion" and "reason." The meaning of the word **passion** is so uncertain as to have given rise to endless discussion. "I shall," says Reid, "by the word 'passion' mean not any principle of action distinct from those desires and affections before explained, but *such a degree of vehemence in them*, as is apt to produce these effects upon the body or upon the mind which have been above described." Passion tends to good, and it is only by accident that it leads us into evil. Reid meant by "passions" impulses of our "animal nature," which are common to man and brute animals, and characteristic of children "before the use of reason." Opposed to passion is reason. This "reason" is the specific difference between the nature of man and the nature of brutes. It is "superior to every passion, and able to give law to it."

Reid pointed out the **appetites** (hunger, thirst, lust, need of action and rest), which are preceded by disagreeable sensations and are periodic. **Desires** differ from appetites, firstly, in that they are not accompanied by a disagreeable sensation; secondly, in that they are not periodic. The chief desires are the desire of power, the desire of honour, and the desire of knowledge. The principle of the desires is not, any more than that of the appetites, the pursuit of pleasure: the appetites tend to the preservation of the body, desires have been given to us for the furtherance of social life.

Those principles of action which have persons for their immediate object, and which imply that one is either ill or well disposed towards a man, or at least towards a living being, are the **affections.** The benevolent affections cannot be reduced to egoism. Naturally pleasant, they are directed towards the happiness of their object (gratitude, compassion, esteem, friendship, love, patriotism). Even the malevolent affections, the chief among which are emulation, anger, and resentment, serve a purpose in the plan of Providence. These principles of action are "such as operate upon the will and intention, but do not suppose any exercise of judgment or reason, and are most of them to be found in some brute animals, as well as in man."

ADAM SMITH (1723-1790),

the "father" of political economy, propounded a "Theory of Moral Sentiments" (1759) and rules of conduct on the psychological laws of **sympathy,** by which he meant the communication to our minds of all the feelings of others. He remarks, for instance, that it is impossible to witness the sufferings of others without being affected by the contagion of this suffering. Nature has joined us in a fellowship with other men, so that their pleasures and their pains become our pleasures and pains. When we approve of our own actions, it is because, when we place ourselves in the position of an impartial spectator, we can, from his point of view, sympathise with the motives which dictated our conduct.

From this modest germ he developed by a progressive growth the wide-spreading tree of morality: moral judgment, the moral imperative with its religious sanction, and ethical character. Accordingly we may distinguish different stages in the development of sympathy: the psychological stage of mere fellow-feeling, the æsthetic stage of moral appreciation, the imperative stage of moral precepts, which further on are construed as commands of God; finally, the concluding stage wherein these laws of duty are taken up into the disposition. The difference of intensity between the original and the sympathetic feelings differs widely with the

various classes of emotions. It is difficult to take part in feelings which arise from bodily conditions, but easy to share those in the production of which the imagination is concerned—it is easier to share in hope and fear than in pleasure and pain. We are also more potently influenced by the causes of suffering than by the signs of it. The wooden leg of the beggar is more effective in exciting our pity than his anxious air.

Nature has so willed it that this feeling of sympathy should not fail to bring pleasure, and it may be sought for its own charm. Evil fails to attract us; the heart, when it follows its natural inclinations, is always drawn to the good. The impulses of sympathy are always towards what we call morality. Consequently, we should have only those sentiments and should perform only those actions which ought to bring the approbation of our fellow-creatures and gain their sympathy. Sometimes, even, we should act in opposition to prejudice and face public censure, in order to obtain from posterity, which is the only equitable judge of conduct, a tardy but universal sympathy, and one that will last for ever. If the actions of others did not sometimes excite in us sympathy and sometimes antipathy, we should have no conception of the moral value of our own actions. A man alone in the world would remain ignorant of good and evil. We should judge our actions as impartial spectators.

JOSEPH PRIESTLEY (1733-1804),

the naturalist, chemist (isolated oxygen, 1774), and theologian, made Hartley's ideas, which at first passed unnoticed, more generally known. He gave them a materialistic colour by affirming the **identity of the mental and cerebral processes,** and maintaining that the former can be understood solely through the study of the latter. He explicitly taught the identity of mind and brain. This is fully developed in his "Disquisitions Relating to Matter and Spirit," 1777.

Priestley enters on the discussion of his subject with a statement of his views as to the nature of matter, and to the notions hitherto entertained of it. **Matter is not inert,** but a certain power or force is necessary to its solidity or essence, without which every particle would fall from every other and be dispersed. This opinion formed the groundwork of his subsequent reasonings respecting the homogeneous nature of man. Man is unquestionably endowed with perception and thought, but these depend upon the brain and nervous system. As far as we are able to judge, **the faculty of thinking and the state of the brain always bear a certain correspondence or relation to each other.** There is no instance of the existence of thought when the brain is destroyed; and whenever that material organ is injured, or impeded in its regular and natural movements there is a corresponding derangement in the mind or thought. Thought depends on the material organisation. If thought were the result of an immaterial substance, we might expect it to display more vigour and activity in proportion as the bodily frame became weakened and diseased; but the very contrary of this is the case. If the mental principle were immaterial, all the faculties of mind would be so too; whereas we see several of these well-defined powers greatly impaired during old age and during the process of bodily distempers and maladies. "Since, therefore, all the faculties of the mind, separately taken, appear to be mortal, the substance or principle in which they exist must be pronounced to be mortal too." The nature of many of our affections militates against the notion of the immateriality of the thinking principle. They can be improved or depraved. For these reasons, **mind is merely a property of matter.** Priestley attempted to strengthen this conclusion from the consideration of various mental phenomena, where the sympathy between the mind and body is conspicuous; from certain declarations in the Scriptures; and from the history of opinions relative to the origin of the soul, and the nature of matter, entertained by philosophers from the earliest period down to his own time.

JEREMY BENTHAM (1748-1832),

who was a disciple of Hobbes and of Helvetius, and a jurist as well as a philosopher, gave by his profound analysis of the different kinds of pleasure a new development to utilitarianism, the principles of which he, moreover, applied to jurisprudence. **His morals are based on the principle of utility.** To attain pleasure and to avoid pain are the great ends in life and the springs of all our actions. He opposed the earlier writers on morals who laboured to find some principle of approbation or disapprobation in the human mind capable of speaking with authority on matters of right and wrong, and of enforcing obedience to its dictates. It was, according to his judgment, a method which was wholly arbitrary, and based the laws of conduct on no solid foundation. The principle, which according to him should be the starting-point in our moral judgment, is derived from the consideration of the **consequences** of our actions. Those actions are good, the consequences of which we can foresee will result in pleasure for us, or at least in more pleasure than pain. Even criminal pleasures are bad only because of the painful consequences which they involve.

An act is good not because it is approved by conscience, or because it proceeds from one motive rather than another ; but simply because it promotes the happiness of those whom it affects. Moral sanction, strictly so-called, that of self-approbation or self-disapprobation is entirely ignored by him. What he calls moral sanction is in reality social sanction. The instruments by which, according to him, human conduct is regulated are self-love, regard for the opinion of others respecting ourselves, fear of God, and fear of the Law. The effect of an action on the sum total of human happiness gives it its moral character.

Although all pleasures are good, they vary in degree of intensity, duration certainty, purity, etc., and their comparative value is a science of moral arithmetic, The social consequences of our acts must be considered most especially ; they outweigh individual interests. Men seldom measure these. In a theft we perceive only the wrong done to the person robbed, and not the greater evil which will result from the bad example. Laws are provisions made in order to ensure to citizens the greatest sum of happiness possible. It is their utility that constitutes their justice. The pain of punishment which is inflicted is not in order to satisfy a desire of vengeance, but to prevent or to make less frequent the recurrence of guilty actions.

The British philosophers mentioned in this chapter, from Hobbes to Reid and Bentham—and especially Hume—may be described as **ETHOLOGISTS,** for their speculations were largely concerned with " human motives," which form the basis of character. (See Chapter XXV.)

CHAPTER IX

PHILOSOPHY IN FRANCE, HOLLAND, GERMANY, ETC.

XVIIth Century Philosophy

RENÉ DESCARTES (1596-1650)

WAS no mere speculative philosopher. He was one of the first to regard the brain as an organ subserving the interaction between mind and body, and the first to state definitely that the brain is the organ of sensation, of thought, and of **emotion.** But in Descartes' time, and for a hundred and fifty years afterwards, the best physiologists had not reached that point. It remained, down to the time of Bichât and Gall, a question whether the passions were or were not located in the abdominal viscera.

Descartes distinguished sharply between matter and spirit, defining the former as extended substance, the latter as inextended thinking substance. He held that **the whole material world and all its processes were to be explained mechanically** by means of the conceptions of extension, divisibility, and mobility. He was the first of the moderns to attempt to give a mechanical theory of the evolution of the world, teaching that purely mechanical explanation in terms of matter and motion must apply not only to the planetary movements and to all the realm of inorganic matter, but also to the processes of organic bodies. He wrote :

"All the functions of the body follow naturally from the sole disposition of its organs, just in the same way that the movements of a clock or other self-acting machine or automaton follow from the arrangement of its weights and wheels. So that there is no reason on account of its functions to conceive that there exists in the body any soul, whether vegetative or sensitive, or any principle of movement other than the blood and its animal spirits agitated by the heat of the fire which burns continually in the heart, and which does not differ in nature from any of the other fires which are met with in inanimate bodies."

He distinguished mind and body as two substances separate and incompatible. They have different properties, and each has its own specific characters or marks. The essence of the body, he says, is "extension"; and the essence of mind is "thought." These two substances are known in different ways. They form the subject-matter of different scientific interests. They are investigated by different methods. The method of the physical sciences is mathematics; the method of psychology, the science of mind, on the contrary, is introspection, inner observation of the events of consciousness. This second position is summed up in the famous Cartesian saying : "I think, therefore I am."

"Doubt" is, with Descartes, the starting-point of all thought, the solvent which must be brought to bear on all inherited beliefs and opinions bequeathed by education and authority. He found it possible to doubt the presentation of his senses, the contents of his memory, and even the demonstration of mathematics. He could doubt all things—except his thinking, *i.e.*, self-consciousness.

He argued that the reasoning soul "can by no means be deduced from the power of matter, but must be expressly created; it is of a nature wholly independent of the body, and consequently is not liable to die with the latter; and finally, because no other causes are observed capable of destroying it, we are naturally led to judge that it is immortal."

The **soul** was conceived by Descartes as the fixed and immutable something, from which all thoughts, feelings, and acts of volition emanate. It is everywhere in the body, but its principal seat, its precise point of conjunction with the body, is the **pineal gland.** Because of the median position of this structure at the base of the brain, he thought it was the point where the senses, which are all double, form a junction of their impressions. Here the soul, besides its own processes of pure understanding, imagines and perceives; the medium of its sensations being nerves running from its seat in the brain to every part of the body. The movements propagated from the peripheral extremities to the central spot excite different sensations, differing partly as the nerves are different, partly as the motion in the same nerve is of a different kind. The varying state of the blood affects the nerves with different kinds of motion; if it be pure and well-tempered, it quickens their sensibility and gives them an action which excites natural joy in the soul; if it be gross and sluggish, a heavier movement ensues which carries a feeling of depression to the soul. Whenever, from any other cause than the state of the blood, these different movements are imparted, the corresponding feeling will occur.

The molecular changes which take place in the brain and are propagated along the motor nerves to the muscles Descartes described as "**animal spirits,**" and in similar manner "animal spirits" were thought by him to convey sensation along sensory nerves to the brain, where we should now speak of molecular changes conducted along them. For Descartes the animal spirits were purely material, consisting of the finest particles contained in the blood, which are filtered from the arteries through minute pores into the central cavity or ventricle of the brain. From this ventricle they pass into the nerves, and thence into the muscles. He said:

"This small gland (the pineal body), which is the principal seat of the soul, is suspended between the cavities containing these spirits in such a manner that it can be moved by them in as many different ways as there are sensible differences in objects; and at the same time, it can be moved in divers ways by the soul, which is of such a nature that it receives as many different impressions within itself, or in other words, has as many different perceptions as there are different movements of the gland; and conversely, the bodily machine being moved in divers ways by the soul or by any other cause, it impels the surrounding spirits towards the pores of the brain, through which they are conducted by the nerves into the muscles, by means of which the soul causes them to move our limbs."

Descartes starts with the two principles, that the sole function of mind is thought, and that **thoughts are of two kinds,** "actions of the soul" which are our desires, and "passions," which are "kinds of perception or forms of knowledge which are found in us." The perceptions "found in us" are again of two kinds, the one kind being merely the perception of our desires, the second kind having the body, not the soul, as their cause. Among the latter, three kinds must be distinguished: (1) perceptions which relate to objects without us, *i.e.*, sensations; (2) perceptions which relate to our own body, such as "hunger, thirst, and other natural appetites"; (3) perceptions which relate to our soul itself, such as "the feelings of joy, anger, and other such sensations."

According to Descartes ("Des Passions de l'Âme," 1649), the various faculties of the soul depend on the relation in which the latter stands to the body. The **passions** are in this way the effect of the influence of the body on the soul, whereas the "internal emotions" are derived directly from the thoughts and judgments of the

soul. He endeavoured further to reduce the various feelings to a few elementary forms. The account given of the passions is in the main physiological, that is, in terms of movements of the animal spirits. He distinguished six primary emotions: wonder, love, hatred, desire, joy, and sadness; of which all the other emotions—and he described about forty—are modifications and combinations.

"The ultimate, immediate cause of the passions is merely the disturbance by which the animal spirits set the small gland, which is in the middle of the brain, in motion. It is therefore an error to place the seat of the passions in the heart. No doubt the passions cause some disturbance to be felt in the heart, but this is *through the medium of a small nerve which descends from the brain to the heart.*" Passion depends so much on the machinery of the organism, that a slight modification in the construction of the machine is enough to transform a passion. "The same impression made on the gland by a terrifying object may arouse fear in some men, and excite courage and boldness in others; the reason of which is that all brains are not made alike, and that a movement of the gland which excites fear in some, will in others cause the spirits to penetrate into the pores of the brain, whence they descend, some into the nerves through which move our hands in defence, and some into those which stir the blood and drive it to the heart in the way required for the production of the spirits necessary to the continuance of this defence, and for the sustenance of the will."

Whatever we may think of the explanation of the passions, Descartes certainly had correct notions of the treatment of the passions, which was almost identical with our modern practice of suggestion, auto-suggestion, and mental discipline. To him, **the human body is an automatic machine** in which everything is explained by extension and the laws of motion. To this machine a soul is joined, and what was mechanical action in the body becomes passion in the soul. The passions are merely the internal movements reflected in the soul. It is within the sphere of medical science, he said, to regulate these movements, to regulate the course of our animal spirits and to change their composition, and thus make us masters of our passions. By means of a system of hygiene and remedies properly proportioned, we should thus be able to pre-arrange and fix accurately the degrees of sadness, of joy or love. But if medical science fails to formulate such therapy, we are not obliged to remain slaves to our bodies; we can still recover possession of ourselves by a sort of **moral hygiene,** *i.e.*, by calling up such and such a thought and dwelling on it, and thus, firstly, suspend the action which would ensue from the passion; secondly, alter the motion of the small gland which is the seat of the soul and give a new direction to the animal spirits contrary to the passion; and, thirdly, without altering the action of the gland, we may through habit associate with the bodily action thoughts, and dwell on them while the impulse to the action lasts. Through habit, therefore, we are able to bring up certain thoughts and change the natural order of the passions.

For the "image" theory of **sense perception,** Descartes substituted a mathematical conception finding the sense-stimulus in "vibratory" rays or undulations (light, air, etc.) expressed in mathematical formulas. These produce effects in the organism which are in no sense like the object perceived, but are symbols or signs of external objects. Heat and cold are sensations of the mind, and not the properties of matter.

Except for the term "animal spirits," Descartes described correctly the physical **theory of memory**: that when a sensation has once passed to the appropriate part of the brain—by a single passage of the animal spirits—the passage is made easier in the same direction for any subsequent flow, and that the repetition of this action makes it easier still, until at length the passage becomes so easy that almost anything, especially an associated flow which may be set going, recalls the impression made by a former sensory act.

Descartes explained that certain sensations can arouse movements which do not depend on the mind at all, which are performed without the mind thinking about them—without the intervention of consciousness—as when in falling from a height we throw forward our hands, or as when a person whose eye is about to be hit starts winking. He thought the animal spirits were thus "reflected," and WILLIS, the famous Oxford professor, quoted Descartes in 1672 in *De Anima Brutorum*, and called this action a **reflex action**, the significance of which is appreciated only to-day.

Descartes held that consciousness and thought are man's exclusive prerogative, and that he alone is blessed with an immortal soul. The spirit being limited, in his estimation, to the higher mental activities, *i.e.*, the intellect, those psychic manifestations which could not be included therein came to be relegated to the level of matter, so that **the lower animals** became, for Descartes, mere **complex machines or automata.** He recognised in the lower animals the existence of all the affections of mind except "thought" or "reason." He ascribed to them the attributes of the corporeal soul—the mental emotions of fear, anger, as well as all the sensations of pleasure and pain; and it is evident, from certain passages in his published correspondence, that what he meant by "thought" was really abstract ideas and the expression and communication of them. This, he said, is never wanting even in the lowest of men, and is never present even in the highest of animals.

Although Descartes had not intended to withhold from animals "feeling," *i.e.*, the power of sensibility, but only that of self-consciousness, his followers took his view of animals as being merely "automata"—in whose nature our own conscious processes operate by a clock-like mechanism—literally, and with logical strictness used it as an excuse for cruelties to dumb animals, because, as they said, they only had sham feelings. Ever since most psychologists have entirely neglected the mental life of animals and restricted psychological research to man.

Man, according to Descartes, is born with ready-formed ideas on God, the world, and other cosmological and ontological concepts which could never be acquired by experience. The idea of God must be true, since no object save God could cause an idea of the infinite and perfect. Further, God is the guarantee of the validity of the clear and distinct ideas generally, since we cannot suppose he would deceive us. Thus the certainty of the object of knowledge rests upon the certainty of the existence of God.

The valuable reasonings of Descartes lost much of their effect because of his fear of the opinion of the Jesuits, then very powerful in France. They had educated him and he was most desirous of keeping on good terms with them, so that he dared not express his real convictions. Indeed, his works were repeatedly condemned by theologians, and though he had argued for the existence of the deity in his works, he was accused in Holland of atheism, and the Synod of Amsterdam upheld the right of the civil power to crush the heretic. His works were placed on the Roman Index. Finally, when he heard of the condemnation of Galileo, he so feared the Inquisition that he stopped writing altogether in 1633.

Descartes occupies, not only as a philosopher, but also as a mathematician and physicist, a place of conspicuous importance. His principal merit in mathematics is that he founded analytical geometry, and as a physicist his merits are based on contributions to the doctrine of the refractions of light, the explanation of the rainbow, and the determination of the weight of the air.

J. B. LE BOSSUET (1627-1704),

the theologian and historian, held that **passion** is a movement of the soul which

being affected by the pleasure or pain which it either experiences or imagines in an object, pursues or avoids that object.

" If we consider the passions as being merely in the body, they would seem to be nothing else than an unusual disturbance of the animal spirits on the occasion of certain objects, which are to be pursued or avoided. Thus it must be that the passions are caused by the impression made and the motion excited in the brain by an object possessing great force. The co-operation of the soul and body in the passions is evident, but it is clear that the good or bad inclination must have its commencement in the body. In the passions the soul is passive, it does not rule over the dispositions of the body, but subserves them."

He placed the principal passions under two categories : those whose object is regarded simply as being present or absent and which, taken together, constitute the *concupiscent* appetite ; and those whose object is considered as being hard to attain or to avoid, and which constitute the *irascible* appetite. To the first category belong love, hate, desire, aversion, joy, sadness ; to the second, courage, fear, hope, despair, anger. There are a great many secondary passions : shame, envy, emulation, admiration, etc., but these are all connected with one or more of the principal passions. One may even say that all the passions depend on love alone, that all are comprised in or excited by love.

" The love we feel for one object comes from our love for another. Desire is nothing else than love extending to an object not possessed, as joy is love of the object possessed. Courage is a kind of love that undertakes the most difficult things in order to possess the loved object, and fear is a kind of love that, in finding itself threatened with the loss of that which it seeks, is disturbed by the danger. Take away love and there will be no passions, and, on the other hand, where love is, there all the passions are found."

NICHOLAS MALEBRANCHE (1638-1715),

a devout Catholic, held that the **soul** cannot know " things themselves " ; they are only the " occasion " of the rise of ideas in the mind. The true cause of all ideas is God, in whose presence and action the world is perceived. Even the ideas of the perfect and infinite cannot be innate to the soul, for it is finite and imperfect. These ideas—that of God himself—are divinely aroused in the mind on the occasion of the contemplation of the world with attention. Hence the saying of Malebranche : " We see all things in God." Actions, moreover, acts of will, are volitions of God, since our desire is only their occasional, not their original, cause. The active life, like the intellectual, is lived in God.

In one important point Malebranche was a dualist, not an absolute idealist : he held that the knowledge of the soul through self-consciousness was more superficial than that of the body. We have a profound knowledge, in his view, of space and its properties—the essence of matter ; but we know only particular states of mind, not general and universal truths.

Malebranche followed Descartes and Spinoza in making the **passions** depend on the body, but considered, on the other hand, the existence of pure emotion higher than those bodily passions, an intellectual love, the love of God. Without a disturbance of the animal spirits and of the blood there is no passion, but often the movement is preceded, and the way prepared for it, by purely spiritual phenomena. Intellectual pleasure is stable, free from remorse, as immutable as the truth which causes it ; but sensuous pleasure is nearly always accompanied by sadness of mind, or remorse of conscience. All the passions have two very remarkable effects : they cause us to apply our mind and they engage our hearts. So far as they cause us

to apply the mind, the passions may be very useful in the acquirement of knowledge; but so far as they engage our hearts, they have always a bad effect, because they only possess the heart by corrupting the reason.

The understanding receives its directions from the will, and the mind must have inclinations, just as bodies have motions. All natural inclinations are directed towards "good in general," and some towards particular goods. "The number of the passions is not to be multiplied according to the number of objects, which are innumerable, but according to the principal relations that can exist between them and us." He classified three principal inclinations or affections. The first group is of the inclinations included in, or derived from, the inclination towards "good in general." In this group is classified *curiosity* or the inclination towards novelty—that uneasiness of the will which makes us seek all that is new in the hope of finding the desired satisfaction—that vain striving of humanity to satisfy an inclination, which the circumstances in which man is placed make it impossible to satisfy. The second group comprises the inclinations towards particular goods which are related to our own preservation and welfare, *i.e.*, *self-love* (including the love of greatness and of pleasure, the love of being and well-being) and love of our own preservation; for God has attached pleasure to certain objects, which man ought to seek, and pain to other objects, which he ought to avoid, in the interests of self-preservation. Men desire not only to possess learning or riches, but also to have the reputation of possessing them, which "produce in the imagination of those around us, or those with whom we come into closest contact, a disposition very advantageous to us." Our third natural affection is that which we feel for those with whom we live, and for all the objects surrounding us: *social attachment*. We rejoice in the joy of others, we suffer by the evils that befall them. "Upon the sense of some surprising evil" a man raises a cry "forced out involuntarily by the disposition of the machine." This cry falls on the ears of others, "it pierces them and makes them understand it," and it stirs with emotion all those who hear it, and makes them involuntarily rush to give help.

The "mother passions" are love and hate. These produce the "general passions"; desire, joy, and sorrow. All the other emotions are made up of these, more or less compounded and modified by circumstances, with the exception of admiration and the secondary emotions developed from it. Admiration is called an "imperfect passion," because it is not excited by either the idea or the sense of good, but only by the novel. The derived emotions are esteem, veneration, contempt, and disdain, according as the admired thing appears great or small; pride, haughtiness, valour, humility, timidity, and so on, when the object is ourselves or our own qualities.

Though natural inclinations and passions are common to all men, yet they vary in strength in different individuals. There is also a variety in the objects to which emotions attach themselves in different individuals. In particular passions there is an infinite variety, according to the relations that different objects may have to different individuals.

All the passions have their own appropriate signs, and this is true also of wonder and admiration. In this manner Malebranche associated with the phenomena of "self-feeling" the phenomena of **contagion of the imagination**, that is, the phenomena which we classify under the heads of imitation and suggestibility.

The contagion of the imagination is best seen in children with respect to their parents, in servants with respect to their masters and mistresses, or in courtiers with respect to their princes and kings, and it is shown generally in all inferiors with respect to their superiors. Suggestion may also arise from other circumstances, in addition to the prestige of the source, as, for example, in the manner in which, or in the degree with which, any statement is made. Another factor is "public opinion." We esteem and love what is esteemed and loved in the world.

Malebranche investigated vision, sense-illusion, and colour-perception, with notable results.

He showed that the distance of an object is judged according as the intensity of the light and sharpness of the image increases or diminishes ; he spoke of the changes in the angle of the visual axes, and mentioned the circumstance that in monocular vision a suspended ring, if approached with a stick from the side, can only with difficulty be found ; he took into account the accommodation of the eye, and was concerned to show that the idea of space arises from a co-operation of sight and touch sensation. In a memoir of the year 1669 he discussed the processes of colour perception, and concluded "que les diverses couleurs ne consistent que dans la différénte promptitude des vibrations de pressions de la matière subtile."

BARUCH DE SPINOZA (1632-1677)

Spinoza, the Jewish philosopher, was born at Amsterdam. In his chief work, which appeared shortly after his premature death, the world—the universe, the cosmos—is identical with the all-pervading notion of God. God is the only, the one substance ; but being infinite, God must have an infinity of attributes. Nothing conceivable can be denied of him. Of this infinity of attributes, we are able to know only two : thought and extension, mind and matter, but the "infinity less two attributes" must have equal reality. Mind and body, therefore, are equally independent of each other and of all the other attributes, but they are also equally dependent upon the one infinite substance : God. Each thing is at once mind and body, representation and that which is represented, idea and object. Body and soul are the same being, only considered under different attributes. The soul cannot be localised (*Ethica*, p. iv). The human mind is the idea of the human body ; it cognises itself in perceiving the affections of its body ; it represents all that takes place in the body, though not all adequately. Between the mind and the body there is an exact parallelism, a real pre-established harmony. The decisions of the mind and the impulses of the body are not only simultaneous facts, but are one and the same thing, though they appear to us under different aspects, according as we consider them from the standpoint of the mind or that of extension. As man's body is composed of very many bodies, so his soul is composed of very many ideas. To judge of the relation of the human mind to the mind of lower beings, we must consider the superiority of man's body to other bodies ; the more complex a body is, and the greater the variety of the affections of which it is capable, the better and more adapted for adequate cognition is the accompanying mind. **The emotions and passions perish with the body, but the human mind** (*i.e.*, not including the emotions) **cannot be destroyed with the body.** There remains something which is eternal.

Although Spinoza held that every passion corresponds to a state of the body, yet, like Descartes, he recognises the existence of a higher emotion, which corresponds to the mind's own special activity. The soul, inasmuch as it possesses adequate ideas, tends to persevere in its own being. In this case, desire is pure action, in which sadness has no place. The adequate idea is the highest degree of our active power ; and *sadness* being that which diminishes or hinders the mind's power of thought, no affection of sadness can reach the mind, in so far as it is active. There remain now only two primitive emotions—*desire* and *joy*—and of these there are two forms, strength of mind and generosity. *Strength of mind* is the desire by which each person endeavours from the dictates of reason alone to preserve his own being. *Generosity* is a reasoned, virtuous sympathy, which induces us, by means of the dictates of reason alone, to endeavour to assist other men, and bind them to ourselves in friendship.

Desire and joy spring from the activity of the soul. When the soul reaches a greater perfection or reality, it feels joy ; when it reaches a lesser perfection, sadness. We can eliminate sadness through the vision of things under the form of eternity, by living in God, and finding in the intellectual love of him happiness and virtue, which are identical. Spinoza proved that *from joy, sadness, and desire, all the other passions can be derived* by three processes, the effects of the association of

ideas, effects of imagination, and effects of sympathy. In this way he accounted for commiseration, emulation, benevolence, and envy.

Since all that furthers or diminishes the being of the object of our love exercises at the same time a like influence on us, we *love* that which rejoices the object of our love and hate that which disturbs it; its happiness and suffering become ours also. The converse is true of the object of our *hate*: its good fortune provokes us and its ill fortune pleases us. If we are filled with no emotion toward things like ourselves, we sympathise in their sad or joyous feelings by involuntary imitation. *Pity*, from which we strive to free ourselves as from every painful affection, inclines us to benevolence or to assistance in the removal of the cause of the misery of others. *Envy* of those who are fortunate, and *commiseration* of those who are in trouble, are alike rooted in emulation. Man is by nature inclined to envy and malevolence. Hate easily leads to under-estimation, love to over-estimation, of the object, and self-love to pride or self-satisfaction, which are much more frequently met with than unfeigned humility. Immoderate desire for honour is termed *ambition*; if the desire to please others is kept within due bounds it is praised as *courtesy*, modesty. *Hope* and *fear*, inconstant pleasure and pain, arise from the idea of something past or to come, concerning whose coming and whose issue we are still in doubt. There is no hope unmingled with fear, and no fear without hope; for he who still doubts imagines something which excludes the existence of that which is expected. If the cause of doubt is removed, hope is transformed into a feeling of confidence and fear into despair. There are as many kinds of emotions as there are classes among their objects or causes.

Besides the emotions to be termed "passions" in the strict sense, states of passivity, Spinoza recognised others as active states. Only those which are of the nature of pleasure or desire belong to the class of *active* emotions; the painful affections are entirely excluded, since without exception they diminish or arrest the mind's power to think. The totality of these nobler impulses is called *fortitude*, and a distinction is made among them between *animositas* (vigour of soul) and *generositas* (magnanimity, noble-mindedness), according as rational desire is directed to the preservation of our own being or to the aid of our fellowmen. Presence of mind and temperance are examples of the former, modesty and clemency of the latter. Vice is as truly an outcome of nature as virtue. Virtue is power, vice is weakness; the former is knowledge, the latter ignorance.

Spinoza's great contemporary, HOBBES, had taught that the fundamental impulse of human nature is the **will for power**; and Spinoza accepted the idea, but parted company with the English philosopher in his theory of what it meant. In his view it is an utter illusion to suppose that to gratify such passions as pride, avarice, and lust is to acquire or exercise power. For strength means freedom, self-determination; and no man can be free whose happiness depends on fortuitous combination of external circumstances, or on the consent of other persons whose desires are such as to set up a conflict between his gratification and theirs. Real power means self-realisation, the exercise of that faculty which is most purely human—that is to say, of thought under the form of reason.

Spinoza understood by **will** "the faculty of affirming and denying," not the **desire** "by which the mind takes a liking or an aversion to anything." "There is in the mind no volition . . . except that which the idea, in so far as it is an idea, involves." "Will and intellect are one and the same thing." **He denied the freedom of the will** in the common acceptation of the term. Men think they are free because they are not conscious of determining causes. Man is free when he intelligently strives to fulfil the inner necessity of his being. Here reason is our guide. To know our limits is to transcend them. **If we know our passions, they can be transformed into instruments for our self-realisation.** That is of real usefulness which first contributes to the highest perfection of the individual, and through him to society. Nothing is useful but that which serves knowledge. Knowledge is our true being, and the highest knowledge is the knowledge of God. We are free as we partake of the nature of God.

Spinoza protested strongly and daringly against philosophy being held in chains by theologians. His celebrated *Tractatus Theologico-Politicus* (1670) had for its primary purposes **the vindication of the freedom of scientific thought** from ecclesiastical interference. And this he did by drawing a definite line of demarcation between the respective offices of religion and of philosophy. The business of the one is to form the character and to purify the heart ; of the other, to guide and inform the intellect. When religion undertakes to teach scientific truths the very ends for which it exists are defeated. When theological dogmatism gains control of the Churches the worst passions are developed under its influence. The claims of theology to dictate our intellectual beliefs are not only mischievous, but totally invalid. They rest on the authority of the Bible as a revelation of God's will. But no such supernatural revelation ever was or could be given. Such violation of the order of nature as the miracles recorded in Scripture history would be impossible.

With such views, it is not surprising that Spinoza was anathematised and excommunicated.

FRENCH PHILOSOPHY OF THE XVIIIth CENTURY

JULES DE LA METTRIE (1709-1751),

a wit, philosopher, and friend of Frederick the Great, was **the founder of French materialism,** which he traced, however, to Descartes, and maintained that the wily philosopher, purely for the sake of the priests, had patched on to his theory a soul, which was in reality quite superfluous.

He took the step from sensationalism to materialism, for he taught the corporeality of the senses and called thought a necessary consequence of matter. To Descartes man alone was endowed with consciousness, while the lower animals were practically machines or automata. It was a short step from this to consider **man himself an automaton,** deprived of all spontaneous mental energy, a theory to which Mettrie, in his works *Historie Naturelle de l'Âme*, 1745, and *L'Homme Machine*, 1748, gives expression. The hypothesis of a soul distinct from matter, having its seat either in a particular point or in some particular part of the body, is inadmissible. The errors of the metaphysicians arose out of their *a priori* methods ; for the complicated machine, which is man, can only be known *a posteriori* through the senses and by experience.

All ideas come from without, from the senses ; without sense impressions, no ideas; without education, few ideas ; and since **the soul is entirely dependent on the bodily organs,** along with which it originates, grows, and declines, it is subject to mortality. Not only animals but men, who differ from the brutes only in degree, are mere machines ; by the soul we mean that part of the body which thinks, and the brain has fine muscles for thinking, as the leg has coarse ones for walking. If man is nothing but body, there is no other pleasure than that of the body ; only that sensuous pleasure is brief, while intellectual pleasure is lasting. Enjoy the moment, till the farce of life is ended ! Virtue exists only in society which restrains from evil by its laws, and incites to good by rousing the love of honour. **The good man, who subordinates his own welfare to that of society, acts under the same necessity as the evil-doer** ; repentance and pangs of conscience, which increase the amount of pain in the world, but are incapable of effecting amendment, are useless and reprehensible : the criminal is an ill man, and must not be more harshly punished than the safety of society requires.

La Mettrie investigated the effect of environment, of food and education, on the temperament, and the effect of temperament on moral conduct. Man is a material machine, the soul is merely the principle of motion, a spring in the machine.

"Thought is so far from being incompatible with matter, that it would seem to be a property of matter, like electricity, mobility, impenetrability, and extension. In a word, man is a machine, and in the whole of the universe there is only the one substance, which is modified in divers ways."

The theory of psychological automatism had many followers, and has reappeared in Germany and elsewhere in the middle of the XIXth century in a more modern form.

FRANÇOIS VOLTAIRE (1694-1778),

the famous poet, historian, and philosopher, rejected both materialism and spiritualism. The former affirms more than it knows; for how can it say that everything is matter while it does not know what the essence of matter is? On the other hand, spiritualism, in order to explain phenomena that have no parallel in the material world—thoughts, feelings, memory, etc.—imagines a special principle, spiritual, distinct from the body and situated within it, which it calls the soul, thus giving substance to a mere abstraction. "A tulip or a rose is produced by an incomprehensible mechanism, and yet we suppose no soul in them. Nor do we suppose any in insects, which live and die. In animals we admit instinct, but we do not at all know what it is. And when we suppose a soul in man, do we understand ourselves any better?" We cannot account for the functions of the soul till we see their connection with organic functions. Yet Voltaire was no atheist. He was a theist.

The whole of nature bears witness to Him who created it. "When we behold a fine machine, we say that there is a good machinist, and that he has an excellent understanding. The world is assuredly an admirable machine; therefore there is in the world an admirable intelligence, wherever it may be." Philosophy does indeed show us—says Voltaire—that **there is a God,** but his attributes and his essence we are unfit to understand. Let us, therefore, abstain from attributing our own qualities to God and making him in our own image. Neither human justice, nor human kindness, nor human wisdom can be his. It is useless to stretch these *ad infinitum;* they will never be aught but human qualities whose boundaries have been extended. God may have created spirit and matter without himself being either matter or spirit. Voltaire wished for a **natural religion free from dogma, which would include not only Christians, but all mankind.** Religious dogmas could not exist but for man's foolishness and credulity, and theological quarrels were the most dreadful plague in the world. The universality of natural religion is a token of truth. All dogmas are different from another, while morality is the same among all men. Jesus himself was a theist; but to-day we have not the pure religion of Christ, but Catholicism, with its dogmas, mysteries, symbols, articles of faith, relics of saints, sacred books, writings of Fathers of the Church, decisions of church councils, bulls of the Popes. **The only gospel we should read is the great book of nature,** written by the hand of God and stamped with his seal. **The only religion one should profess consists in worshipping God and being a righteous man.** Just as the world is conceived to be an immense machine, built by the Supreme Maker, so Voltaire looked upon the whole body of beliefs as a work made with set purpose by law-givers and priests. **A religion is necessary for the people.** "Atheism and fanaticism are two monsters which may tear society to pieces." A retributive and avenging God is also a necessity, for in all countries the lower classes—the brutal, the ignorant, and the vulgar—need to be strongly curbed.

Philosophers, though they are called unbelievers, have in all times been the most upright men in the world. **Those who must have recourse to religion in order to behave righteously are much to be pitied.** The basis of morality cannot lie in philosophical reflection, which is accessible only to a small number of thinkers. **Morality**

lies in the very essence of human nature. " Do thou unto others as thou wouldst have them do unto thee." This law cannot be wrested from the human heart. It is the foundation of morality and of all society at all times. Altruism is just as innate in human nature as self-love. **Moral good and evil in all countries are what is beneficial or hurtful to society**; in all places and times he who makes the greatest sacrifices to the public is called the most virtuous. There is no absolute good or evil.

Such moral philosophy could but end in cosmopolitanism, and, indeed, patriotism is described by Voltaire as in most cases an artificial, selfish, and hurtful thing. He left to the heroes of Plutarch their conception of patriotism, and wished that the age of reason would unite all separate countries into one great *patrie* of humanity.

ÉTIENNE DE CONDILLAC (1715-1780),

French Abbé, author of *Essai sur l'Origine des Connaissances Humaines* (1746), transferred the sensationalist theory to France in another work of his, *Traité des Sensations* (1754).

Condillac studied the human mind not as a metaphysician, but as a psychologist and a logician; not in order to discover the nature of it, but to understand its operations. He denied the existence of Locke's inner sense. Locke had held that all our knowledge springs from experience, but he had assumed two sources of this empirical knowledge—sensation and reflection, or external and internal sense—but Condillac contended for the reduction of the two to one. He abolished reflection and retained only sensation. **Sensations alone, accompanied by feeling, reproduced as ideas, and dominated by association, account for the entire mental life.** What is called reflection is to him sensation and nothing more. All mental processes, even will and the association of ideas, are in his eyes only modified sensations. Memory, comparison, judgment, abstraction and reflection are nothing but different forms of attention; similarly the emotions, the appetites, and the will, are nothing but modifications of desire; while both alike take their origin in sensation. Sensation is the sole source and the sole content of the life of the mind as a whole. On his theory it is difficult to see how man differs from the lower animals, many of whom have senses quite as acute as his.

Being accustomed to ascribe all the sensations of the sense of touch to external objects, says Condillac, we fall into like habits with our other senses. Thus our sensations become objective; they appear as qualities of bodies around us. They have become ideas. Let us now suppose a sensation more vivid than others to force itself upon our consciousness so powerfully as to throw all others, at least temporarily, into the shade; this exclusive sensation will be what we call attention. But attention may just as well be directed to a past sensation, which recurs again to the mind. Memory is therefore nothing but a transformed sensation. Once given a twofold kind of attention and there results comparison. Now, we cannot compare two sensations without perceiving some difference or resemblance between them. To perceive such relations is to perform an act of judgment. Thus does sensation as it undergoes transformation become successively attention, memory, comparison, and judgment. Condillac lays it down as a principle that there are no neutral sensations, but that each of them gives us either pleasure or pain, and makes us inclined to continue or to escape it. Were it not for this property of our sensations, intellectual activity would not be aroused—attention, memory, and therefore understanding would be left undeveloped. The famous dictum of Condillac—*penser est sentir*, to think is to feel—was meant to emphasise the idea that it is impossible to say where sensation ends and thought begins; in other words, that feeling and thought are always interdependent.

We can distinguish two "selves" in every man: the self of habit and the self of reflection. If we suppress in a grown-up man the self of reflection, the self of habit

which remains suffices for such needs as are absolutely necessary for the preservation of the animal. **Instinct is nothing but habit minus reflection.** But, Condillac added immediately afterwards, it is by reflecting that beasts acquire instinct. As they have but few wants, a time soon comes when they have done all that reflection can teach them. They daily repeat the same actions, and their habits become automatic. **Instinct is not innate and hereditary, for it is subject to improvement, and whatever is subject to improvement is acquired.**

The evolution of thought is coincident with that of speech, and it is the gift of language, by which man is able to associate and combine ideas, that distinguishes him from the brute.

The sum of our reflections over and above our habits constitutes our reason. But language is necessary for the development of reason. Were our thought limited to the representation of individual and concrete objects, and unable to form abstract and general ideas, it would remain for ever in a rudimentary state. **But for words, there would be no abstract ideas.** Whenever a man thinks, even though he should not express his thought outwardly, he speaks. This has been called "inward language." Consequently, "the art of reasoning is equivalent to the art of speaking."

This theory of the interdependence of thought and language constitutes Condillac's chief merit. We need only mention besides, that he considered all inclinations, good and bad alike, to spring from self-love.

DENIS DIDEROT (1713-1784)

was Condillac's most distinguished pupil. He (with D'Alembert) was the author of the famous "Encyclopædia" (1751-1772) in twenty-eight volumes, which formed one of the most important events in the history of human knowledge. All the leading ideas in the revolt against the Church had a place in Diderot's great work, in which a number of leading thinkers collaborated with him. Diderot was deeply impressed with the function of the nervous system in psychology, and dogmatically declared **against freedom of the will and immortality.** ("Interpretation de la Nature," 1754.)

Diderot suggested in 1749, with Rousseau, raised printing types for the blind; and the idea was carried out in 1785 by VALENTINE HAUY (1745-1822), the founder of the first French institute for the blind. The first school for deaf-mutes was founded in Paris in 1755 by the ABBÉ DE L'EPEÉ (1712-1789).

BARON D'HOLBACH (1723-1789)

was a friend of Diderot, and a confessed materialist. His work, *La Système de la Nature*, 1770, was regarded as **the atheists' Bible.** Religion divides men instead of uniting them. The senseless doctrine of freedom was invented only to solve the senseless problem of the justification of God in view of the existence of evil. **Man is at every moment of his life a passive instrument in the hands of necessity; the universe is an immeasurable and uninterrupted chain of actions and reactions.** The most fatal error is the idea of human and divine spirits, which has been advanced by philosophers and adopted with applause by fools. The word "spirit" has no meaning. The savages admit the existence of "spirits" to explain effects for which they cannot account and which seem to them marvellous. Such an idea of spirit is preserved only by ignorance and sloth. The immortality of the soul is a religious dogma which never was of any use except to priests, and is not even a check upon the passions if they are at all violent, as experience sufficiently proves.

D'Holbach subjected deism and theism to a searching criticism, obviously directed against Voltaire's natural religion. The deists' God is useless, the theists' God is full of contradictions. If we nevertheless accept him, we have no right to reject anything in the name of reason, and we are inconsistent if we refuse to go further and decline to submit to religious dogma. Theism is liable to as many heresies and schisms as religion, and is, from a logical point of view, even more untenable. So there will always be but a step "from theism to superstition." The least derangement in the machine, a slight ailment, some unforeseen affliction, is sufficient to disturb the humours, and nothing more is required. Natural religion is only a variety of the other kind of religion, and speedily comes back to the original type. It was fear and ignorance of causes that first suggested to man the idea of his gods. He made them rude and fierce, then civilised like himself; and nothing but science can cause this instinctive theology to disappear.

Nature is an active, self-moving, living whole, an endless chain of causes and effects. As man has doubled himself, so also has he doubled nature. Evil gave the first impulse to the formation of the idea of God; pain and ignorance have been the parents of superstition; our sufferings were ascribed to unknown powers, of which we were in fear, but which, at the same time, we hoped to propitiate by prayer and sacrifice. If we seek to give the word God a tenable meaning, it signifies active nature. Matter and motion are alike eternal.

D'Holbach defined man as a material being, organised so as to feel, think, and be modified in certain ways peculiar to himself—that is, to the particular combinations of substances of which he is composed. The intellectual faculties may be reduced to changes produced in the brain. We directly perceive only external movements, while the inner motions of invisible molecules are known only by their effects and have been wrongly ascribed to the mind. **In dividing himself into body and soul, man has in reality only distinguished between his brain and himself.** Man is a purely physical being. **All so-called spiritual phenomena are functions of the brain.** Thought and volition are sensations; sensation is motion. The moving forces in the moral world are the same as those in the physical world; in the latter they are called attraction and repulsion; in the former, love and hate.

All human actions proceed from interest. Good and bad men are distinguished only by their organisations, and by the ideas they form concerning happiness. Repentance is only the regret for evil consequences, but neither responsibility nor punishment is abolished, for we have a right to protect ourselves. Virtue is the art of making ourselves happy through the happiness of others. **Nature herself chastises immorality,** since she makes the intemperate unhappy. Religion has hindered the recognition of these rules. The true moralist will cure the mind through the body, control the passions and hold them in check by other passions instead of by sermons, and will teach men that the surest road to personal ends is to labour for the public good.

CLAUDE ADRIEN HELVETIUS (1715-1771)

published in 1758 a book entitled *De l'Ésprit*, which aroused the antagonism of the Catholic clergy and made him lose his position at Court. **He declared the satisfaction of self-interest to be the basis of morality.** Virtuous is he whose strongest passion agrees with common interest. Thus Helvetius represented us as enslaved by things which surround us.

In a later work *De l'Homme, de ses Facultés intellectuelles et de son Éducation*, published after his death, in 1772, he gave currency to the notion that men are born not only without character, but also absolutely indifferent to all character, without any tendency or disposition of any kind whatever. We all come into the world formed and disposed alike, and are purely the creatures of the circumstances in

which we are placed; in other words, **education can do everything.** To ensure the happiness of mankind, it will only be necessary to bring the art of education to perfection. Education will make enlightened men, and even men of genius, as numerous as they have hitherto been scarce. All the powers of mind which have adorned but a few of our species might, in spite of anything contained in the original frame and organisation of the individual, have been the lot of every one of the thousands who daily come into and go out of the world, without leaving any other trace behind them than in their progeny.

It is curious that philosophers, though they correctly assumed the soul as immaterial and indivisible, and matter as compound, were ever ready to admit attributes to this spiritual substance, rather than to assume an original diversity of material organisation, to explain the varieties in the character of man. If the attributes are immaterial, how is it that we feel within us so decided a capacity for certain pursuits, and so utter a disability to follow others? How is it that children manifest so great a variety in their original disposition to the various emotions, such as anger, fear, etc.? How can the early display of talents be accounted for? Helvetius explained it in a very simple manner. He told story after story to prove his argument; as, for example, that of a boy who used to be left alone in a room with a big clock, and afterwards became a distinguished mechanic.

Helvetius ignored the capacity of the brain. CHARLES BONNET (1720-1793), the celebrated physiologist and philosopher, recognised this and criticised him for it. He said:

"Rather a bold genius, and one who knows how to manage his subject with as much art as grace, he has thought that he made a very philosophic step in discovering that the horse differs from man only by his hoof. It appeared to him, that, if the feet of the horse, in place of terminating by an inflexible hoof, had ended in supple fingers, he would soon have attained to a level with man. I doubt whether a philosopher, who shall have deeply studied the nature of animals, will applaud the discovery of this ingenious author, whose merit ought not to be confounded with his opinions. He had not considered, that any animal whatever is a particular system, all of whose parts have a mutual harmony among themselves. The brain of the horse corresponds to his hoof, as the horse himself answers to the place which he holds in the organic system. If the hoof of the animal were converted into flexible fingers, he would not be the more capable of generalising his sensations. The hoof would still exist in the brain, that is, the brain would want that admirable organisation, which enables the soul of man to generalise its ideas; and were it ordained that the brain of the horse should undergo a change corresponding to that of his feet, he would no longer be a horse, but another animal which would require a different name."

Helvetius adopted the premises of Hobbes, and rejected all his conclusions. **Self-love** was the only rule he recognised. While to Hobbes the cause of division and hatred was the interest of the individual, Helvetius discovered, in the workings of the laws of interest, the principle of tolerance and of sympathy.

"Men are not wicked, but they are the slaves of their own interests. We must take them as they are. All hatred of them is unjust. Fools bring forth folly as a wilding bears bitter fruit. The humane man is he to whom the sight of another's misfortune is unbearable, and who to escape from this sight is compelled, so to speak, to succour the unfortunate."

In other words, he who acts kindly thinks only of his own relief. To expect men to practise altruism through disinterested goodness is only a dream of the mystics, who refuse to see that self-interest is the only force by which the human machine is worked. Nothing less than the threats of the law are needed for the

prevention through fear of every action contrary to the public good, and if it were not for the honour and esteem by which the public repays services rendered to it, heroism would disappear. But if morality cannot do without the support of the law, the law, on the other hand, must turn to morality for instruction.

Helvetius, while he believed individuals to be bound to follow self-interest, required of the State, not the abolition of property, but **the provision of opportunity for everyone** to acquire it, restriction of the exploitation of labour, reduction of the hours of daily work to seven or eight, and the extension of culture.

GEORGE CABANIS (1757-1808),

in his *Rapports du Physique et du Moral de l'Homme* (1802), insists on the importance of the inner organic sensations, whilst Condillac had confined himself almost exclusively to outward impressions. He was even more materialistic than his contemporaries. According to him, **the brain is to thought what the stomach is to digestion.** As impressions reach the brain they excite it to activity, just as food, when it enters the stomach, stimulates in it secretion of the gastric juice.

"In order to arrive at a correct idea of these operations from which thought arises, we must consider the brain as a particular organ, destined specially to produce it in the same way as the stomach and the intestines are there to perform digestion, the liver to filter the bile, the parotid, the maxillary, and sublingual glands to prepare the salivary juice."

The proper function of the brain is to perceive each particular impression, to attach signs to it, to combine and compare together the different impressions, and to form therefrom judgments and determinations, just as the function of the stomach is to act upon nutritious substances. From this Cabanis derived the notorious formula : "The brain in some sort digests impressions ; it produces an organic secretion of thought."

Being a physician as well as a psychologist, he showed, by the aid of several hundred observations made upon man, both in health and sickness, **the reciprocal action of the body upon the mind and of the mind upon the body** ; as also the influence of age, sex, temperament, diet, climate, on the manifestation of mind and character.

Condillac said everything is acquired, even instinct. Cabanis looked upon instinct as innate, and inferred therefrom that external sensations are not, as Condillac declared, the sole principle of all mental life. Moral ideas and determinations do not depend solely upon sensation, but the impressions resulting from the functions of several internal organs contribute to them more or less, and, in certain cases, appear to be the sole cause of their production. **There is within us a whole system of inclinations** and determinations formed by impressions almost totally unconnected with those of the external world ; and these inclinations necessarily influence our way of considering objects, the direction of our researches concerning them, and our judgment of them. It is not, therefore, the external world alone that shapes the thoughts and desires of the "self" ; it is rather the latter, pre-formed by instinct and by specific dispositions, that builds for itself an external world with the elements of reality that interest it. Likewise, spontaneous activity precedes in us reflective activity. We are first determined to act without being aware of the means we employ, and often without even having conceived a precise idea of the end we desire to attain.

JEAN JACQUES ROUSSEAU (1712-1778),

the Swiss philosopher, formed a strong contrast to the materialism we have just mentioned. He was **an idealist** and **champion of individual freedom.** Let us do away

with all artificial conventions and unnatural restrictions. Let us get back to primitive life. "Back to Nature" is the great thought in all his books. **Civilisation is the great evil, the parent of all vices.** Man, as he comes from the hands of Nature, is good; but the artificiality of Society has spoiled him. Society, with its creation of property and division of labour and separation of classes, has awakened selfish passions and created every crime. Let us have individual, isolated education, so that the true nature may unfold. Let man exercise his bodily functions and preserve in their naturalness and innocence all his primitive instincts. All nature, all that is characteristic, all that is good, has disappeared with advancing culture; the only relief from the universal degeneracy is to be hoped for from a return to nature by the individual and society.

Morals, institutions and beliefs all hurt him, and appeared to him false and different from what they should be. Whence comes it that the immense majority of men are sunk in poverty, in order to maintain in luxury the few who in their turn suffer from having no rule of life and nothing more to desire? Man was created good, vice is acquired. Original man was good, for he lived alone, only joining occasionally his fellow-creatures. Man, having once left the state of nature behind him, had constantly new wants. His intelligence and sensibility developed, the family was constituted, and groups of families were formed, and the idea of property appeared. Property implies the organisation of civil society, of penal justice and the legal recognition of inequality. Henceforth there must be rich men and poor men; and by a prodigious piece of dexterity, those who have possessions have managed to get their wealth insured and protected by those who have none. Soon there will be powerful men, and weak men, and in the end masters and slaves. In the state of nature men were all equal, save for a few physical differences, since they all led the same peaceful and solitary life. In the present state some are starving, while others are wallowing in superfluous wealth, and all become crafty, jealous, and wicked. The long toil of civilisation, which gave us arts, sciences, and industry, also brought upon us diseases, misery, sufferings of all kinds, and especially vices. Society is an assemblage of artificial men, preyed upon by factitious though only too real passions, which did not exist in the primitive state. Therefore, if man's nature is now corrupted, we must not infer therefrom that it has always been so. This corruption is his own work, and is the ransom paid for his release from savagery.

The remedy, if it exists, can be found only in a system of education that would rehabilitate man depraved by the morals and institutions of to-day. But such a system of education implies a whole system of philosophy, for it pre-supposes a thorough knowledge of man's nature, of the laws of his mental development, of his private and public intercourse with his fellow-creatures, of his place in nature, of his future destiny, and, lastly, of the first cause of all things.

Materialism—the philosophy of the Encyclopædists—need only to be stated in order to be refuted, said Rousseau. The heart rejects it, conscience condemns it. Matter is inert. To account for the motion of the universe we therefore need an intelligent motive power. How does this force move matter? I do not know, and the probability is that I shall never know. But am I better acquainted with the soul's way of moving the body? Yet I cannot doubt that it does move it.

I believe that **the world is presided over by a wise and powerful Will**; I see this, or rather, I feel it, and it is the only important thing for me to know. Do not ask me whether the world is eternal or was created, or what are the metaphysical attributes of God. It is sufficient for me to have an unshaken conviction that he exists, that he moves the universe, that he ordains all things, and that he is therefore intelligent, powerful and good. Let philosophers search further; my heart and reason are contented with this. The same inward assent makes us sure that we are free; no other demonstration is needed Indeed, liberty is the most essential characteristic of mankind. **It is not so much man's understanding that specifically**

distinguishes him from other animals as his being a free agent. But from his freedom it follows that the soul must be immortal ; for if we are free, the soul must be immaterial and essentially independent of the necessary laws which rule over matter.

Moral order requires that everyone be treated according to his deserts. Therefore we shall live after death. The union of the soul and body is a forced condition ; when they cease to be united they both resume their natural state. The life of the soul after the decay of the body is assured to me by the fact that in this world the wicked triumph, while the good are oppressed. **All passions are good when we control them, all evil when they control us.**

God has manifested himself to men both in the universe, and within themselves, in their hearts. Natural revelation is enough to make us religious. The Gospel is the most sublime of all books, but still it is a book unknown to more than three-quarters of the world. Do you believe that the wild African is less dear to our common Father than you or I ? The only indisputable revelation is the one that is given universally to all men. And when Rousseau added that **all religions are good, so long as God is fitly served,** and worship is essentially from the heart, he could not but expect both Catholic bishops and Protestant clergymen to excommunicate him.

Every religion claims to be revealed and alone true. All revelation comes down to us by human tradition. To examine it carefully would require an amount of learning which could not possibly be a condition of salvation and acceptance with God. " **I neither accept revelation nor reject it, but I reject the obligation to accept it.**" Rousseau was evidently endowed with the religious sense. " Without faith, no real virtue can exist." Rousseau spoke of it impressively, as a man who practiced it, loved it, and could not live without it.

Like his religion, so his ethics were based on the "inward revelation " which is called conscience, and which dictates to us what we ought to do. If a conflict arises between conscience and our reason, conscience is what we must unhesitatingly follow. **Conscience is the most enlightened of all philosophers, and as safe a guide for the soul as instinct for the body.** It would be sufficient to guide our steps in innocence were we always willing to listen to it.

All our inclinations are legitimate. " Whatever the cause of our existence may be, it has provided for our preservation by giving us feelings suitable to our nature, and it cannot be denied that these at least are innate. The first of these is the love of self ; but we also desire the happiness of others, and when it costs nothing to our own, the latter is increased by it." With these benevolent affections our moral sense is closely connected. " Love of good and hatred of evil are as natural to us as the love of ourselves. The behests of conscience are not judgments but feelings."

His contact with the philosopher HOBBES is interesting. Both agree in the theory of a **social contract** as the foundation of the State. Both would deduce the civil from the natural condition of man. But while Hobbes conceived of man being at enmity and as making a contract for the sake of mutual safety and preservation, according to Rousseau men are not foes by nature, but are naturally drawn to one another for the sake of mutual advantage and development. With Hobbes the contract is based on fear and selfishness, and on the idea that might is right, and the sovereign alone is all-powerful. With Rousseau **the contract unites all in the enjoyment of equal rights and equal duties** ; it is reciprocal, based on brotherhood and love, and the power is lodged in the people themselves. According to Rousseau, the State is a democracy ; according to Hobbes, it is an absolute monarchy.

Rousseau, as we have seen, was, like Voltaire, a deist. *Émile*, his brilliant contribution to the **theory of education,** appeared in 1762. The book was publicly

burned in Paris and an order issued for Rousseau's arrest. He fled to Geneva and Berne, but was ordered to quit each place. In Neufchâtel he was prosecuted by the local clergy, but Frederick the Great gave him protection. He left for England, and after a few months returned to France, where he was left unmolested.

GERMAN PHILOSOPHY

G. W. LEIBNIZ (1646-1716)

took all knowledge for his province. At once a mathematician, a physicist, a historian, a metaphysician, and a diplomatist, he went to the bottom of whatever subject he touched, and enriched all his multifarious studies with new views or with new facts.

He taught that the universe created by God consists of an infinite number of real beings, each different from every other, each containing from the first the potentiality of its whole subsequent history, each indivisible and incapable of being destroyed, save by an act of God. These enduring beings or substances are the **monads,** the elements of which all things are composed. These monads, which Leibniz regarded as the ultimate basis of all existence, are not, like the atoms of Epicurus, physical and extended particles ; but they are rather centres of force and have the powers of self-activity. They are simple substances emanating from God, as from the primordial unity. The soul of each man and of each animal is such a monad ; but **the soul of man is a monad of a higher order than all others,** is not bound to any particular part of the body, and is properly called a mind, because its consciousness is richer and its psychical activities are of a higher order, and it expresses or reflects the world more fully, and knows also God.

The aggregates of monads range from the inorganic, through plants and animals, up to man. The body of man Leibniz regarded as a complex of separate monads, but the soul was a single monad, the substantial centre of man's being. The soul does not receive its impressions immediately from the body ; but, from the beginning of its existence, it contains within itself all the ideas which ought to develop in time and in a determined order. The soul is, in fact, a spiritual automaton. Its operations are not mechanical, but it contains within itself all that is beautiful in mechanism. He said : " I consider that the souls which are destined one day to become human exist in the seed, like those of other species ; that they have existed in our ancestors as far back as Adam—that is, since the beginning of the world—in the forms of organised bodies."

In opposition to the Empiricists, who gave too much importance to the so-called external sensations, Leibniz maintained that our **consciousness** is a spontaneous process, which manifests itself at all times independently of any external stimulus, and is therefore always active, even when, as during sleep, the soul " does not think." In his opinion, our psychic life consists in a complexity or a chain of facts, not all of which appear to us in a clear and distinct manner. Those of which we are clearly conscious he called **apperceptions,** whereas those of which we are only more or less dimly conscious he called **perceptions.** He was also of opinion, in opposition to the Spiritualists and Cartesians, that we possess no inborn ideas ; but he believed in certain innate dispositions or aptitudes of the soul, which, however, are in need of the help of experience to develop themselves. The mind is not a *tabula rasa, a* blank tablet, receiving impressions from outside itself ; it is, on the contrary, the *fons et origo* of all action. The will is the principle by which the flow of presentations in consciousness takes its determined course ; it is the dynamic aspect of mind.

The old-standing antagonism between faith and reason was not, according to

Leibniz, founded in the nature of things, the essence of which is harmony and order; thus arose the celebrated doctrine of the "**pre-established harmony,**" the soul and body being compared to two clocks wound up to keep exact time with each other. *There is a complete series of psychical processes parallel to a complete series of physical processes, and between the two a pre-established harmony.* The laws of the body are those of motion, while the laws of the soul are moral laws. The soul he thought non-material and the prime "entelechy" or realisation of the body; but the body is possessed of a second entelechy, namely, the force of movement.

There is no place for free-will in such a system. Leibniz not only admits the eternal punishment of predestined sinners, but even defends it as morally appropriate. According to him, **everything is for the best in the best of all possible worlds.** All is done for the best, but also all is done through an unbroken series of efficient causes. At the same time, these causes are only material in appearance; in reality they are spiritual beings. **There is no such thing as dead matter; the universe consists of living forces all through.**

Far from the body being the cause of **passion,** it is passion that is the cause of the body. The soul has within itself the principle of all its actions and even of all its passions. The body only expresses its law of limitation.

The tendency of every monad to advance in being is, in the human soul, the principle of the passions and emotions. But this tendency towards a higher perfection would not in itself suffice to explain the emotional life of mankind. The monad is not an isolated thing, for, owing to the pre-established harmony, it is in agreement with all the other monads; and it is in this interdependence of creatures that the principle of passion is to be found. Passion is a limitation of action. The appetites are like so many little springs which try to release themselves, and which make our machine go. They deliver us from obstacles without our thinking about it. In the lowest stage such instinctive actions are unconscious; in the higher they give rise to the passions which we do not feel, and which are attributed to the body, although there is always something corresponding to them in the mind. Lastly, above the passions proper "there are distinct inclinations which reason gives to us, whose force and formation we feel." These inclinations do not depend on the body, but express the very nature of the soul; they correspond to distinct ideas, and are veritable activities. "All action is a step towards pleasure, and all passion a step towards pain." As there are three kinds of inclinations, so there are also three kinds of pleasures. There are some pleasures which correspond to our unconscious inclinations, others which correspond to the passions, and others, lastly—the purest—which correspond to the activity of the mind.

Leibniz instituted the Academy of Science in Berlin; but for his inability to accept the current doctrine of the immutability of the species, he was prevented by the Church from founding a similar Academy in Vienna.

It is now agreed that Leibniz discovered the *differential calculus* independently of Newton; and, what is more, that the formulation by which alone it has been made available was his exclusive invention. In physics, he was a pioneer of the conservation of energy. In geology, he started the theory that our planet began as a glowing molten mass derived from the sun, gradually cooling, the theory of the descent of its strata by fracture, and the deposit of sedimentary rocks and their induration. The modern theory of evolution is a special application of his theory of development.

G. E. STAHL (1660-1734),

professor at Halle, physician and chemist, in his work *Theoria medica vera* (1707), expounded his theory of **animism.** He rejected the distinction of vegetative, sensitive, and rational souls, and ascribed all vital manifestations, especially growth

and movement, to the rational soul. He put forward and brilliantly maintained the view that all the chemical events of the living body, even though they might superficially resemble, were at the bottom wholly different from the chemical changes taking place in the laboratory; since in the living body all chemical changes were directly governed by the sensitive soul which pervaded all parts and presided over all events. Stahl's fundamental position was that between living things, so long as they are alive, however simple, and non-living things, however composite, however complex in their phenomena, there is a great gulf fixed. The former, so long as they are alive, are actuated by an immaterial agent, the sensitive soul; the latter are not. Further, the living body is fitted for special ends and purposes; the living body does not exist for itself; it is constituted to be the true and continued minister of the soul. The body is made for the soul; the soul is not made for, and is not the product of, the body.

He wrote: "Vital activities are directly administered and exercised by the soul itself, and are truly organic acts carried out in corporeal instruments of a superior acting cause, in order to bring about certain effects, which are not only in general certain, and in particular necessary, but also in each and every particular adapted, in a special and yet most complete manner, to the needs of the moment and to the various irregularities introduced by accidental external causes. Vital activities, vital movements, cannot, as some recent crude speculations suppose, have any real likeness to such movements as, in an ordinary way, depend on the material condition of the body and take place without any direct use or end or aims."

Chemistry, and even anatomy, are useless to the healing art. The source of all vital movement is the soul, which builds up the machine of the body, and maintains it for a time against external influences. The substance of the body is continually renewed. **The immediate cause of death is not disease, but the direct action of the soul,** which leaves the bodily machine either because it has become unworkable through some serious lesion, or because it does not choose to work it any longer. In any case putrefaction increases with age, and may finally become irresistible. **The soul tries to preserve the body as long as possible,** and most so-called diseases are merely manifestations of its efforts in this direction, *e.g.*, the fevers, which the soul counteracts by a more rapid motion of the circulation and secretion. The soul is liable to error, as when it sends too much blood to a particular part, which then becomes congested. The soul, in spite of its mistakes, knows much more about the body it has built up than does the most skilful physician. The latter's chief duty, therefore, is to watch and assist its efforts. Stahl's view of the soul as a sort of sanitary inspector did not please the theologian. His doctrine of animism was a reaction against the chemical and mechanical theories of the XVIIth century.

Stahl's chief and leading principle, that the rational soul of man governs the whole economy of his body, is based on the fact observed by physicians at all times, from Hippocrates onwards, that the *vis conservativa et medicatrix naturæ* resists injuries which threaten the body and corrects or removes disorders induced or arising in it. A fatal consequence of this view was that too much attention was given to the so-called "expectant" treatment, and the timely interference by active remedies and surgical operation was neglected. However, his doctrine made Stahl realise the importance of **psychic treatment of mental disorders.**

Stahl increased and spread the knowledge of chemistry. The thing which brought him the greatest renown was the "phlogiston" theory, of which we shall speak in the next chapter. (See also p. 176.)

CHRISTIAN THOMASIUS (1655-1728),

a celebrated jurist, founder and rector of the University of Halle, who fought for

the abolition of witch trials and instruments of torture, and for the freedom of faith, was an **expert in the knowledge of human nature.** He claimed to be able to discover the peculiarities of a person's character by determining "by means of a brief conversation and with the help of a few obvious rules concerning human nature, the special passions of the character in question and then the degree in which it shares the other passions common to the human race." Similarly to modern phrenologists, he set his students the problem that, given four traits of character, the intensities of which are expressed in numbers (say, ambition 60, voluptuousness 50, affection 30, and avarice 5), what would the conduct of such a person be likely to be? ("Versuch vom Wesen des Geistes," 1699 and 1711.)

Thomasius was the first instructor who ventured to deliver lectures in the German language instead of Latin. Christian Wolff, of whom we shall speak next, followed his example.

CHRISTIAN WOLFF (1679-1754)

was a disciple of Leibniz, whose doctrines he made known to the world, and was the first to introduce a methodical study of psychology into the universities. He developed the ideas of his master in a **classification of the mental faculties,** which had a marked influence on German psychology of the XVIIIth and part of the XIXth century. He opposed the theory that the body is a machine merely, and sought to account for its properties and functions by the conception of a non-mechanical principle, the vis essentialis or **vital force.**

Wolff held introspection to be the only means of obtaining a knowledge of the mental processes. He considered psychology as consisting of two parts: empirical and rational or speculative; the former having for its object the description and explanation of the phenomena of consciousness, and the latter the discussion of questions concerning the essence of the soul, its destiny, its immortality, etc. In his empirical psychology he distinguished inner and outer sense; the former being regarded as the means of obtaining cognition of the phenomena of mind, the latter of those of the external world. **All knowledge is to him the outcome of sensation;** and thought and intelligence are the result of attention, the former consisting in a retrospective examination of what we have perceived, the latter being the faculty of representing things to ourselves distinctly.

Wolff, like his predecessors, maintained the Platonic division between the faculties of *cognition* and *desire*, each of which he subdivided into a higher and lower part. The lower cognitive faculty comprises imagination, the poetic faculty, and memory; the higher faculty comprises attention, reflection, and the reasoning power. The lower faculty of desire embraces pleasure and displeasure, desire and repugnance, and the emotions; the higher part embraces willing and not willing, and liberty. The Wolffian School subsequently modified this division, giving increasing importance to feeling, which was finally separated from desire and recognised as an independent faculty between the other two. This was the origin of the classical triple distinction, subsequently accepted by Kant, of the three faculties: cognition, feeling, and willing.

Wolff not only divided mind into a number of faculties, but he believed each to correspond to a **special portion of the brain.** Thus he fell into the same error as COMTE did a century later, of suiting physiology to the results of his introspection and speculation; but he is less to blame than Comte, for the study of the anatomy and physiology of the brain was in its initial stages at his period, and nearly all the special sciences were dominated by metaphysical ideas.

The suggestion of "faculties" soon crystallised in the extravagant **faculty psychology** which cut up the mind into watertight compartments, each doing its

peculiar work in independence of the others. In modern times different "faculties" have been spoken of in the same external manner, as acting independently of, and in opposition to, one another. Not only was a division between different parts of faculties thus introduced—a division disproved by the thoroughgoing unity of conscious life, without which even the strongest contrasts could not be felt or apprehended—but moreover, those who took this view entangled themselves in the illusion that by tracing the phenomena back to different "faculties" they had reached an explanation: that, *e.g.*, knowledge and feeling would severally be more easily intelligible if a special faculty of knowledge and a special faculty of feeling were accepted.

In consequence of accusations brought against him by theologians, Wolff had to leave the country in 1723, but was recalled in 1740, and rose to great honour as chancellor of his university.

G. E. LESSING (1729-1781)

was, apart from his achievements in German literature, a philosopher of distinction. He combined Leibniz's doctrines with those of Spinoza, and laid the foundation of a **philosophy of religion.** The idolatrous reverence for the Bible was an abomination to him. The letter is not the spirit, the Bible is not religion, nor yet its foundation, but only its records. Christianity is older than the New Testament.

JOHANN NICHOLAS TETENS (1736-1807)

made an unsuccessful attempt at forming an independent psychology which should be solely based on observation and experiment; his attempt being in the direction of the **measurement of the duration of images produced by different sensations.** He denied the materialistic hypothesis that the mental processes are equivalent to cerebral stimuli.

Tetens, in his "Philosophische Versuche" (1777), classified mental states into thought, feeling, and will. He found in his analysis, as did others before him, that in every perception a thought is contained; for only when the mind apprehends an object as a particular object, isolates and distinguishes it from others, does the mind perceive or is it conscious of the object;—and the mind becomes thereby conscious of itself. The act of thinking and the awareness of this act, he discovered, do not occur at the same time, and he conjectured that the change produced in the ideas through thought is perceived as an effect—just as the outer objects are apprehended entirely through their effects; hence the flow of thought must be a mere phenomenon.

IMMANUEL KANT (1724-1804),

whose life coincided with the period when German literature was at its highest, was born at Königsberg, in Prussia, where he held a chair at the University from 1770-1797.

In the year 1781, when Kant was well over fifty years of age, his world-renowned *Critique of Pure Reason* was published. In this book, to the writing of which, as he himself assures us, he was incited by the scepticism of David Hume, he undertook the examination of the origin, extent, and limit of human knowledge, and unfolded his doctrine of the relativity of all knowledge. He tried to establish the distinction between phenomena—whose substance is given us through impressions on the senses, but whose form is a purely subjective product of the mind itself—and real things or "things-in-themselves," which exist out of relation to time, space, or causality. He showed us, in this *Critique*, that what we call **external objects are really only mental**

representations resulting from the nature of our sensibility. To us they are mere appearances, the inner nature of which we can never ascertain. The appearance of the things we know; the things-in-themselves, we do not and cannot know. Nevertheless, in opposition to Berkeley, Kant declared that, although we do not know how, we must assume that transcendental objects or things-in-themselves exist.

Kant distinguished **two kinds of knowledge,** one experimental and another founded on belief. He maintained that the first kind is only relative, subjective, or phenomenal, or that we know only the relation of the subject to the object; that we do not know either the subject or the object in itself, but both in their mutual relations only, and that this relation constitutes their reality to us. The subject he conceived endowed with particular categories which are applied to the object; whatever is general and necessary in knowledge belonged to the subject, while the particular and variable is the attribute of the object. Hence all experimental knowledge is founded upon dualism; upon the union of the subject and object; for, even the categories, though inherent in the subject, and contrived by the mind from within, acquire objective reality only by their application to the object. Kant, though he considered both subject and object, had, however, the subject more in mind than the object. He reduced all categories or forms, according to which the mind acquires experimental knowledge, to four kinds—to quantity, quality, relation, and modality; of these, the two first concern objects in general, and the two last the relations of objects to each other and to our understanding. Thus Kant admitted notions independent of experience, as conceptions of space, time, cause, and others; and considered these conceptions, not as the result of external impressions, but of the faculties of the subject: they exist from within, and by their means we are acquainted with the objects.

Kant maintained the three faculties of **knowing** (cognition), **feeling** (of pleasure and pain), and **willing** (desire), to be each of independent origin, and impossible of further reduction. Intellect and will refer to objects, feeling to the self. Knowledge is divided by him into intelligence (understanding), judgment, and reason, which constitute together the higher part, the lower part being the sensations. In his opinion there is not only a difference of degree between the two, but the former is the active, the latter the passive, or receptive part, which furnishes the material for the other to work upon. Therefore, the faculty of knowledge, and more especially the reason, in Kant's estimation, is the sovereign faculty, which regulates and selects from the feelings and the desires.

He argued further that our minds also are inaccessible to our direct observation, and that we have direct knowledge only of mental phenomena or appearances. These mental phenomena, owing to their instability and fluctuation, are not as susceptible of direct observation as the phenomena of the external world, and, therefore, psychology could never be a science, though it would always be a useful branch of study.

Mental phenomena do not resemble "objects," do not possess the stability of physical phenomena; they are "processes," and therefore cannot be studied by the same methods. We cannot observe our mental mechanism while under the influence of a strong emotion. If we can stop to reflect, the emotion tends to be weakened, and may even disappear altogether. The introspective method limits psychological observations to a certain period of life, when the mind is matured and accustomed to follow the inner processes, in a mentally normal man, and even within these limits can give but very uncertain results; whilst it renders any analysis of the mental states in animals quite out of the question. Kant accordingly proposed to found his empirical psychology on the observation, not of self, but of others.

Human actions must, like all other phenomena, form an unbroken chain of antecedents and consequents. **With sufficient knowledge and powers of calculation, a man's whole future conduct might be foretold.** Nevertheless, under the XVIIIth

century idea of man as naturally the creature of passion or self-interest, he claimed for us, as moral agents, the power of choosing to obey duty in preference to either.

All reason demands uniformity, order, law; only what in theory is recognised as true has in practice to be imposed as right. In this way, Kant arrived at his formula of absolute morality: act so that the principle of thy conduct may be the law for all rational beings. He called this the **Categorical Imperative,** as distinguished from such hypothetical imperatives as: act this way if you wish to be happy either here or hereafter; or, act as public opinion tells you. Moreover, the motive, as distinguished from the end of moral action, should not be calculating self-interest nor uncalculating impulse, but simply desire to fulfil the law as such.

The moral law is so clear and categorical, while the realisation of it in this life is so imperfect, that **there must be a future life** for the soul to work out its task, and **there must be a supreme moral legislator** who has formulated the law, and will provide the opportunity for its triumph.

As regards pleasure and pain, Kant adopted the view of the Italian philosopher **VERRI** (1741-1816), that pleasure is not a positive state, but merely the cessation of pain. **Man's sole motive principle is pain.** Pain precedes every pleasure. Pleasure cannot follow another pleasure. Pains that pass slowly are not followed by a lively pleasure, because we are not conscious of the transition.

Passion is an inclination which is little or not at all under the control of reason. On the other hand, the vivid consciousness of an actual pleasure or pain, which allows of no reflection in the subject, is **emotion.** Emotion is a seizure of the soul, is violent, fleeting, and may be compared to intoxication. Passion moves slowly, reflects, is like a disease resulting from the absorption of a poison, or from a vitiated constitution. Where there is much emotion, there is usually little passion. Emotion is like water bursting its dykes; passion like a torrent, which cuts an ever deeper bed. As examples of emotion, Kant cited excessive joy, hopeless melancholy, fright, anger, anxiety. Among the passions he made a distinction between those that are natural, innate, ardent, such as love of liberty, sexual love; and the acquired passions which are calmer, such as ambition, desire of ruling, and avarice.

Most of the great philosophers have done first-class work in some special line of investigation, apart from their philosophy, and Kant was no exception. He offered a brilliant solution of the problem of the origin and constitution of the celestial system in his "Natural History of the Heavens," 1755, a work embodying the celebrated nebular hypothesis. Kant's cosmogony may have been premature and mistaken in its details, but his idea of the heavenly bodies as having originated from the condensation of diffused gaseous matter still holds its ground.

J. G. v. HERDER (1744-1803)

was a poet and illustrious writer of philosophical treatises on natural history and theology. His opposition to the subjective philosophy of Kant and Fichte made him unpopular. He rescued Spinoza from an ignominious neglect, and was influenced by naturalists like Haller, Buffon, Sömmering, and Blumenbach, who through physiology, comparative anatomy, and ethnology, attempted to bring the study of the human race and its mental development into connection with that of the brute creation, of the surrounding plant-life, of the characteristics of climate and soil, and of the great natural features of sky and landscape. Herder did not believe that we could study the great forces of nature and mind from the inside or in the abstract. **Irritability,** the highest physical phenomenon of matter, was to be the starting-point of his psychology. He was the first to show clearly that it is not abstract reasoning, but patient inquiry into origin and growth, that is the most

profitable means of approaching the vast problems of civilisation and religion. In his chief work, "Ideas for a Philosophy of Human History" (1784-91), he is mainly concerned with intellectual and moral phenomena. Its leading idea is thus expressed:

"The force which thinks and works in me is in its nature as eternal as that which holds suns and stars together. The instrument may, like the stars, wear out, but the laws by which they all exist and re-appear in other form never change. . . . The history of man is a natural process; in his life we see the same laws of development which we see in nature. Man is not only the crowning work of the universe to whom all lower forms of life point; he is also the first link in a higher order of existence. Hence the life work of man is to cultivate those elements in his humanity which unite him with the highest."

It is interesting to note that he considered man's sociability, his benevolence and —like Cicero, Seneca, Lavater, etc.—his inclination to venerate a Superior Being, his love of religion, as innate. To him, as to Lessing, **Christ's religion and not Christianity was what we ought to profess.** He has also the great merit of having urged the importance of the study of language and literature in primitive forms as the great gateway into **anthropology** and the science of humanity (1798). He expressed a hope, in 1775, that **at some future time the functions of the different parts of the brain would be discovered.**

CHAPTER X

THE PROGRESS OF SCIENCE IN THE XVIIth AND XVIIIth CENTURIES

PROGRESS OF THE NATURAL SCIENCES

SCIENTIFIC knowledge increased rapidly in the XVIIth and XVIIIth centuries, especially in chemistry, natural history, anatomy, physiology, and general medicine. True, this period cannot be compared with that of the century following, for, as we shall see, scientific research was still handicapped by the survival of mystical theories from the earlier Middle Ages; but there can be no doubt that the foundation was then laid for the achievements of the XIXth century. With the rapid increase of cultivators of science came also the foundation of learned societies. Imitating the examples of the *Academia Secretorum Naturæ*, instituted at Naples by Baptista Porta, in 1560, and another *Academy for the Promotion of Natural Philosophy* at Rome, in 1603, the *Academia del Cimento* was established in Florence in 1657, the *Royal Society* in London in 1645, the *German Academy of Naturalists* (Leopold I.) in 1652, the *Royal Academy of Sciences* in Paris in 1665, the *Royal Academy of Science* in Berlin in 1700, and the *Academia Española* in Madrid in 1714. All these societies entered into scientific investigations energetically, with results that enriched the world.

JEAN BAPTISTE VAN HELMONT (1577-1644),

of Louvain, was a great scientist and a devout Catholic, one of the founders of the iatro-chemical school, a naturalist and physician, and the leading physiologist of the opening years of the XVIIth century. Though many of his concepts were fantastic, he originated many bright and correct ideas, and made several useful contributions to the medical and chemical sciences. He was the first writer to use the word "gas" (1624) and the first to recognise **the physiological importance of ferments and gases,** particularly of carbonic acid, and his knowledge of the gastric secretions was considerable. Digestion, he declared, does not, as Galen maintained, depend upon heat, but upon a certain ferment existing in the gastric juice. Heat is not, as has hitherto been taught, the cause of life, but rather one of its products.

Van Helmont took up Vesalius's doctrine of the elaboration of the animal spirits by successive stages, and distinguished six such stages. In addition he mingled with his chemistry the mystical conception of **archæi,** which he derived from Paracelsus. Like the latter, he believed that each material process of the body is presided over by a special dominating vital power, archæus. One of these regulating principles of the body is the *archæus influus*, which governs all the psychical and physiological processes in the body; another is the *archæus insitus*, a subsidiary power which resides in each individual part of the body, but is under the influence of the former; and a third principle, the *idea morbosa*, which causes disease.

Van Helmont recognised a sensory and motor soul, as belonging to man alone. Plants and animals possess only a certain vital power. This sensory-motor soul is the prime agent of all the acts of the body by means of the brain and nerves, but its actual seat is the orifice of the stomach. The sensory-motor soul is mortal, and co-exists in man with the immortal mind, of which it forms the shell, so to say. Before the fall of Adam man possessed the immortal mind, which discharged the functions of life. At the fall, God introduced into man the sensory-motor soul, and with it death, the immortal mind retiring within the soul and becoming, as it were, its kernel. Through the mortal soul gaining dominance over the immortal mind, there arose disease. It is therefore the highest task of man to recognise and identify himself with the divine nature of his spirit. This is to be done by prayer and abstraction of the immortal mind from its natural fetters and the sensory-motor soul.

Van Helmont manufactured many remarkable remedies, with which he claimed to have succeeded in curing myriads of patients who had failed to receive any benefit whatever from the ordinary resources of medical science. He was strongly against venesection.

PIERRE GASSENDI (1592-1655),

first professor of theology at Aix, then in 1646 Regius professor of mathematics in Paris, revolted against the predominant scholastic philosophy, rehabilitated Epicur, and was among the first to employ the methods of Baconian empiricism in his attempt to formulate a systematic view of the world. He was **the founder of the modern atomic theory.** He taught that atoms are the primal constituents, the dominant entities of the world. They are the original seeds of all things. They have indeed been created and set in motion by God ; but from them, by generation and destruction, everything has been formed and still continues to be. All growth and decay are the results of the combination and separation of atoms. He anticipated many of the ideas of modern science. Like Newton, he explained the fall of bodies by the earth's attraction.

GEORGE E. STAHL (1660-1734),

whose philosophical theories we explained in the last chapter, advanced the knowledge of chemistry and popularised the " phlogiston " theory (1729), propounded before him, in 1670, by JOACHIM BECHER (1635-1682). This theory was to the effect that all combustible materials or substances contain an invisible element to which the name " phlogiston " was given. Stahl was not able to demonstrate the actual existence of this element ; he simply assumed its existence. Chemists believed the phlogiston theory for nearly a hundred years, though **JOHN MAYOW** (1643-1679) had disproved it, when fresh experiments proved Stahl's theory to be false. At the same time, the fact should be stated that the term " oxidation " and " reduction," which came into use during the following century, developed out of this theory of phlogiston.

In 1756 carbonic acid was discovered by **JOSEPH BLACK** (1728-1799) ; in 1766 hydrogen by **HENRY CAVENDISH** (1731-1810) ; in 1772 nitrogen by **RUTHERFORD** (1749-1819) : and in 1774 oxygen was isolated by **JOSEPH PRIESTLEY** (see page 148.), independently of **K. W. SCHEELE** (1742-1786), in 1775. **A. L. LAVOISIER** (1743-1794), another great chemist, overthrew the phlogiston theory by proving the action of oxygen (1778), and discovered the indestructibility of matter (1789). (He fell a victim to the French Revolution and was guillotined.)

Another subject of ardent investigation, besides chemistry, was natural history.

CONRAD v. GESNER (1516-1565),

professor of natural history at Zürich, whom Cuvier called the "German Pliny," on account of his equal attainment in botany, zoology, bibliography, and general erudition, published his famous "Geschichte des Tierreichs" in five folio volumes between 1553-1559, and with it **laid the foundation for modern zoology.** In botany he made the first attempt at a true classification of plants. He also wrote a book on mineralogy.

JOHN RAY (1627-1705),

the celebrated naturalist, was the first to make out that **fossils** are the remains of natural animals and plants, which have passed away in unknown ages, thus telling men of the countless ages of the earth's existence. Ray also led the way to **comparative anatomy** in his synopsis of quadrupeds. He was the first to define the use of the term "species," and to lay emphasis on anatomical characteristics as a basis of classification. He may be called the father of modern zoology.

GEORGES LEROY (1723-1789),

the friend of Hume and Diderot, appears to have been the first to observe **the mental characteristics of animals,** a subject which was apparently never inquired into throughout the ages. He was a huntsman, and wrote therefore with knowledge, especially about the wolf, fox, deer, rabbit, and dog. He attributed to these animals observation, comparison, and judgment. His book, entitled *Letters on Animals,* is enlivened by many touches of nature, which make it highly interesting.

CASPAR FRIEDRICH WOLFF (1733-1794)

The antiquated psychology of the Middle Ages considered the mental life of man and that of the brute to be two entirely different classes of phenomena; the one it attributed to "reason," the other to "instinct." In harmony with the traditional story of creation, it was assumed that each animal species had received a definite, unconscious psychic force from the Creator at its formation, and that this instinct of each species was just as unchangeable as its bodily structure. All living things were supposed to have been created in their present condition, and one species was believed to be, genetically, quite distinct from every other species, however closely it might resemble it morphologically and in its relationship to its environment. Moreover, the idea was prevalent that animals, whilst still in the germ, were models in miniature of the adult condition, the various parts only requiring expansion and unfolding. **CHARLES BONNET** (1720-1793) of whom we shall speak presently, was the chief apostle of this form of unfolding "evolution" as then understood.

Caspar Friedrich Wolff, Professor of Anatomy and Physiology in St. Petersburg University, in his *Theoria Generationis,* 1759, **laid the foundation of modern embryology** and was the first to assail this doctrine of "unfolding." He demonstrated that all the complex organs are formed from simpler structures, and are only developed gradually. He discovered the true character of embryonic development, and proved that there is a series of very remarkable formative processes in the evolution of the fœtus from the simple ovum. But the physiologists of the time, with the famous **ALBRECHT VON HALLER** (1708-1777) at their head, flatly refused to entertain these empirical truths, which may be directly proved by microscopic observation, and clung to the old dogma of "preformation." This theory assumed that in the human ovum—and in the egg of all other animals—the organism was

already present or " preformed," in all its parts ; the " evolution " of the embryo consisted literally in an " unfolding " of the folded organs. Haller declared, " No part of the body is made from another ; all are created at once." Wolff's doctrine was resuscitated by MENDEL.

COMTE DE BUFFON (1707-1788),

the great French naturalist and anthropologist, was no believer in the permanent stability of the species. He hinted that **all the present species have gradually been evolved** from ancestral forms of a different type (1749), but as a concession to the Sorbonne, and afraid of spending the remainder of his days in the Bastille, he added : " But no ; it is certain from Revelation that every species was directly created by a separate fiat." He was a believer in the view that **acquired characters are capable of being transmitted.** This is what he says on the subject :

" Upon the whole, every circumstance concurs in proving that mankind are not composed of species essentially different from each other ; that, on the contrary, there was originally but one species, which, after multiplying and spreading over the whole surface of the earth, have undergone various changes by the influence of climate, food, mode of living, epidemic diseases, and the admixture of dissimilar individuals ; that at first these changes were not so conspicuous, and produced only individual varieties ; that these varieties became afterwards specific because they were rendered more general, more strongly marked, and more permanent, by the continual action of the same causes ; that they are transmitted from generation to generation, as deformities or diseases pass from parents to children."

Buffon described the " Varieties of the Human Species," and was therefore regarded by FLOURENS as the **founder of anthropology.** Individual variations, according to him, are due to three causes : climate, food, and habits. These influences, acting over large areas on large groups of people, produce general and constant varieties. To these varieties he gave the name **race.**

In his *Théorie de la Terre* (1749), he attempted to state simply geological truths ; but the theological faculty of the Sorbonne dragged him at once from his high position, forced him to récant ignominiously, and to print his recantation, which runs as follows :

" I declare that I had no intention of contradicting the text of Scripture ; that I believe most firmly all therein related about the creation, both as to order of time and matter of fact. I abandon everything in my book respecting the formation of the earth, and generally all which may be contrary to the narrative of Moses."

JEAN PICARD (1620-1682) had already, in 1682, estimated the size of the earth ; **BOUGIER,** in 1738, made the first attempt to measure its density ; **LAZZARO MORRO** in 1740, **JAMES HUTTON** (1726-1797) in 1749, and **ABRAHAM WERNER** of Freiburg (1750-1817) in 1776, studied the formation of the earth's crust, and with these investigations **geology became established as a science,** having broken loose from the trammels of theology.

The prevailing doctrine of the Church continued to be that " all things were made at the beginning of the world," and that to say that stones and fossils were made before or since the " beginning " is contrary to Scripture. JOHN WESLEY (1703-1791), the famous preacher, basing his theology on the declaration that the Almighty after creation found the earth and all created things " very good," declared, in his sermon on *The Cause and Cure of Earthquakes*, that no one who believes the Scriptures can deny that " sin is the moral cause of earthquakes, whatever their natural cause may be," and that earthquakes are the " effect of that curse which was brought upon the earth by the original transgression."

CARL v. LINNÉ (1707-1778), the great **botanist,** a contemporary of Buffon, "found biology a chaos and left it a cosmos." His system was published in 1768. Whereas Buffon described, Linnæus classified. Order and method were with him a passion.

GEOFFROY ST. HILAIRE (1772-1844),

in 1795, came to the conclusion that **all species have descended from a primitive type;** and, in 1796, GALL proved the gradual evolution of one of the structures—the brain; **GOETHE** (1749-1832), the German poet, who was a scientist as well, about the same time and quite independently, declared that all the more perfect organic natures, such as fishes, amphibians, birds, and mammals, with man at their head, were formed at first on one general type. ("Theory of the Metamorphosis or Transformation of Plants," 1790.)

ERASMUS DARWIN (1731-1802),

the grandfather of Charles Darwin, was a philosopher as well as a naturalist, and said that animals vary from one another chiefly because they are continually altering their habits and changing their environment. He endeavoured to explain the animal instincts by means of experience and association, regulated by the impulse of self-preservation and by the necessity of individual adaptation to external conditions. His principal work was "Zoonomia, or the Laws of Organic Life" (1794).

G. R. TREVIRANUS (1776-1837),

naturalist at Bremen, in his work on Biology, in 1802, expressed the idea that from forms of life originally simple had arisen all higher organisations by gradual development; that every living creature has a capacity for receiving modifications of its structure from external influences; and that no species had become really extinct, but that each had passed into some other species. He wrote in 1821 on the *Functions of the Brain.* According to his theory, the convolutions of the brain contain the centres for perception, association, and memory; sight is located in the occipital region, hearing in the cerebellum, and smell in the frontal region.

JOHN HUNTER (1728-1793)

rivalled Haller as a collector—his vast scientific collection forming now the College of Surgeons' Museum in London—and exercised far-reaching and profound influence upon many sciences. His contributions to **human and comparative anatomy,** the natural history of plants and animals, vegetable and animal physiology, geology and palæontology, were of signal value. Manifold were the results of his studies; but not the least important was the declaration of his belief that in the brain were posited the centres of thought and feeling, and that it consisted of a plurality of mental functions or faculties. His greatest interest was natural science, and he was the first of scientific surgeons. He wrote of himself:

"I am not a reader of books," and "I believe nothing that I have not seen and observed myself." His reply, when taunted with ignorance of the classics, is famous: "Jesse Foot accuses me of not understanding the dead languages, but I could teach him that on the dead body which he never knew, in any language, dead or living."

JOHANN FRIEDRICH BLUMENBACH (1752-1840),

professor in the Faculty of Medicine at Göttingen, laid the foundation of **race classification** based on measurement (1776). He classified mankind into five varieties under the one species : Caucasian, Mongolian, Ethiopian, American, and Malay ; laying particular stress upon the shape of the skull and of the face, and may therefore be regarded as **the founder of craniology.** He was a great collector of crania, and it became the fashion to visit the Blumenbachian Museum, to have the differences which distinguish the various cranial types pointed out, and to indulge in sentimental rhapsodies upon the beauty and symmetry of the young female Georgian skull, which was considered the highest type of all.

Blumenbach dealt a death-blow to the fabulous tales which had at all ages been recorded of the Natural History of Man and which had been accepted by credulous people : men with eyes situated in their shoulders, or with their feet turned backwards, men with dogs' heads, or, indeed, with no heads at all ; fossil bones of animals as large as the elephant were held to be human and to have belonged to a race which attained a stature of twenty feet. Even Buffon believed this statement.

We can refer only briefly to two **pioneers in astronomy** of this period, having mentioned NEWTON in Chapter VII, page 117.

PIERRE DE LAPLACE (1749-1827)

re-discovered the **nebular hypothesis** forty years after Kant. It was published in his magnificent astronomical treatises, *Exposition du Système du Monde* (1796) and *Traité du Méchanique Céleste* (1799), in which he showed that the entire mechanism of the celestial bodies is strictly in accordance with the principles and laws of mathematical science.

SIR WILLIAM HERSCHEL (1738-1822)

discovered a new planet—Uranus—and pointed out the probable **formation of new suns going on in far-distant regions.** He pictured our own sun rushing through space at the rate of 150 million miles a year, carrying with it our earth and all the other planets, and, above all, he traced the law of gravitation into the distant star-world, and showed it there holding suns together and causing them to revolve round each other. In 1793 he explained the cause of sunspots, and in 1822 he discovered the use of the spectroscope for the detection of chemical elements.

PROGRESS OF MEDICAL SCIENCE,

especially of the knowledge of

THE BRAIN AND ITS FUNCTIONS

WILLIAM HARVEY (1578-1657)

was one of the first to demonstrate the value of Bacon's method. He was a pupil of GIROLAMO FABRICIUS (1537-1619) of Padua (successor of Fallopius), who was the first to give an elaborate description of the valves in the veins (1546). Continuing these researches, Harvey **discovered the circulation of the blood** (1616, date of Manuscript in British Museum ; 1628, date of his treatise), a discovery which rendered him immortal. But he also made other important researches, such as into

the procreation of animals, as a result of which he formulated the well-known law : " Every living thing comes from an egg." The results of Harvey's observations are the more remarkable when we consider the scanty instruments and appliances then available. That he followed Bacon's method is seen from his explanation :

He said of himself that he felt it in some sort criminal to call in question doctrines that had descended through a long succession of ages and carried the authority of the ancients, but he " appealed unto Nature, that bowed to no antiquity, and was still higher authority than the ancients." He also said : " I profess both to learn and to teach anatomy not from books, but from dissections ; not from the position of philosopher, but from the fabric of Nature."

His discovery of the circulation of the blood, which ranks second to none in its consequences on physiology and medicine, was, on its announcement, met by a host of clamourers, who denounced its author, and had such power over the public mind that he was deemed a madman, and not safe to be consulted as a physician. The Faculty of Paris interdicted the demonstration in proof of his discovery. He was ridiculed and persecuted by almost all the learned contemporaries, and, by the consequent loss of his practice, was reduced to comparative poverty.

When the reality of the great discovery of Harvey dawned upon the medical world, the first result was a school of medicine, which went to the other extreme and regarded man simply as an hydraulic machine, and found the principle of every malady in imperfections of circulation.

ANDRÉA CESALPINO (1519-1603), Professor of Medicine at Pisa, and physician to Pope Clemens VIII., anticipated the discovery of the blood before Harvey. He had grasped, as pure theory, the truth about the systemic and pulmonary circulations, but his ideas were not supported by any convincing experiments. Cesalpino was an able naturalist, taught botany as well as medicine, was **the first true classifier of plants** (" De Plantis," Florence, 1583), as was acknowledged by Linnæus, and the last writer to regard the heart as the sole seat of the soul. **JOHN MAYOW** (1643-1679), of London (see p. 176), **explained the process of respiration,** and declared that " the particles of the air absorbed during respiration are designed to convert the black or venous blood into the red or arterial." He also declared the placenta to be the lungs of the fœtus, and knew that the third cranial nerve contracted the pupil. Mayow located the soul in the d ra mater, for by it, he thought, the animal spirits were drawn from the blood t^{o} the brain.

FRANCIS SYLVIUS (1614-1672),

—Jacques Dubois (le Boë)—professor in Leyden, the most ardent defender of the doctrine of animal spirits, is one of the founders of the iatro-chemical school and was **the first to apply chemistry to physiology,** divesting it of most of the phantastic trappings which van Helmont gave it. He is also famous for his prescriptions, some of which survive to this day. **He introduced clinical teaching** in the university of Leyden, which he rendered famous. Sylvius was a psycho-therapeutist. " Whoever," said he, " is unable to treat disease of the mind, is no physician. I have had to care for a large number of cases of this kind, and have cured many ; but assuredly rather by moral impressions and the effect of reason, than by the use of drugs." He was also **famous as an anatomist.** The *fossa Sylvii* and the *aqueduct of Sylvius* in the brain are named after him. He had many distinguished pupils, notably Willis, Swammerdam, de Graaf, and Stenson.

THOMAS WILLIS (1622-1675),

the most distinguished disciple of Sylvius, a famous anatomist, was professor in the university of Oxford, and one of the founders of the Royal Society (1660).

Willis was fully aware of the **importance of the brain for mental processes,** the higher modes of which, in the case of man, he attributed to a rational incorporeal soul ; nevertheless, he distinguished a corporeal soul consisting of two parts, one of flame residing in the blood ; the other an ethereal element—the animal spirits—diffused throughout the nervous system and in a less degree through other tissues. He sought to discover the mental functions of the brain, or the canals through which the "animal spirits" flow when psychical activity is present, and strove to prove that these spirits were secreted in the cortex, and transmitted thence through the white substance in the nerves of the body.

Willis assigned to **each particular part of the brain a special influence on the mind** (1681). He held that the cerebrum subserves the animal functions and the voluntary motions, the cerebellum the involuntary; that a perception of all the sensations takes place in the fibres of the corpora striata—the seat of the sensus commune—and through these descending voluntary movements are excited ; that the understanding is seated in the corpus callosum, and memory in the convolutions, which are its storehouse ; that the animal instincts are located in the thalamus opticus and corpora quadrigemina, and that the animal spirits are generated in the cortex of the cerebrum and the cerebellum from the arterial blood ; that they collect in the medulla, are variously distributed and arranged to excite the animal actions, and distil through a pedicle ; that the animal spirits secreted in the cerebellum are ever flowing, equally and continuously, into the nerves which regulate involuntary movements ; but those of the cerebrum tumultuously and irregularly as the animal actions are vehemently performed or quiescent.

Willis believed the vagi nerves to originate in the cerebellum, and it is due to this mistaken notion that he attributed the vital functions of the heart and respiration to that organ.

Willis maintained that serous effete matter in the ventricles trickles partly through the olfactory nerves into the nostrils, partly through the infundibulum to the pituitary gland, and thence by peculiar ducts to the various veins which return the blood to the heart from the brain.

He agreed with Galen in considering the use of the fornix to consist in supporting the hemispheres ; and decided that the pineal gland was not the seat of the soul, but a lymphatic gland (the view Galen held), having no relation with the substance of the brain.

Willis considered the brain to consist, like all other organs, of "fibres," which, however, on account of the softness of the tissue, cannot be isolated.

Willis investigated also the **blood supply of the brain,** and certain vessels at the base bear his name : the "circle of Willis." As to the loops of nerves with which the arteries here and there are encircled, he stated their use to be to reflex or close the arteries, and thus during the various emotions of the mind to admit the blood in greater or less quantity to certain parts. These nerves which control the calibre of the arteries are now known to be the **vaso-motor nerves.**

A contemporary of Sylvius, **JOH. JAC. WEPFER** (1620-1695), of Schaffhausen, also traced the course of the vessels of the brain, with more accuracy than had previously been done, and is known for his observations on apoplexy. **REALDO COLOMBO** (1516-1559), successor of Vesalius at Padua and later professor in Rome, made observations of the circulation on the exposed hearts of animals, is the **discoverer of the smaller circulation,** and noticed the movements of the brain isochronous with the action of the heart (1559). A more careful description of these movements was given in 1618 by **JEAN RIOLAN** (1580-1657), professor of anatomy in Paris.

THOMAS SYDENHAM (1624-1689),

the great English physician, was a contemporary of Willis. He was a supporter of the doctrine of Hippocrates regarding the **vis medicatrix naturæ.** Sydenham was

against all systems, and broke the power of the iatro-physical and iatro-chemical schools. The philosopher and physician LOCKE was a friend of his.

PIERRE CHANET

—"Traité de l'Ésprit de l'Homme," Paris, 1649—might be mentioned here on account of his theories of **localisation of functions in the brain.**

He located *imagination* in the fore-part of the brain and gave a variety of reasons for it, the chief being that, after a strong effort of the imagination, we feel a lassitude, and considerable heat in the forehead. He, however, cautioned his readers not to think that the imagination resides in an indivisible point of the brain, or is attached to a single spot, but its locality is more extended.

With reference to *memory*, he was afraid that he might be accused of using improper terms in attributing an organ to memory, which has no action, and is, properly speaking, no faculty. Be that as it may, it has a passive instrument, a particular portion of the brain where the spirits are arrested and fixed, namely the cerebellum.

"I hold," he says, "with the common opinion that this part is the cerebellum. The proofs are, certainly, not so strongly in favour of this theory as I should wish. Still, they seem probable and must be accepted. I find them contradicted only by one surgeon, who boasts of having removed the cerebellum without any disorder of the intellect intervening. But this surgeon seems to belong to that class of vain-glorious operators who brag of having removed large organs when they have only removed a few atoms. If he had simply said that memory had not suffered, I might have believed him; but to say that no faculty whatever was damaged is to say that nature made an organ of no use. I hold, on the other hand, an author worthy of belief, who states that he found the cerebellum absent in a man who, during life, had little or no memory. What a marvellous composition must, then, that organ have, which is the direct instrument of our mental operations! What would be our delight if the mechanism of this masterpiece of the Omnipotent were displayed before our eyes! We should behold in this organ a little world; and if it belonged to a Leibniz, this little world would be the abstract of a Universe."

This controversy on the question whether lesions of the brain impair the mental manifestation has been revived two and a half centuries later.

MARCELLO MALPIGHI (1628-1694)

In 1661 began the **application of the microscope,** which had been invented in 1590, and enabled the study of **minute anatomy.**

Malpighi, professor of medicine in the university of Bologna, who was in the habit of manufacturing his own microscopes, was able, by aid of one of these instruments, to exhibit the blood, loaded with its corpuscular bodies, passing rapidly from one capillary vessel to another in the frog's lung (1665). He also discovered the air cells of the lungs (1661), the cells of plants (1674) and the lower layers of the epidermis.

Malpighi (*De Cerebro* 1686) held that the brain is an appendage, to the spinal cord, in which **medullary fibres,** collected together, **radiate towards the brain,** until they end in the cortical portion, just as the fibres in the stem of a cauliflower radiate into the leaves. **CARLO FRACASSATUS,** his friend, professor of anatomy at Bologna and Pisa, also adopted this opinion, and **THOMAS BARTHOLIN** (1616-1680), of Copenhagen, in his "Anatomy," said this opinion was both new and peculiar, and that by it he could understand how fishes, on account of their small brain, are dull as to sensation, but agile as to movement, from their large spinal cord.

Malpighi's microscopical researches into the anatomy of the brain suffered from

the inadequacy of his instruments and the coarseness of his method (he boiled the brain before examination). This led him to declare that **the cortex of the brain consisted of "microscopic globules"** and was therefore a glandular organ for the secretion of the animal spirits. Most of the XVIIIth century anatomists appear to have held the opinion of the brain being a gland, and that its white substance consisted of microscopic pipe-like structures and the grey of granular bodies.

A. van LEEUWENHOEK (1632-1723),

a Dutch naturalist, by the same aid (the microscope), was the first to describe spermatozoa and to give a complete account of the red corpuscles (1674), to discover the striped character of voluntary muscle, and the structure of the crystalline lens. **He was the first to see** what he called animalcules, *i.e.*, **micro-organisms** (1687), and to demonstrate the capillary anastomosis between the arteries and veins. He discovered also that the grey matter of the brain was made up of what he called globules (in reality **nerve-cells**), thus agreeing with Malpighi, but in opposition to the view of his fellow-countryman **RUYSCH** (1638-1731), who claimed that it consisted of a congeries of blood-vessels. He also claimed that the nerve-fibrils contained globules floating in a fluid and that their vibration is the cause of sensation. (*Thesauri Anatomici decem*, Amsterdam, 1701-16.)

RAYMOND de VIEUSSENS (1641-1716),

professor at Montpellier, in his "Neurologia Universalis" (1685), described the mighty **nerve tracts** which pass through the corpora striata and capsula interna both up towards the hemispheres of the brain and down towards the spinal cord. When he followed them upwards, he found that they formed three regions in the white medullary portions of the brain (centrum ovale) : the *regio superna*, highest up near the crown of the head ; the *regio media*, below the latter ; and the *regio inferna*, farthest down, nearest the fissure of Sylvius ; and Vieussens thought that it was in these regions of the cerebral medulla (white substance of the cortex) that **the seat of the soul** and psychical activity lay ; more especially in the "centrum semi-ovale Vieusseni," probably because of its lesion in apoplexy, as noticed also by Wepfer, Willis, and Lancisi.

Vieussens considered the **ganglia of the nerves**, which were known already to Galen, to be receptacles of the animal spirits, for the nourishment and preservation of the nerves.

G. M. LANCISI (1654-1720),

physician to three Popes in succession, described in his work "De subtancis mortibus," Rome, 1707, the minute anatomy of the corpus callosum, and ascribed to the **pons**, in his work "De sede cogitantis animæ," 1718, the fabulous quality of **controlling the functions of the soul**, the power of thought being in direct relation to the bulk of this organ. The pineal gland (Descartes) he regarded as a subsidiary centre.

V. COITER (1534-1600), pupil of Fallopius and Eustachius, a great **authority on the comparative anatomy of crania**, in 1573, had already described the anterior and posterior spinal nerve roots, and **MISTICHELLI**, in 1709, and **FRANCIS PETIT**—POURFOUR DU PETIT—(1664-1741), in 1710, described the decussation of the fibres of the spinal cord below the pons. Petit regarded the cortex of the brain as containing the centres for voluntary movement.

ANTONIO PACCHIONI (1665-1726),

a pupil of Malpighi, thought he had discovered in the dura mater of the brain an apparatus for the movement of the animal spirits, similar in importance to the heart in the circulation of the blood. ("De Dura matris fabrica," Rome, 1701.) That no such apparatus exists was shown by **GIOV. Dom. SANTORINI** (1681-1737), in his work "Observationes Anatomicæ," Venice, 1727, and by the anatomist **A. v. HALLER** (1708-1777).

HERMANN BOERHAAVE (1668-1738),

the great professor at Leyden in Holland, thought that **every sense has its own sense organ,** so that there were regions in the brain separated in situation according to the different senses. He attempted to show that the animal spirits consist of a very refined aqueous fluid, which is produced in the brain and moves the muscles, being distributed by means of the nerves, having also a **nutrient property**—which was disputed afterwards by Haller. He located the soul in the gyrus fornicatus.

Boerhaave, through his great ability, made his university famous and the centre of medical influence in Europe. **He laid the foundation of organic chemistry** (1701), and is especially remarkable through his eminent pupils: Haller, Cullen, and Van Swieten.

Boerhaave was a representative of the iatro-mechanic school, originating with Descartes. To him the muscles were springs, the heart was a pump, the kidneys a sieve, and secretions of the glandular juices were produced by pressure; the heat of the body was the result of the friction of the globules of blood against the walls of the blood-vessels; it was greater in the lungs because the vessels of the lungs were supposed to be narrower than those of other organs. When iatro-mechanism became insufficient, chemistry came to its aid. Distillations, fermentations, and effervescences played their *rôle*. As mentioned, FRANCIS SYLVIUS (1614-1672) and THOMAS WILLIS (1622-1675) were its most eminent representatives.

FRIEDRICH HOFFMANN (1660-1742),

Boerhaave's contemporary, professor of medicine in the University of Halle, formulated the theory of the **nervous influence in the production of disease.** He declared melancholia and mania to be due to the diminished or increased impulse of the blood. If the impulse is deficient and the stoppage is light, resulting only in a difficulty of the return of venous blood, there results melancholia. If the impulse is stronger, the blood thicker, and the congestion greater, there results mania. The treatment was in accordance with this view—venesection, cold applications to the head, etc.

EMANUEL v. SWEDENBORG (1688-1772),

a Swedish mystic seer and founder of the Swedenborgian religious sect, penetrated deeply in many departments of natural sciences. In 1770 he published in Amsterdam his famous "Occonomia Regni Animalis," in which he dealt with the brain, and showed himself not only a learned anatomist and a sharp-sighted observer, but also in many respects an unprejudiced, acute, and deep anatomical thinker. **He relied chiefly on clinical results** from the study of cases by other authors who were accessible to him, and drew largely from Vieussens, Wepfer, Pacchioni, Ruysch, Lancisi, Malpighi, Leeuwenhoek, and others.

He maintained that the surface of the cerebrum, the grey cortex of the brain, served as the material basis of the psychical phenomena, as well as for the conscious perceptions and voluntary impulses to motion. He knew that the medullary substance of the brain was fibrous, and he claimed that at the end of these fibrils hang small elements, which are the seat of psychical activity, though "the soul pervades the entire brain," both the cortical and medullary parts. In the cortical elements, which Swedenborg called "spherulæ" or "cerebellula," the soul receives the sense impressions, transforms them into ideas, judgments, and decisions; but all the regions of the cortex are not of equal value. Some regions governed the higher, others the lower functions; some received the sensory impressions and others sent out the different kinds of motor impulses; that is, the **different departments of the psychical activity were localised in different places in the cerebral cortex.**

The most important part of the cerebral cortex, where the psychical phenomena actually take place, is the **anterior and superior region of the cerebrum.** "All the sensations affect chiefly the anterior province of the cerebrum, and the voluntary conatus or efforts proceed thence. . . . And, therefore, **if this portion of the cerebrum is wounded, then the internal senses—imagination, memory, thought—suffer**; the very will is weakened, and the power of determination blunted. . . . This is not the case if the injury is in the back part of the cerebrum."

Swedenborg divided the anterior superior region of the brain in three lobes: the one situated highest in the crown of the head; the third lowest down, along the fissure of Sylvius; and the second between the two. He says further: "The royal road of the sensations of the body to the soul . . . is through the corpora striata. . . . All determinations of the will also descend by that road. . . . It is the Mercury of Olympus; it announces to the soul what is happening to the body, and it bears the mandates of the soul to the body." And as the corpora striata lie immediately under the anterior and superior region of the brain "all sensations arrive for the most part to the anterior region of the cerebrum, and the voluntary impulses likewise emanate from this." And "the muscles and actions which are in the ultimates of the body, or the soles of the feet, depend more intimately upon the highest parts (of the brain); upon the middle lobe, the muscles which belong to the abdomen and thorax; and upon the third lobe, those which belong to the face and head." This localisation is very similar to the results of modern research.

THÉOPHILE DE BORDEU (1722-1776),

was the founder of the vitalistic school at Montpellier. He brought forward new views which transformed Stahl's animism into vitalism. He noticed that **nerves regulate the secretion of the bodily glands,** and held the view that the brain had as many parts as the body has organs, so that **each organ was represented in the brain.** His pupil, P. J. BARTHEZ (1734-1806), regarded the "vital principle" as the cause of vital phenomena.

ALBRECHT v. HALLER (1708-1777),

another pupil of the celebrated Boerhaave, was a distinguished **anatomist and physiologist,** and was a physician, botanist, and poet as well. He was living in the time of Frederick the Great, and wrote a work of great influence on the "Elements of Physiology" (1757), in which he declared that the brain is connected with the mind and the psychical functions only so far as it is the sensorium commune, or the place where all activities of sense are exercised and whence all muscular movements take their origin. **He believed the sensorium to extend over the whole substance of cerebrum and cerebellum.** He thought that the only prospect of attaining to any knowledge of the use of the various parts of the brain lay in diligently availing

ourselves of every opportunity for **dissecting the brains of insane,** and in accurately **comparing the brains of animals** (whose faculties are well known) **with the human brain.**

Previous to Haller, as we have seen, it was held that the soul must be present at some one spot in the brain, where it would receive or be affected by all the agitations brought from the sense organs by the converging sensory nerves, and where it could control the outflow of nervous impulses along the motor nerves; for the soul was considered as playing upon the central ends of groups of motor nerves and originating in them impulses appropriate to the production of the movements it willed, much as a musician plays upon the keys of a piano, striking them in combinations appropriate to the production of harmonious chords. According to this way of thinking, it was necessary that the seat of the soul should be a central and single organ in the brain, and, since almost all parts of the brain exist in bilateral symmetrical duplication, the choice was strictly limited and fell in turn upon each of the single median structures, *e.g.*, the septum lucidum, the corpus callosum, the central ventricle, the pineal gland; all of which, however, were in turn shown to have no immediate connection with consciousness.

Haller rejected Stahl's view that the soul acts directly in all parts of the body; but he argued that "no narrower seat can be allotted to the soul than the conjoint origin of all the nerves; nor can any structure be proposed as its seat, except that to which we can trace all the nerves. For it will be easily understood that the sensorium commune ought to lack no feeling of any part of the whole animated body, nor any nerve which can convey from any part of the body the impression of external objects. And the same may be said of the nerves of movement. Wherefore, even quite apart from the experimental results described above, we cannot admit as the exclusive seat of the soul, either the corpus callosum, the septum lucidum, the tiny pineal gland, the corpora striata, or any other particular region of the brain." And he concluded that "both sensation and movement have their source in the medulla of the brain. This, therefore, is the seat of the soul." By medulla he denoted the whole of the central mass of both cerebrum and cerebellum. He regarded the white matter of the brain (now known to consist exclusively of nerve-fibres) as the seat of sensation and movement for another reason, because he thought it insensitive to stimuli. Still, he inclined to the view that different parts of the brain are specially concerned in different mental functions; though in summing up he wrote: "Our present knowledge does not permit us to speak with any show of truth about the more complicated functions of the mind, or to assign in the brain to imagination its seat, to common sensation its seat, to memory its seat."

In postulating a special sensitive force or sensibility for neural action and a special "irritability" for muscular movement, Haller gave strong support to the erroneous theory of a specific "**vital force,**" which lasted, with modifications, down to the middle of the XIXth century, by which time physiology had entered upon a new phase.

He was the first to describe the **cerebro-spinal fluid** (1766), and his fame is due to the fact that he was among the first of physiologists to employ the method of experimentation in his work. He was also one of the founders of **Comparative Anatomy.**

JOHN BROWN (1735-1788),

in his "Elementæ Medicinæ," Edinburgh (1780), built a system of his own on Haller's discovery that irritability and contractibility had some relation to vital phenomena. It was built on the theory that **life was a state due to stimuli and maintained by stimuli,** and he applied it to the nature and causation of disease, conceiving two states—strength and weakness, sthenia and asthenia. He made some sensible remarks as regards insanity. He admitted that insanity may

originate in the brain, but he attached greater importance to abnormal passions as a factor in the causation of mental derangement, since passions disturb the whole body and not only the brain. Therefore **insanity is not a disorder of the brain alone,** but an affection of the whole body.

GERHARD VAN SWIETEN (1700-1772),

a pupil of Boerhaave, who became physician to Empress Maria Theresia and professor of medicine at Vienna, whose medical school he made famous, **believed in brain localisation,** but he considered the organisation of the brain too complicated, too intricate, and too difficult of investigation to permit us to hope that we should ever be able to point out the seat of *memory, judgment, or imagination*; faculties which, as we shall show in later chapters, it is impossible to localise.

Van Swieten, writing theoretically on surgery, advised us in the case of very bad compound fractures which may most probably require amputation, to defer operation until we have tried the force of antiseptic fomentation, and applications of like kind, for two or three days. (Quoted by Percival Pott, " Chirurgical Works.")

ANTON DE HAËN (1704-1776),

another pupil of Boerhaave, was a distinguished physician, who went with Van Swieten to Vienna, and became professor there in 1754. He was the originator of **electro-therapeutics,** applied especially to nervous disorders (1755.) Curiously, he was a believer in witchcraft, and wrote a treatise in defence of it.

The science of **electricity** was founded by WILLIAM GILBERT (1540-1603), an Englishman, in 1600; and BENJAMIN FRANKLIN (1706-1790) investigated its nature (1746) and made experiments with the lightning-rod (1752). H. C. OERSTED (1777-1851) discovered electro-magnetism in 1819; and M. FARADAY (1791-1867) electrical induction (1831), dynamo-electricity, and largely electro-chemistry.

Electro-physiology had its origin in the epoch-making experiments on muscle-nerve preparations, summarised in 1792 by LUIGI GALVANI (1737-1798) of Bologna. It was followed up with rare skill and insight by ALESSANDRO VOLTA (1745-1827) in his " Letters on Animal Electricity " (1792). Its actual founder was EMIL DU BOIS REYMOND (1818-1896). He published observations pointing to an electrical theory of propagation of nerve impulse in 1848, and was followed in 1850 by G. B. DUCHENNE (1806-1875), on " Electro-Diagnosis and Therapeutics."

C. L. HOFFMANN (1721-1807)

conceived (1792) that the **principle of life** or vitality could not be separated from matter, but was one of its essential properties; that life was a series of mutual actions and reactions between the fluids and solids of the body; and that all the operations of the body and the mind are the result of this regular and harmonious action. He was also the author of the "antiseptic" theory, that in diseases, especially in fevers, septic products of decomposition are carried in the blood and act as irritants to the solid parts. His treatment and remedies, accordingly, were designed to antagonise this influence. He was very famous in his day.

G. B. MORGAGNI (1682-1771),

professor in Padua, was **the father of pathological anatomy,** the science of the causes of error in the working of the human machine. In his work " *De sedibus et causis*

morborum per anatomem indagatis," Venice, 1761, he gave the clinical history of cases and their post-mortem appearances.

J. A. UNZER (1727-1799),

professor at Halle, after twenty-five years of patient and painstaking research, published in 1771 his " First Elements of Physiology," in which he dealt in a scientific manner with the problem how **instinctive actions** could be distinguished from those prompted by intelligence. He recognised the following " instincts " : for food, self-preservation, self-defence, propagation, for the protection of offspring, love of life, self-love, for the performance of voluntary movements, and instinct for repose and enjoyment. Unzer was a metaphysician and defended Stahl. He did not believe the **brain** could be the seat of the soul, as its faculties have been manifested in subjects whose brain had been entirely destroyed, and in children born without a brain !

So firmly was the belief in animal spirits implanted for centuries in the minds of scientific men that even Unzer wrote : " All the phenomena of motion and sensation manifested through the nerves render probable the existence of a remarkable subtle fluid essence which is present invisibly in the medulla of the brain and nerves, and is the means whereby all the functions of both are performed. It is termed the vital spirit or nervous fluid, but it is not known how and when it contributes to the animal actions."

J. C. A. MAYER (1747-1801),

professor of anatomy in Berlin University, in his *Anat.-Physiol. Abhandlung vom Gehirne* (1779), asks, " Are all the functions of the rational soul of man localised in those parts where it manifests vivifying power ; or are the operations of a single mental power effected in a single and especially appointed part of the brain ? And does not the mind perhaps localise its ideas by the operation of single faculties in particular departments, one in one place, and another in another ? "

CHARLES BONNET (1720-1793),

physiologist and philosopher, of Geneva, author of " Essay de Psychologie " (1754), " Essay analytique sur les Facultés de l'Âme " (1759), and other works on psychology and natural history, was a severe critic of Condillac. In his opinion, man is not purely psychical nor purely physical, but is a psycho-physical being. Thought, therefore, cannot be produced without the action of the nervous fibres ; but the latter are by no means identical with thought itself, the origin of which is a mystery. He refuses to admit the materialistic theory as generally accepted in his time, but nevertheless maintains that, properly to understand the formation and the connection of ideas, there is no other way but to examine the relation of the nervous fibres. On this assumption he made several important observations upon the physiologica conditions of the mental processes.

He considered the brain to be formed of a plurality of organs, and the various attributes of the intellect and the various kinds of feeling to act on different sets of fibres. In fact **he attributed a different function to each nerve fibre** for each special sensation, and a different function for each part of the brain, though he confessed his inability to designate these functions. He held that when the fibres are put in motion too violently, or for too long a period, they are fatigued and suffer pain. He also observed that **the brain became more complex as we ascend the animal scale,** and he thought that all the nerve fibres converged towards one common centre, which must be the seat of the soul. He said :

"The action of sound is not confined to the tympanum, nor that of light to the retina; there are nerves which propagate these different impressions to the brain. . . . Feeling is not in the fingers, neither is sensation in the external senses. . . . We know that we have ideas only by the aid of the senses; this is a truth, which experience attests. Experience also teaches us that our ideas of every kind are chained to one another, and that this connection belongs to the combination, which the fibres of the senses have together. It therefore follows that the different senses with which we are endowed have, somewhere in the brain, secret communications, by means of which they may act on one another. The part where the communications take place is that which must be regarded as the seat of the soul. . . . It is by this part that the soul acts on the body, and by the body on so many different beings. Now the soul acts only by the agency of the nerves; it follows, therefore, that the nerves of all the parts, which the soul governs, must terminate in this organ, which we regard as the intermediate seat of feeling and of action."

The soul is a unit. The nervous apparatus is complex. If the soul is to act through the nervous apparatus there must be a centre somewhere where all the impressions are received, a centre of all the nerve-fibres which convey the communications, and that centre will be the seat of the soul. That was the reasoning of the most ancient philosophers, and it still prevailed at the end of the XVIIIth century. Bonnet, notwithstanding his advanced notions, fell a victim to it. He was also wrong in assuming that we have ideas only by the aid of the senses. It is not the perfection of the senses which gives intelligence to the brain, but it is the perfection of the brain which determines the employment of the senses, the external instruments.

XAVIER BICHÂT (1771-1802),

biologist and author of "vitalism," is the **earliest exponent of modern descriptive anatomy** and scientific medicine. His "Anatomy and Physiology as applied to Medicine" (1800) established a new science, the science of "histology," but this term was introduced only a few years later (1819) by AUG. F. J. C. MAYER (1787-1865). It comprehends the study of the minute anatomy of the tissues of the human body, their classification and properties. **Life,** according to Bichât, is the totality of those functions which resist death.

He held that **every kind of sensation has its centre in the brain,** but the brain is never affected by the passions; the organs of organic life and the sympathetic ganglia are the exclusive seat of the latter. Lesions of the liver, stomach, spleen, intestines, heart, etc., produce a variety of affections which cease when the cause is removed. Fear, for instance, arises from the stomach, choler from the liver, goodness from the heart, joy from the intestines!

During the XVIIIth century the facts of living bodies were studied by two opposing schools; by the first as a deduction from physical and mechanical discoveries, by the second as the procedure of a metaphysical entity, the vital principle. In contrast with these opposing schools, Bichât endeavoured to present the laws of phenomena characteristic of living things, without attempting to penetrate their primal cause. "We can study the phenomena of light, of heat, of oxygen, without knowledge of what the essential nature of each of these things may be. And so in the study of life we can study the properties of organs animated by life without knowing what may be their vital principle." Abandoning all attempts to discuss the origin or the essential meaning of life, Bichât surveyed the facts of living bodies, and reached many of the great generalisations on which biological science is founded.

He wrote "Physiological Researches on Life and Death" (1800) and a text-book on "General Anatomy" (1801). He showed in the latter, the most important and influential of his works, by the aid of the microscope, that the body of one of the

higher animals is not only a collection of organs, but also a collection of *tissues*, and that the same is true of the higher plants.

He died, at the age of thirty-one, through an accident.

S. T. von SÖMMERING (1755-1830),

the physiologist, was a friend of Kant, but still accepted Descartes. He wrote, in 1791 (Hirn und Nervenlehre, Par. 83), that it is not improbable that **certain kinds of ideas arise in determinate parts of the brain**; that certain mental functions are executed in determinate parts; in short, that these different powers appropriate different provinces in the brain. In 1796 (*Über das Organ der Seele*, a work dedicated to Kant) **he localised the seat of the soul** (pneuma psychicon) **in the fluid of the cerebral ventricles.** During his anatomical studies on the real origin of the cranial nerves he was struck by the fact that nearly all terminated in the walls of the cerebral ventricles, where they are bathed by the serous fluid of these cavities. This led him to conclude that this fluid is the single medium of nervous activity, the sensorium commune, the organ and seat of the soul. Kant replied that the soul cannot be spatially localised; the site of the sensorium commune can be considered, not as the seat, but as the *organ* of the soul; and that the sensorium cannot be in the ventricular fluid, because water cannot be organised, and without organisation no matter can serve as the immediate organ of the soul.

Sömmering contributed to the advance of **ethnology** by his classical investigations into the comparative anatomy of the Negro and the European. We shall have occasion to refer to him frequently in the succeeding part of this work.

GEORGE PROCHASKA (1749-1820),

pupil of A. de Haen, Professor of Anatomy at Prague (1771-91), afterwards at Vienna, in his work on "The Functions of the Nervous System," 1784, brings us very near to the **localisation of mental functions** in the brain. He says:

"It is our consciousness and a certain peculiar feeling which convinces everyone that he thinks with his brain. But since the cerebrum as well as the cerebellum is composed of many parts variously figured, it is probable that nature, which never works in vain, has destined those parts to various uses, in that **the various faculties of mind seem to require different parts of the cerebrum and cerebellum for their production.** . . . Hitherto it has not been possible to determine what portions of the cerebrum or cerebellum are specially subservient to this or that faculty of the mind." He regretted that the whole subject was still in obscurity, and thought with Haller "that no light can be thrown upon it in any other way than by a careful dissection of the brains of fatuous persons, apoplectics, and such as have other disorders of the understanding."

Prochaska was an **adherent of the "faculty psychology,"** and the faculties he expected to be localised were those of Wolff's description. In his "Physiology of Man," Par. 340, he says that "it is beyond all doubt that the internal senses—the faculties of perception, attention, imagination, memory, and so forth, are the results of the mutual action of the organisation of the brain and the faculties of the soul. For, in proportion as the development and perfection of the brain advance through the influence of time and exercise, the understanding equally increases; and, on the contrary, whatever impedes the development of the brain weakens or mutilates these powers. On this account, also, the faculties of the understanding are not alike in all men; and for the same reason, any disease which operates either directly or indirectly on the brain may produce insanity, the entire loss of consciousness, or only the loss of memory." Hitherto it had not been possible to determine what

portion of the cerebrum or cerebellum is especially subservient to this or that faculty ; but " it is by no means improbable that each division of the intellect has its allotted organ in the brain, so that there is one for the *perceptions*, another for the *understanding*, probably others also for the *will*, and *imagination*, and *memory*, which act wonderfully in concert and mutually excite each other to action." Again, he says that " the impressions which are excited in the sensorium of the mind through the external senses and their nerves are arranged and prepared by means of numerous faculties and organs, in a wonderful, and to our understanding an incomprehensible, manner, so that from them the most beautiful and interesting functions arise, which are called thought and consciousness ; and the parts into which they can be divided are called the internal senses." But he adds : " But we cannot yet tell with certainty what part of the brain is necessary to this or that internal sense." Still, he coincides with BOERHAAVE in the supposition that **the seat of the perceptive faculty must be very remote from that of the imagination,** because during sleep the imagination may be in a high state of activity, whilst the perceptive faculty is inactive. This is the reason, he says, that in sleep the ideas are so confused, and do not begin to recover their distinctness until the perceptive faculty awakes.

Prochaska—as all other physiologists until **GALL**—still searched for the **sensorium commune.** He says : " The sensorium commune reflects the sensorial impressions into motor by definite laws peculiar to itself, and independently of consciousness, and since we laid down that the sensorium commune comprises the medulla oblongata, medulla spinalis, and the origin of all the nerves, it follows that the cerebrum and cerebellum, together with their connections, the sensorium commune excepted, constitute the organs of the faculty of thought ; and as in some animals these organs are entirely wanting, it is fair to conjecture that the faculty of thought is also wanting, and that they exist solely in virtue of the *vis nervosa* of the sensorium commune and of the nerves with which they are endowed."

Prochaska was also one of those physiologists who **doubted the hypothesis of the animal spirits.** In 1784 he wrote : " The arguments adduced in its favour prove nothing when carefully analysed, and the whole hypothesis is altogether devoid of truth."

J. M. de DÉGÉRANDO (1772-1842),

French physiologist, had as little expectation as Haller, Van Swieten, and Prochaska that we should ever be able to determine with certainty the organs of the different faculties. He admitted, however, an essential difference between the different functions, and explained the association of ideas in his work, " Des signes et de l'art de penser " (1800), in the following manner : " The vibration," he says, " which takes place in one organ is communicated to another or to several, and awakens the impressions deposited there."

THE END OF THE DOCTRINE OF " ANIMAL SPIRITS "

The " animal spirits " were assumed to be a very fine and subtle ethereal fluid elaborated in the brain and used by the soul in the performance of its functions. " Not," observed GALEN (131-201), " that this animal spirit is the substance of the soul, but it is its prime agent while inhabiting the brain." The principal ground for the belief in the existence of the animal spirits seems to have been the idea that the brain is a secretory organ—an idea which was suggested by the great quantity of blood sent to it and by some supposed resemblances in its structure to other secreting glands. Yet as nothing cognisable by the senses was produced by it, it was concluded that it must secrete something of a subtle or ethereal nature peculiarly

suited to the performance of the functions which belong to the brain, and which are unlike those of other material substances.

It was after the "animal spirits" were ejected from the ventricles that—as MALPIGHI, SYLVIUS, and WILLIS attempted to show—they were secreted by the cortical substance, whence they were received by the medullary substance, to be transmitted by it to the nerves of the whole body. If the brain is a gland, as even the great MALPIGHI (1628-1694) believed—it must secrete. What? The answer was immediate—animal spirits—about the existence of which the great majority of men had no doubt, and about whose nature and activity they talked as glibly as though they had been seen and weighed and measured. With this explanation of mental life they were content, and so, wrapped about with mists of their own making, they stood still on the road that leads to knowledge; and they advanced only when the animal spirits had been banished. Among those who had denied the existence of animal spirits were AVICENNA, FELIX PLATER, and VAN HELMONT. Long before Prochaska, WEPFER (1620-1695), the discoverer of the hæmorrhagic nature of apoplexy (1658), attempted to overthrow the doctrine, which was defended by Willis.

The REV. STEPHEN HALES (1677-1761), known also for his experiments on the blood pressure of animals and his contributions to plant physiology, studied the form of muscles at rest and in contraction and speculated that what we now call a nervous impulse, but which was then spoken of as the animal spirits, might possibly be of an electric nature.

Opponents of the animal spirits were also found in the Stahlians, who maintained that all the functions of the nerves depended directly on the soul, and rejected the animal spirits as useless. But the Stahlian doctrines being overturned, notably by HALLER (1708-1777), the animal spirits were re-established, or, rather, continued.

After it had been fully decided that the animal spirits were not generated in the ventricles of the brain, nor generated in the brain, to be collected in the ventricles, still all believed in the use of the ventricles as receptacles for the effete matters which flow towards the ventricles after the secretion of the spirits and the nutrition of the brain, escaping partly in the nostrils and partly through the supposed ducts from the pituitary gland to the fauces, forming the mucous matter there, and if in abundance causing coryza and catarrh. This doctrine was opposed by C. V. SCHNEIDER (1614-1680), professor in Wittenberg (who, in his work *De morbis capitis seu cephalicis illis*, 1669, opposed also the localisation theory of Galen and the Arabs), showing that all the foramina of the cribriform plate were closed by a firmly adherent dura mater, and that there were no ducts passing down to the fauces: that catarrhs never collected in the ventricles of the brain, but had their seat in the pituitary membrane of the nares and fauces, which, from being more exactly described by him, was called the *Schneiderian membrane*. Still, as we have seen, there were a number of anatomists who adhered to the old doctrine.

When the animal spirits had been banished, their place was taken by the *vis nervosa*—a term used by HALLER, and defined by UNZER and PROCHASKA to designate the agent (as yet unknown) by which the nervous system is rendered fit for the performance of its functions.

VIEWS ON INSANITY

The housing of the insane and the manner of their treatment during the XVIth and XVIIth centuries were a disgrace to humanity. No reform took place till the beginning of the XIXth century. Since in Chapter XV. the state of the insane prior to the reform will be fully described, this part of the subject need not be dealt with here. But the history of the speculations and investigations on the functions of the brain would not be complete without mention of some of the physicians who held enlightened views of the nature of mental derangement.

LORENZO BELLINI (1643-1704), in his work "De morbis capitis," Bologna (1683), gave a good description of the symptoms of melancholia, especially as regards aboulia and mental inhibition.

MORIZ HOFFMANN (1622-1698), in 1662, proposed transfusion of blood for the cure of melancholia, and **JEAN BAPTISTE DENIS** (-1704) in 1687 carried it out on a patient and claimed complete recovery. **SIR GEORGE ENT** (1604-1689) proposed to introduce the same treatment in England in 1667, but failed to convince the medical faculty. **KLEIN**, in 1680, and **M. ETTMÜLLER** (1644-1683), in 1682, recommended the same treatment in Germany.

ELIAS CAMERARIUS (1673-1734), professor at Tübingen, declared disturbances of the circulation in the brain to be the origin of both melancholia and mania, in opposition to the current belief in the XVIIIth century that mental derangement was due to abnormal conditions of the animal spirits.

WILLIAM BATTIE (1704-1776), in his "Treatise on Madness," London (1758), attached special significance to the growth of spiculæ in the interior of the skull-cap as an etiological factor.

A. CH. LORRIE (1726-1783) made observations on the pulsations of the brain, and treated in his work "De Melancholia," Paris (1762), of insanity in general. He divided the symptoms according to the various regions which originate them or which they affect. The German alienist, **FRIEDRICH NASSE** (1778-1851), did the same.

A. LE CAMUS (1722-1772), in his work "Médecine de l'Ésprit" (1769), traced the origin of disorders of the "understanding" to the derangement of the mechanism of the body and advised treatment on this basis.

R. A. VOGEL (1724-1774), in his work "*Academicæ prælectiones de cognoscendis et curandis corp. hum. affectibus*," Göttingen (1772), distinguished six varieties of mental derangement: mania, melancholia, fatuitas, stupiditas, amentia, and oblivio. A more minute classification was furnished by **F. BOISSIER DE SAUVAGES** (1706-1767) in his *Nosologia Methodica*, Leyden (1760).

ZÜCKERT (1737-1778) of Berlin, in his work "Von den Leidenschaften" (1770), attempted to trace mental disorders to the influence of abnormal emotions and passions.

F. C. G. SCHEIDEMANTEL (1735-1796), in his book on "Die Leidenschaften als Heilmittel betrachtet," Hildburghausen (1787), recommended that patients who are not amenable to persuasive treatment should be provoked to fright, anger, or other strong emotions, which tend to produce changes in the functions of the body favouring their recovery. He gives details of what emotions to arouse in the various forms of insanity. Of similar tendency is the work "Traité de nerfs et de leur maladies," (Paris, 1782), by **S. A. TISSOT** (1728-1797), and the Prize Essay "De l'influence des passions de l'âme dans les maladies, et des moyens d'en corriger des mauvais effets," Paris (1798), by **C. J. TISSOT** (1750-1826), The latter recommended amongst other means "music" as a relief for sadness, and was altogether a strong advocate of psychotherapy.

THOMAS ARNOLD (1742-1826), published a thorough treatise on Insanity, Leicester, 1782, in which he classified mental disorders on psychological lines and gave due attention to pathological anatomy.

W. PERFECT (1740-1789) published, among other books, "Select Cases of Insanity," Rochester (1787), in which he expressed the view that in the greater number of cases hereditary predisposition is the cause, and we should find it, if we could only trace the family history back far enough.

A. HARPER, in his "Treatise on Insanity," London (1789), laid stress on treating the body as well as the mind in mental disorders. All excitants should be avoided, therefore "all forcible measures." The strict confinement in cells hinders recovery.

FAULKNER'S book, "Observations on the general and improper treatment of insanity, with a plan for the more speedy and effectual recovery of insane persons," London (1790), dealt principally with psychotherapy and the *early treatment* of mental disorders, before the asylum became necessary.

WILLIAM PARGETER'S essay, "Observations on Maniacal Disorders," London (1792), mentioned, besides the recognised causes of insanity, *localised cerebral injuries*. He did not think pathological observations post-mortem would disclose the nature of

insanity, since we cannot distinguish between cause and effect. His treatment was psychical, but he did not undervalue natural and medicinal remedies.

VINCENZO CHIARUGI (1759-1822) wrote a work, "Della Pazzia in genere e in spezie," Florence (1793), in three volumes, which comprised all that was known of insanity from ancient times to date. He divided insanity in three principal forms: (1) Melancholia, a partial derangement; (2) Mania; (3) Dementia—the latter two being complete derangements. All three have their subdivisions. He inaugurated in Italy post-mortem examination of the brains of insane.

L. H. C. NIEMAYER (1775-1800), in a Prize Essay, "Commentar de commercio inter animi pathemata," Göttingen (1795), recommended Scheidemantel's method of influencing the patients by definite emotions on the ground that they affect the "internal secretions," which act on the blood and through it on the nervous system.

J. H. BOLTEN, in his work "Gedanken von psychologischen Kuren," Halle (1751), advocated psychotherapy on strictly medico-psychological lines.

BENJAMIN RUSH (1745-1813), professor of medicine in the University of Philadelphia, in his "Diseases of the Mind," maintained that insanity is not a disease of the brain, but an affection of the blood and the cerebral arteries. He conceded that the brain is the instrument of the mind, but stated that he could find no evidence of brain disease in cases of insanity. He also insisted that debility is the predisposing cause of all disease. He attended President Washington in his last illness (1797).

ERNST PLATNER (1744-1818) observed the cranial abnormalities in the insane. He ("Specimen de vi corporis," Leipsic, 1767) and **J. F. MECKEL** (1724-1774), in the "Mêmoires de l'Académie Royale à Berlin," vol. xx., 1764) noticed the differences in the specific gravity of the brains of sane and insane (maniacs and melancholiacs).

JOHN FERRIAR (1761-1815), in his "Medical Histories and Reflections," Washington (1792), recommended prolonged warm baths for maniacs and cold baths for melancholiacs.

JOHN HASLAM (1764-1844), of Bethlem Hospital, in his "Observations on Insanity," London (1798), held that the intellect is involved in both mania and melancholia; only the emotional state is different. Prevention is better than treatment, consequently education should be directed early towards the discipline of the emotions and passions. He was the first to describe "General Paralysis of the Insane."

ALEXANDER CRICHTON (1763-1856) wrote a fairly complete treatise on "Mental Derangement," London (1798). He traced the origin of all insanity to changes in the bloodvessels.

NOTE

Here ends **PART I.** With the ascendancy of the natural sciences in the XIXth century, speculations about the soul, and metaphysics in general, fell into neglect, and philosophy became almost apologetic in her tone. The philosophers began to devote themselves to a more critical study of the particular branches of their field, like logic, psychology, ethics, æstheticism, and the history of philosophy, and fought shy of system-building. Brain physiology became at the same time a more exact science.

PART II

THE HISTORY OF PHILOSOPHY AND SCIENCE IN THE XIXth CENTURY

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THE HISTORY OF PHILOSOPHY AND SCIENCE in the XIXth century

SECTION I

FRANCIS JOSEPH GALL: AN UNACKNOWLEDGED GENIUS

CHAPTER XI

GALL AS ANATOMIST

FRANCIS JOSEPH GALL (1758-1828),

WHOSE biography we shall give in a later chapter, was one of the greatest anatomists that ever lived. He has been so much maligned and misrepresented—mostly on second-hand evidence—that I think it expedient to give most liberal quotations from his own works, **to enable the reader to form his own independent judgment.** Here is a list of his most important discoveries—announced already in the year 1796, but published in book-form only between 1808 and 1820. Most of these discoveries have been acknowledged at some time or other by independent writers, and it will be seen that any single one of them should have sufficed to bring him fame.

1. **Gall demonstrated the evolution of the brain** and the successive development of the different parts of the nervous system.

He traced the development of the brain from the smallest ganglia in insects to the first appearance of convolutions in higher animals. He had many arguments with contemporary naturalists and anatomists on this subject, more especially about the resemblances of the brains of the orang-outang and man.

He was the first to describe the formation and development of the brain in the fœtus, and to call attention to the simplicity of the convolutions in new-born infants, and in idiots, as compared with the complexity of the brain of the normal adult. Dr. **PAUL TOPINARD** (1830-1911) in his "Anthropology," 1890, assigns the credit of this discovery to **ANT. DESMOULINS** (1796-1828), in 1825, when Gall's work had been before the public for some years; but Topinard deems Gall's work an "imaginary fancy."

In the report on Gall's Memoir, the Committee of the Institute of France declared: "In the nervous system all is formed simultaneously," whereas Gall had asserted that in the fœtus of man, as well as of animals, the brain is only gradually formed. He says (in his work on "Sur les Fonctions du Cerveau," six vols., Paris, 1822-26, from which this and all succeeding quotations are taken, when not otherwise stated):

"In the human fœtus of about six months, the nerves of the vertebral column,

of the muscles of the eye and the trifacial nerves are sooner formed than the olfactory nerves, and the latter before the auditory and the optic nerves, the pyramids, and the annular protuberance, in which scarcely any trace of nervous filaments are perceptible. The peduncles of the brain, on the surface of which the bundles of fibres are so distinct afterwards, at this time appear to consist only of a mass of grey substances ; the optic thalami, corpora striata, and the hemispheres do not contain any distinct filament (without preparation and to the naked eye) ; they are discovered sooner in the posterior and middle, than in the anterior lobes. . . ."

" But, without intending to undervalue the advantages to be derived from the examination of the fœtal brain in its different ages, I have always inclined to the opinion that the study of the brain of the various classes of animals below man is a surer method of attaining knowledge of the general laws of the organisation of the nervous system and the brain. . . . I would wish, then, that the successive development of the brain should be studied mostly in the fœtus ; but, to know the true structure of this organ, the continuity and connection of its parts, the direction and the varied interlacings of its fibrils, their origin, reinforcements, and expansion, etc., I should always prefer either the adult human brain, or brains less complex, but more or less analogous to it."

2. **Gall was the first to unfold the convolutions of the brain** by his new method of dissection, descriptions of which appeared later in Cloquet's " Manuel d'Anatomie descriptif " (1816) and Green & South's " Dissector's Manual " (London, 1825).

Gall had a hospital patient in whose case he was much interested—a case of hydrocephalus—which led to the discovery of the unfolding of the brain. She was a small woman, and " in spite of her hydrocephalus, appeared to have intellectual faculties in no respect inferior to those generally possessed by women in her station." Her head was so large that Gall thought it must contain at least four pounds of water. Her death occurred in her fifty-fifth year, and he found, in fact, more than four pounds of water in the cerebral cavities, which had distended the superior portion of the brain to a smooth and thin surface, instead of a mass of corrugated convolutions. It is from this brain that he learned to unfold the convolutions and other anatomical lessons. Previous to this discovery it was supposed by anatomists that the acridity of the water liquefied the brain.

Gall's method—**the dissection of the brain stem from below upwards and tracing the fibres from the spinal cord to the cortex**—was a new procedure in the study of the brain, and it was through the skilful use of this method that he disclosed some of the intricacies of the anatomy of the nervous system.

The mode of examining the brain then in use among anatomists was, after removing the membranes which enclose it, to cut through it in different directions, to scrape away a large portion of its substance, till the lower structures became visible.

By his discovery of the unfolding of the convolutions and the fibrous consistence of the white matter of the brain, Gall proved that both together were not the pulpy mass that his predecessors and contemporaries believed them to be. He showed that by the dilatation of the lateral ventricles in hydrocephalic heads, the brain may be distended without any destruction of its parts. He gave regular demonstrations before doctors from all parts of Europe, a number of whom published accounts of what they had seen. Moreover, Gall himself went on a tour visiting the various German and other universities, everywhere explaining his methods and discoveries.

Among his audience at Halle in 1805 was **J. C. REIL** (1759-1813), who became famous as an anatomist, and many have attributed Gall's discoveries and scientific method of dissection to him. But Reil himself made no such claim ; in fact, his

researches were published only two years later, in 1807, in the "Archives of Physiology."

Again, **S. T. v. SÖMMERING** (1755-1830), in a memoir to the Academy of Munich, 1808, claimed that the discovery of the unfolding of the convolutions was a very ancient one, made by BERENGARI (1470-1530) of Bologna in 1521; but, as Gall says: "Berengari merely describes the convolutions of the brain as they appear to the eye; he compares them to folds, and there is not a single word in his work which would lead us to presume that he had any idea of the unfolding of the brain."

Gall was able to unfold the convolutions without tearing of the fibres or breaking of the small blood vessels. Others evidently did not succeed so well.

Thus **K. A. RUDOLPHI** (1771-1832), the teacher of Johannes Müller, in the "Grundriss der Physiologie," 1823, said: "I have tried all the manipulations indicated by Gall, in order to unfold the brain, and I have always found that this cannot be effected without severely lacerating it, and that the convolutions are never unfolded in a regular and natural manner, as he pretends." To which Gall replied: "Those who cannot succeed in this artificial operation, certainly have a right to say, that they have not been able to convince themselves of this by their own dexterity; but to hear them, one would believe that they accused me of imposture and charlatanism. But I repeat what I have said in the discussion of the same subject in the work of TIEDEMANN—I invite Sömmering, Rudolphi, Blainville, etc., to come and see with their own eyes this unfolding, which is so inconceivable, and, in the course of half an hour, they will be enabled to do it with as much promptitude as myself."

Another anatomist who is supposed to have anticipated Gall's method of anatomical dissection and views on hydrocephalus is **SIR EVERARD HOME** (1756-1832), brother-in-law of the celebrated John Hunter. (Philosophical Transactions, 1814). But Home must have been fully acquainted with Gall's work in this department, considering the number of German books which had already appeared, besides the Memoir to the Institute of France and Gall's reply to it, in 1808, and the accounts which had appeared in English medical journals and books. In 1806 there was published in the "Edinburgh Medical and Surgical Journal," by **T. C. ROSENMÜLLER** (1771-1820), Professor of Anatomy in Leipsic University, an "Account of Dr. Gall's Discoveries regarding the Structure of the Brain," and an anonymous publication on Gall's Theory with Hufeland's observations thereon, in English, appeared the same year, a copy of which is in my possession. Yet Sir Everard Home seems to have made the claim, and **JOHN BOSTOCK** (1773-1846), the anatomist, believed him. Hence the indignation of Gall, who replied:

"Does Sir Everard Home mean to appropriate to himself the discovery of the unfolding of the cerebral hemispheres? Several years before I undertook my travels, which were commenced in 1805, in my lectures at Vienna, before numerous auditors of all nations, I demonstrated the unfolding of the brain in the most famous universities of Germany, in Denmark, Holland, Switzerland, etc., and finally, in 1807, in Paris. Would not Sir Everard Home have been informed of it? My discovery created too great a sensation, to admit of the supposition that he was not. The memoir before the Institute, and the report of that society upon it, were made in 1808; the answer to that report appeared in 1809; this answer was sent to the "Royal Society" the same year. In 1810, the first volume of my large work, on the Anatomy of the Brain, was sold even in London; and in that volume it is expressly said, as it is in the memoir presented to the Institute, and in my answer, that it was the observation of hydrocephalic cases which led me to the discovery of this unfolding. Finally, in the presence of the London Medical and Chirurgical Society, Dr. Spurzheim demonstrated the structure and expansion of the brain [he had been Gall's prosector], previous to the time when Sir Everard Home read his

memoir to the Royal Society. Sir Everard Home, then, could not be ignorant of my discovery. What motive has he, then, in claiming it ? "

That Sir Everard Home was a dishonest man is shown by another disgraceful incident. Home prepared the catalogue of Hunter's museum and then burned his manuscripts, that he might conceal the plagiarisms of which he had been guilty in writing his book on " Comparative Anatomy."

3. **Gall was the first to demonstrate that the white matter of the brain is fibrous in structure.**

This was denied by many anatomists of his day ; for example, by the Brothers **WENZEL** (Josef Wenzel (1768-1806) and Karl Wenzel (1769-1827), both anatomists), **J. F. ACKERMANN** (1765-1815), etc. ; and even the Committee of the French Academy spoke of it only as " pulp." JOHN GORDON, Lecturer on Anatomy in Edinburgh University, also denied it. In 1802, John and Charles Bell published *The Anatomy of the Human Body*, in the third volume of which CHARLES BELL (1774-1842) gave descriptions of the brain and made no mention of its fibrous structure. The state of knowledge of cerebral anatomy in those days may be judged from this fact. By the method then in vogue of making thin sections of the brain, right through the hemispheres, down to the corpus callosum, vertically, horizontally, obliquely, from below upwards, from above downwards, the surface of the brain appeared to the observer merely as a gelatinous substance, more or less coloured ; and they failed to discover that the white part of the brain consisted of fibres going in various directions ; for these fibres are so delicate and so closely connected, that, when cut, they appear to form only a uniform and pulpy mass. As for the nerves, the general view of them was that they all took their rise in the brain, and the spinal cord was a prolongation of that organ.

In answer to the general belief that the brain consists of a soft and pulpy mass, uniform and homogeneous, solely designed to support the vessels and assist their divisions, Gall explained that if it were pulp, it would be washed or blown away by the impulse of water or air and would not separate into layers as it does ; and that the fibres and bundles of fibres are distinctly visible, that they go in different directions, form their own expansions, and that " they are developed at different periods of life," etc.

NICOLAUS STENSON (1638-1686) of Copenhagen, in his " Anatomy of the Brain," 1667, was really the first to surmise (if not to demonstrate) that the white matter of the brain is fibrous ; but his suggestion was disregarded. He wrote : " If, indeed, the white substance (of the brain) of which I am speaking be, as in most places it seems to be, wholly fibrous in nature, we must necessarily admit that the arrangement of its fibres is made according to some definite pattern, on which, doubtless, depends the diversity of sensations and movements."

4. **Gall was the first to declare that the grey matter of the brain and spinal cord gives origin to the nervous fibres and supplies their nutrient energy.**

Even those who acknowledged the white matter to be fibrous in consistency had the curious notion that it was formed before the grey matter ; for example, Serres, Rolando, Burdach and Tiedemann.

E. R. A. SERRES (1787-1868), in his " Comparative Anatomy of the Brain," Paris, 1824, said : " One of the physical laws of organic matter is that dissimilar organs may discharge the same function. The non-fibrous grey substance is not first formed, and cannot give origin to the fibrous white substance. The nervous system, as well as the whole organism, is not formed from the centre to the periphery, but from the periphery to the centre." These are the two propositions to which Serres recurred on almost every page of his work. He went on to say : " Gall's hypothesis is founded on the idea of the central development of the nervous system.

It supposes that the spinal marrow and encephalon are formed from the centre to the circumference. The grey matter in the cerebro-spinal axis is considered to exist previous to the white matter at the periphery, to the nerves implanted in it, to the inter-vertebral ganglia still more eccentric, and to the nerves that from these ganglia radiate to every part of the animal. . . . This hypothesis is utterly opposed to facts. We see that the inter-vertebral ganglia do not furnish the substance of the nerves which radiate from them, since these nerves exist before they do. We see that the spinal matter is not, and cannot furnish the substance of the cords that are implanted in it, since these cords do not primarily communicate with it, and frequently even exist without it. We see, finally, that the grey substance of this spinal axis cannot be the organ of the nutrition of the white substance, since the latter is invariably formed first." In conclusion, he reiterates his belief that the nervous system is formed from the circumference to the centre, and not from the centre to the circumference, and invokes the judgment of the Royal Academy of Sciences on this point.

Gall, in his reply to Serres, pointed to the development of the spinal cord in the embryo, that it exists before the development of the nerves ; and he also showed by the embryonic development of the cortex of the brain that it arises before the fibrous structure. He pointed out other errors to Serres, and continued :

" I much prefer facts to the judgment of Academies. If the latter had the preference, where should we be, now that so many Academies have come into existence and furnish thousands of reports ; more especially, if these reports are received as law by the whole world ! According to this hypothesis, the fingers and toes are formed before the trunks of these extremities, and the latter before the central parts of the body. In the same way, the leaves and flowers should be formed before the branches, the branches before the stem, and the stem before the root."

K. F. BURDACH (1776-1847) of Königsberg, in his work " Vom Bau und Leben des Gehirns," 1819), expresses the same view as Serres. He said :

" My manner of considering the nervous system of the trunk is founded on the general principle, that *unity* is the essence of sensibility, and that, to comprehend the origin and genesis of the soul, we must proceed from the circumference, and stop at the centre. . . . The nervous system of the trunk is a network, and in order that intuition should not stop in this network, we must seek for the points, where the commencement is subject to no doubt. But where could this take place, if not in the peripheric extremities ? It is only by starting from these, that we uninterruptedly acquire a general knowledge."

In Burdach we see a mistaken philosophy influencing physiology. As Gall said :

" The transcendental philosophy of Germany has taken possession of the heads of our French philosophers. To hear these gentlemen, everything in the nervous system is homogeneous, all is unity ; the white fibrous substance gives origin to the non-fibrous substance ; the nerves are formed from the circumference to the centre, and not from the centre to the circumference. . . . It is false to say that the nerves proceed to the ganglia, instead of saying that they arise, or depart from them. It is, as if we should say, that the branches crossed to the trunk, instead of growing from it."

F. TIEDEMANN (1781-1861), Professor of Anatomy in Heidelberg University, wrote in his work on " Anatomie und Bildungsschichte des Gehirns im Fœtus des Menschen," 1816 :

" Gall is in error in affirming that the grey substance, *to which he gives the name*

of matrix of the nerves, is the first formed, and is that which produces and nourishes the nerves." Gall replied : " I ask M. Tiedemann how he can infer from these data that the pulpy, non-fibrous substance develops after the white fibrous substance ? If he would examine without prejudice, he would find that the pulpy, gelatinous substance, the cortical substance, exists a long time before any trace of fibrous matter is perceptible and nourishes and multiplies the nervous filaments ; no matter, whether this substance, as in the spinal cord, is placed internally to the fibrous, or externally, as in the cerebral hemispheres."

Tiedemann believed besides that the grey matter of the brain is formed in convolutions by the action of the pia mater, the membrane investing them. He said :

" The convolutions are formed in consequence of the increase in the pia mater, which, in enlarging, bends and sinks its folds into the soft layer of cerebral substance, which covers the external portion of the hemispheres."

But Gall explained :

" I appeal to the good sense of my readers and of M. Tiedemann himself. . . . The pia mater is not a membrane, which, in compressing the brain, would make notches on its surface ; it is a tissue of sanguinous vessels destined to nourish, penetrate, accompany, and to excite to activity, the cerebral substance. . . . Tiedemann so frequently tells us that the pia mater everywhere secretes a non-fibrous pulpy substance, that, in tearing off the pia mater, this substance remains adherent to it, in the form of flakes. . . . If the skin of an animal, the rind of a fruit, the bark of a tree, are placed on the surface, are they, on that account, applied from without inwards, or from within outwards ?

" Let it be borne in mind, that it is not the fibrous, but the gelatinous, non-fibrous substance, that is penetrated by an abundant tissue of blood-vessels ; that the whole formation of every organ is necessarily effected by the vascular system. Is it not then conformable to physiological principles to seek the primary origin of the nervous filaments in a substance penetrated by an infinity of blood-vessels ? When one is forced to assert, that, wherever ganglia exist, filaments come from them ; that, wherever a nerve is united to a ganglion, it goes from it increased in energy . . . it is difficult to understand, how one can fail to distinguish in the non-fibrous substance the primary and sole origin of the nervous filaments."

5. **Gall was the first to show the enlargements of the spinal cord in the cervical, dorsal, and the lumbar regions.**

RUDOLPHI (1771-1832), the famous German physiologist, professed not to be able to see these enlargements, and expressed doubt as to the origin of the nerves from the grey substance in the interior of the cord, as Gall had asserted to be the case. Serres, Carus, and the Committee of the Institute of France also denied the fact ; and Tiedemann wrote :

" As in the embryo the medulla spinalis is found in the lowest state of organisation, these enlargements should be distinctly visible ; but, on examining it from its first growth, nothing like enlargements or ganglia can be discovered." To which Gall replied : " It is because, from the commencement, the medulla spinalis is found but little developed, and because the period for the appearance of the nerves has not yet arrived, that these enlargements cannot be distinctly perceived. How can they be seen in the medulla, which as yet has no consistence, which cannot as yet be separated from its sheath ? Have not anatomists, and even the Committee of the Institute themselves, denied the existence of these enlargements, so distinct and so evident ? "

REIL thought that these ganglionic enlargements have the function of modifying impressions made upon nerves.

6. **Gall was the first to " demonstrate " the course of the motor nerves through the**

pyramids, cerebral peduncles, corpora striata, thence radiating like a fan, thus spread out towards the periphery of the hemispheres. He demonstrated also the converging and diverging systems of fibres in the brain, and showed the formation of the great commissure of the hemispheres.

VIEUSSENS, in 1684, had already begun to trace the nerve fibres from the pyramids to the corpus striatum and hemispheres in three tracts; but he does not seem to have carried conviction, for anatomists in Gall's time denied the fact.

RUDOLPHI did not admit the diverging of the fibres or that they change their direction at all, and believed "that we shall find therein a very important argument for the unity of the brain."

In answer to TIEDEMANN'S denial Gall said:

"Such is the diverging system of nerve fibres of the cerebrum. All anatomists who follow the progress of the science have adopted this exposition of the structure since our public demonstrations and the publication of our anatomy of the brain. . . . Reil saw our demonstration of the brain and was convinced of this phenomenon (the converging and diverging systems). And I think that, if M. Tiedemann would witness one of our dissections, or rather one of our demonstrations of the developments of the brain, he would soon become a believer in the two systems of the diverging and converging fibres."

SÖMMERING, in opposition to Gall's discovery of the ascending sensory and descending motor nerve fibres from the cortex of the brain—the two sets being always found together—declared that all the motor and sensory nerve-fibres take their origin in the walls of the ventricles, and that they are united by no other material than the cerebro-spinal fluid, which must be regarded as the seat of the soul.

This discovery is sometimes attributed to REIL, but Reil never claimed to be the discoverer of the system of diverging and converging fibres, and his work was not published until some years after the visit of Gall to Halle, when Reil had said, as quoted by Prof. Bischoff (1781-1861) of Bonn, in the preface to his exposition of Gall's doctrine: "I have seen in the anatomical demonstrations of the brain, made by Gall, more than I thought that a man could discover in his whole life."

Let me add the acknowledgment of a modern authority, none less than Prof. PAUL FLECHSIG (1847-). He writes ("Gehirn und Seele," Leipsic, 1896):

"To Gall is due the merit of having proved by careful anatomical investigations that the white brain-substance consists of various systems of conducting fibres and thus to have prepared the way for the views of the present day, *especially for Meynert's projection system.*" Yet THEODOR MEYNERT (1833-1892) declared Gall to have been nothing less than a "swindler."

7. **To Gall must be attributed the credit of the first anatomical demonstration of the crossing of the nerve fibres in the pyramids.**

It had long been known to physicians as early as ARETÆUS (30-90) that lesions on one side of the brain produced loss of motion upon the opposite side of the body; but contemporary anatomists were divided upon the subject of decussation, while many denied altogether the crossing in the pyramids, as, for example, Gall's own teacher—Prochaska—as well as Barthez, Sabatier, Royer, Dumas, Bichât, Chaussier, Magendie, Desmoulins, Vicq d'Azyr, Haller, and Morgagni. It was through the labours of Gall that the actual decussation was first made a matter of ocular demonstration and the subject thus placed beyond the pale of controversy.

8. **Gall was the first to show the true origin of the olfactory, oculo-motorius, and trigeminal nerves** (the latter also called the "Nerve of Bell," who discovered its more minute anatomy), **as well as of the nervus abducens and the optic nerve.**

He traced the optic nerve to the anterior pair of the corpora quadrigemina,

whereas his contemporaries—Rolando, Rudolphi, Tiedemann, etc.—declared the optic thalamus to be its origin.

Before the publication of Gall's memoir, Cuvier still derived the olfactory nerve from the corpora striata, and the optic from the thalamus.

SERRES said that the auditory and the facial nerves have not the origin which Gall supposes, for " these nerves are formed *without* the cranium and at first with no communication with the encephalon."

9. **Gall described the structure of the cerebellum in man and animals.** He described for the first time the formation and structure of the corpus callosum, the annular protuberance, the pineal gland, cornu ammonis, and other parts of the brain. **He described also the " insula," that portion of brain within the fissure of Sylvius, and resting on the corpus striatum,** which has been falsely attributed to Reil and named the " Island of Reil," though Reil's first mention of the insula was only in 1809.

10. **Gall considered the cortex of the brain to contain—besides the centres for the highest psychical activities—the centres for motion and sensation,** centres which have been discovered about seventy years later.

He showed that the cerebral hemispheres have specific local connection with certain muscles, as he believed, with those that are employed by the various mental powers in the manifestation of their functions. In that part of his large work dealing with the " **Expression of the Emotions** " he shows how certain faculties use definite groups of muscles, and holds that when their brain organs are stimulated so will corresponding movements occur ; but these cortical areas being no part of the instruments themselves, they may be removed without injuring the instruments which they only use. He explains : " As the brain alone is the seat of thought, the motions produced by thought must be derived from it. If the cause of voluntary motion existed in the same parts which executed it, each motion would exist after the destruction of the brain, and would not be augmented when this organ is irritated, nor suppressed by its compression."

Other writers on the Expression of the Emotions after Gall are : Sir Charles Bell (1806), Duchenne (1862), Gratiolet (1865), Charles Darwin (1872), Mantegazza, Piderit, Warner (1885), and H. Krukenberg (1913).

Such are in brief Gall's anatomical discoveries. They were received with enthusiasm by some, as, for example, by Reil, Loder, Hufeland ; others, like Walter Rudolphi, Sömmering, Tiedemann, denied them ; and again others, when they were no longer deniable, attributed them to Reil, Sir Everard Home, etc.

Professor J. G. WALTER (1734-1818), **of Berlin, declared Gall to be completely ignorant of anatomy** (quoted in " Edinburgh Medical and Surgical Journal," 1806).

On the other hand, the celebrated **C. W. v. HUFELAND** (1762-1836), Physician to the King of Prussia, said :

" It is only necessary to have eyes, and to open them, to be convinced of what Gall demonstrated concerning the dissection of the nerves, the crossing in the pyramids, etc."

J. C. v. LODER (1753-1832), of Jena and Halle, one of the great anatomists of Dr. Gall's time, wrote :

" Now that Gall has been at Halle, and I have had an opportunity, not only of listening to his lectures, but also of dissecting with him, either alone or **in the company of Reil,** and several others, nine human brains and fourteen of animals, I think I am able and entitled to pronounce my opinion of his doctrines. . . . The discoveries made by Gall are of the highest importance. Many of them possess such a degree of evidence that I cannot conceive how any one with good eyes can mistake them. I refer to the passage of the nerve fibres in the corpora pyramidalis,

nd thence into the corpora striata and hemispheres, the bundles of the spinal narrow, the origin of the motor nerves of the eyes, the trigeminal nerves, those of he sixth pair of nerves, etc. **These discoveries alone would be sufficient to render he name of Gall immortal.** They are the most important that have been made in natomy since that of an absorbent system. . . . **I acknowledge with Reil** that I ave found in Dr. Gall more than I believed it possible for a man to discover in a ifetime. . . . The unfolding of the convolutions is a capital thing. What have we ot the right to expect from further progress in a route thus opened? **I am shamed of myself for having, like others, for thirty years, cut up some hundreds of rains, as we slice up cheese,** and not perceived the forest by reason of the great umber of trees. The best thing we can do is to listen to the truth and learn what ve are ignorant of."

The celebrated **J. F. BLUMENBACH** (1752-1840), writing from Göttingen to Dr. J. A. ALBERS (1772-1821), of Bremen, on the 10th September, 1805, said:

"I need not inform you that I congratulate myself uncommonly on having heard Dr. Gall. The views which he maintains about the organisation of the brain, the derivation of some of the supposed cerebral nerves from the spinal cord . . . are to ny mind extremely important."

When Gall arrived at Paris, the most brilliant success attended at first his anat-omical demonstrations. But when Napoleon returned from his campaign in Germany, he over-awed the members of the Institute (see Chapter XVI.), and **Gall was denounced as a charlatan.** The adverse report on his memoir, presented to the Institute in 1808, followed almost as a matter of course.

His method of dissection was attributed to the ancients; though how they could have discovered the direction of the nerve fibres was not stated. The Committee of the Institute also pretended that VAROLIUS and VIEUSSENS had, two centuries before, done the same thing; whereas Vieussens dissected the brain from the centrum ovale, and Varolius began the dissection at the base, not to trace the parts upwards, but simply, he said, because the brain *compresses* these parts against the skull, especially in the dead body, and renders the ordinary method of dissecting from above inconvenient. Varolius had so false an idea of the anatomy of the brain that he conceived the crura were *offshoots* of the cerebrum and cerebellum and from the spinal cord, and declared *the spinal cord to be formed from the cerebrum.* These critics passed silently over a dozen points; as, for example, the formation of the convolutions of the hemispheres, the radiation of the nerve fibres, the progressive development of the brain in the different species of animals. They allowed, however, eighteen discoveries. The Report was signed by JAS. RÉNÉ TENON (1724-1816), ANT. PORTAL (1742-1832), R. B. SABATIER (1732-1811), PHILIPPE PINEL (1745-1826), and GEORGES CUVIER (1769-1832). A translation of it appeared in the "Edinburgh Medical and Surgical Journal," 1909.

The opponents of Gall seized upon this report with avidity. Another consequence was that some authors appropriated Gall's ideas without mentioning their source. Others praised him in some respects, but were careful to add sufficient blame; and a few others who became partisans of his openly were expelled from the learned societies.

That the Academy's report was biassed is shown by the fact that **J. P. FLOURENS** (1794-1867), who we shall see when we deal with other achievements of Gall, was Gall's greatest antagonist, yet wrote of him as "**the profound observer whose genius has opened for us the study of the anatomy and physiology of the brain.** I shall never forget the impression I received the first time I saw Gall dissect a brain. It seemed to me as if I had never seen this organ."

GEOFFROY ST. HILAIRE (1772-1844), in a letter to Dr. Dannecy, said: "I shall

always remember our astonishment, our sensations, our enthusiasm, on seeing Gall for the first time demonstrate his anatomical discoveries in the Jardin du Roi. The word ' brain ' will always call up to mind the name of Gall. **The brain has brought him inextinguishable renown,** and is entirely his, as much as the balloon is Montgolfier's, the moon is La Place's, and the fossil animals are Cuvier's."

DUCROTAY de BLAINVILLE (1777-1850), at the Academy of Natural Sciences on June 23rd, 1828, said that " Gall had given to the researches of the brain and nervous system an impulse and direction altogether new ; this new direction had diverted anatomists from the beaten track to which they had attached themselves before his labours ; and that if he had done nothing but this, and were all the points of his anatomy to be successfully contested and completely refuted, there would still remain to him the honour of having discovered a new impulse, and consequently to him must be referred as to its source all that may be valuable in future labours on this subject."

With reference to those discoveries of Gall which have been attributed to other anatomists, we must not forget that, though Gall's great work, of which the first volume deals exclusively with the anatomy of the brain and nervous system, was not published until 1809, his discoveries were made known to the world several years before that date through the publications of those who had attended his demonstrations and lectures (which he started in 1796), as by Froriep, Bischoff, J. F. Ackermann, Walter of Berlin, Walther of Bonn, Blöde, John Meyer of Naples, Démangeon, etc., and some of these books were translated into foreign languages ; and that the memoir on the anatomical discoveries was presented to the Institute of France in 1808, the report on which was sent to all the academies of the world.

LUIGI ROLANDO (1773-1831) was one of those from whom Gall was supposed to have taken some of his discoveries.

But Rolando (Saggio sopra la vera struttura del cervello, 1828) admitted that he had only three brains at his disposal, and in consequence we see a want of exactness in the description of the course of the fibres in the brain, in the description of the corpora striata ; and like all anatomists of his time he made the optic nerve arise from the thalamus opticus, the olfactory nerve from the anterior commissure ; the entire structure of the cerebellum was a great mystery to him ; he denied that any fibres come from the grey substance of the brain, and he declared he had observed that the cerebellum of an idiot was composed of only 324 laminæ, whereas that of an intelligent man consists of 700, and so on.

Rolando should be remembered, however, as having been the first to excite the surface of the brains of animals, after trephining the skull, more than forty years before Hitzig, and having observed convulsions being produced. He believed that the white substance, not the grey, produced particular movements, but he did not define them. The great Flourens did not think the cortex to be thus excitable, and held that the current travelled down to the structures at the base of the brain and to the spinal cord. Thus we have a dispute very similar to that of more recent times.

Rolando observed in injury of the cerebellum irregularity of movement but no paralysis. He was puzzled by the phenomenon, since he thought only the corpora striata were the regulators of muscular movements, so he assumed the cerebellum to be an electrical organ, which secreted a fluid analogous to the galvanic fluid, which was transported by the nerves to stimulate the muscles of locomotion. He waxed eloquent on his discovery that " the cerebellum is an organ, whose structure is precisely similar to the apparatus of Volta. What other proof can we desire to demonstrate that the cerebellum prepares a fluid analogous to that which the Voltaic instrument develops ? What more direct inference can be made, if we observe that all the influence of the nervous fluid on the muscles of locomotion

ceases if this organ is injured or destroyed? It appears to me that no one has insisted upon the necessity of admitting a particular mechanism, by means of which the fluid prepared in the cerebral electro-motor can be transmitted to the central extremity of the nerve, that may be regarded as a conductor by which this fluid is enabled to pass, in order to irritate the muscles which are to be put in motion."

Gall criticised Rolando and pointed out that "the new discoveries in physics and chemistry always become the warhorse of the physiologists. I have already proved that the cerebellum cannot be compared to the galvanic pile or to a Voltaic apparatus."

CUVIER (1769-1832) acknowledged in his Report on Flourens' experiments the achievements of Gall. He said:

"It is now known by the investigations of M. Gall that the spinal marrow is a mass of medullary matter, white externally, grey internally, divided longitudinally, from above downwards, into anterior and posterior columns, the *fasciculi* of which communicate with each other by means of transverse medullary fibres; that it swells out at particular distances; that it gives off at each swelling one pair of nerves; that the *medulla oblongata* is the upper part of the spinal marrow enclosed within the skull, which also gives off several pairs of nerves; that the fibres of communication between the two columns cross at the *medulla oblongata*, so that those of the right side proceed upwards into the left side, and *vice versa*; that these *fasciculi*, after having been enlarged, in the mammiferæ, a first time, by a mixture of grey matter, and having formed the prominence known by the name of *pons Varolii*, separate and take the name of *crura cerebri*, still continuing to give off nerves; that they are again enlarged, by a new mixture of grey matter, in order to form the masses commonly called the *optic thalami*; and a third time, to form those named *corpora striata*;—that from the whole external border of these last enlargements arises a lamina, more or less thick, more or less convoluted externally, according to the species, covered entirely on the outer surface with grey matter, forming what is called the *hemispheres*. This lamina, after having been reflected upon itself, in the middle of the convolutions, is united to that on the opposite side by one or more commissures or fasciculi, of transverse fibres, the largest of which, existing only in the mammiferæ, is named the *corpus callosum*. It is also known that, on the *crura cerebri*, behind the *optic thalami*, there are one or two pairs of smaller swellings; known when there are two pairs, as in the mammiferæ, by the name of *corpora quadrigemina*, and from the first of which the optic nerves appear to arise; that the olfactory nerve is the only one which does not evidently take its rise from the spinal marrow, or from its columns; finally, that the cerebellum, a single mass, white internally and cineritious externally, like the hemispheres, but often more divided by external folds, is placed transversely behind the corpora quadrigemina, and over the *medulla oblongata*, to which it is united by transverse bundles which are called the *crura cerebelli*, and which are inserted into the cerebellum at the sides of the *pons Varolii*."

Gall called attention to this report, because certain points in the anatomy of the brain, which were doubted or denied, in 1808, by the Committee that examined his memoir, were now admitted and adopted. But he corrected, among other statements made by Cuvier, the one where he speaks of the cerebellum as a single mass, and said that "he can refer only to the cerebellum of fishes, reptiles, and birds. The part which, in birds, constitutes the whole cerebellum, forms only the middle or fundamental portion in mammiferous animals. At each side of it, in the latter, there exists a lobe, more or less complicated, but always symmetrical with its counterpart on the opposite side. Consequently, the cerebellum of the mammiferæ belongs, like the brain, to the class of double organs."

It is interesting also to note Gall's **anticipation of there being different tracts in the spinal cord for the nerves of motion and for those of sensation.**

In 1802 Gall wrote:

" It has long been observed, that in palsy, voluntary motion and the sense of touch were generally destroyed at the same time ; but that sometimes the one ceased, while the other remained. From this it has been inferred that there are two sets of nerves. Anatomy has not yet demonstrated them ; but I believe that they exist, and for the following reasons. The same nervous fibres do not go to the muscles and to the skin, and each of these parts has a distinct function. The nerves which are necessary for voluntary motion cannot propagate the impressions of the sense of touch, nor the latter impressions of movement."

In vol. i. of his " Anatomy and Physiology of the Brain and Nervous System," Paris, 1810, Gall represented the spinal cord as possessing one tract for motion and another for sensation.

After 1810 Gall did no more original work, but was engaged with the publication of his material. But the various ideas he had thrown out evidently took root in different directions ; and so did the above suggestion.

In 1811 **CHARLES BELL** (1774-1842) published a tiny pamphlet entitled, " Idea of a new Anatomy of the Brain," issued for private circulation, wherein he put forward the *belief* that the nervous system was constructed on the principle that " the nerves are not single nerves possessing various powers, but bundles of different nerves, whose filaments are united for the convenience of distribution, but which are distinct in office as they are in origin from the brain."

It was not until twelve years later that he published his discovery in a communication to the Royal Society, that the anterior root of a spinal nerve is motor in function, the posterior root, sensory.

He proved that the nerves of motion and sensation, although running blended together in a common sheath, and in appearance constituting a single nerve, all the fibres of which served for the same purposes, were also, in reality, distinct organs, one serving for sensation and the other for motion, each capable of acting independently of the other, and each separately liable to disease.

F. MAGENDIE (1783-1855) had been working on this problem too, and furnished the experimental proof in 1822. **HERBERT MAYO** (1796-1852) was also engaged in investigating it.

Magendie said :

" I have proved by direct experiments that these distinct roots (anterior and posterior) have also functions entirely distinct. The anterior are destined for motion, the posterior for sensation. If we cut off the first, the animal loses all motion, but it preserves its sensibility untouched ; and, *vice versa*, if we cut the second, sensibility is lost, but the animal preserves its power of motion."

Gall had previously made the same observation in man. He gave the history of a patient " who had lost the motion of his arms for many years but still preserved a lively sensibility in them. He died, and on examination of the spinal cord, the posterior roots were found in their state of integrity, whilst the anterior ones had lost their medullary substance and were reduced to their membranous envelope."

It would be natural to suppose that a great man like Sir Charles Bell would have the magnanimity to do, at least, justice to a fellow-worker, and to recognise some of Gall's discoveries. But he went out of his way to make the astoundingly untrue statement that Gall knew not the difference between cerebrum and the cerebellum, so ignorant was he. In his treatise " On the Nervous Circle which connects the Voluntary Muscles with the Brain," published in the Philosophical Transactions of the Royal Society, 1823, Bell said : .

" The most extravagant departure from all the legitimate modes of reasoning, although still under the colour of anatomical investigation, is the system of Dr. Gall. It is sufficient to say, that **without comprehending the grand divisions of the nervous system, without a notion of the distinct properties of the individual nerves,** or having made any distinction of the columns of the spinal marrow, **without even**

having ascertained the difference of cerebrum and cerebellum, Gall proceeded to describe the brain as composed of many particular and independent organs, and to assign to each the residence of some special faculty."

This was a deliberate misrepresentation, and one can only wonder what was the motive. It was deliberate, for Bell many years later, in a quarto volume entitled : *The Nervous System of the Human Body*, 1836, when much more was known in England about Gall's anatomical researches, and such medical journals as the *Lancet* and the *British and Foreign Medico-Chirurgical Review* had become partisans in Gall's favour, Sir Charles Bell repeated the original statement without modification. But, if the great Sir Charles Bell condemned Gall, what chance had the latter of gaining official recognition—that is to say, recognition in the medical schools ? Gall's work was extinguished so far as the Universities were concerned, and the only reply later anatomists could give was that " Gall had been exposed and buried long ago, and to attempt to re-discuss his merits would not only be useless but frivolous."

Bell was, however, not the only opponent who suppressed the truth. His criticism was surpassed in virulence by **Dr. JOHN GORDON** (1786-1818), the Lecturer in Anatomy and Physiology in Edinburgh University, who wrote in the *Edinburgh Review*, No. 49, 1815 :

" The anatomical discoveries of Drs. Gall and Spurzheim [the prosector of whom we shall speak later] remain to be considered ; and these are on no account to be passed over in silence. It appears to us that **in this department they have displayed more quackery** than in any other. . . . These gentlemen are too knowing not to have perceived that the science of anatomy is in general cultivated with most zeal by those who have the least leisure to devote to it. . . . They calculated, no doubt, that as the number of individuals is inconsiderable, who are not only zealous in anatomical pursuits, but by a fortunate combination of circumstances, are enabled to bestow their whole time upon it, the chance that a few bold affirmations respecting the structure of a delicate and complicate organ (the brain) would be put to the test of experiment is comparatively small. . . . Let us now see what Drs. Gall and Spurzheim say upon the subject (the brain). They affirm without scruple that it is possible to demonstrate the white matter to be fibrous in all parts of the brain. . . . We not only maintain, however, that *this is incorrect*, but that *they must have known it to be so*. . . . Such is the grand system of the diverging fibres of the brain of which Drs. Gall and Spurzheim are the sole inventors and proprietors. . . . It is our duty to remark that *the system is a complete fiction from beginning to end. . . . We must ascribe their inaccuracy solely to intention. . . . It is a wilful misrepresentation in them*, therefore, to affirm that in portions of the brain which are composed purely of white nervous matter, either diverging or converging fibres can be shown by the method they have described."

This same Prof. Gordon, who described the anatomical discoveries of Gall in the *Edinburgh Review* as " quackery from beginning to end " and as " amazing absurdity," two years later—in 1817—endeavoured to prove, in a specially printed pamphlet, that *Gall had borrowed his ideas from Reil*, quite ignoring the fact that Reil had attended Gall's demonstrations at Halle in 1805 and had expressed his admiration for them. As Gall said :

" Let any one compare the early works of Reil with those he has published since he has attended my dissections at Halle in 1805, and let them also compare the successive improvements in both the lectures and books of Richerand, Béclard, Blainville, Serres, Georget, Lallemand, Tiedemann, Carus, etc., and they will be astonished at the progress which has been made since the appearance of my expositions. . . . The enthusiasm with which Reil and Loder have received my discoveries is well known."

JOHANN CHRISTIAN REIL (1759-1813), professor of medicine at Halle (1787) and Berlin (1810), was the original editor of the " Archiv für Physiologie," the first

periodical to be devoted to the science of physiology. The " Island of Reil " (though first described by Gall) was named after him. He is also the author of " Rhapsodies," a clever work on the psychic treatment of the insane (1803).

Dr. Gordon relied on the book by Reil published in 1807, two years after Gall's visit, in which Reil makes no mention of Gall, but wherein he makes no claim as to originality either. If Gall's discoveries had not been original, the French Academy would have taken no notice of his work, or would at least have made some mention of the fact in their report. It is worthy of notice, too, that Dr. Gordon, though he possessed Gall's original work, preferred to criticise the anatomy of Gall as described in condensed form in a contribution to the *French Dictionary of Medicine*, " the large work being too tedious for general perusal."

Anyone looking at the anatomical text-books which appeared after Gall's public demonstrations must see how complete was the change they effected in the knowledge of the brain. Yet it is rare that we find any credit being given to him. One of the few satisfactory acknowledgments of his merit in the medical literature of Great Britain during the last fifty years is by **SIR SAMUEL WILKS** (1824-1911), in *Guy's Hospital Reports*, 1879, which would not be read by many. Men of science who have profited by Gall's labours have refused him the honour which is his due They have excluded his name from their books, as if it would be a sin to mention it.

GALL AS PHYSIOLOGIST

Gall wrote in 1796, in his letter to Baron Retzer, that the highest development of brain-matter is found in the cerebral hemispheres, and that **the grey surface of the brain is the material base of all mental and moral activity,** the instrument through which all psychical manifestation takes place ; and that therefore a systematic study of the structure and functions of that organ and the nervous system in general would disclose some important facts which might help us to understand man's psychical activities, his mental gifts, variety of sentiments, emotional dispositions, and the choice of motives which give him an impulse to action. Gall declared that we know nothing of the nature of the soul, but we know its attributes, and these attributes would never come into existence were it not for the brain being acted upon by external influences. As regards past methods, he said :

" In place of seeking simply for phenomena, men have hitherto confined themselves, as to some extent is still the custom, to philosophic subtleties ; exhausted themselves in speculations on the intimate nature of the soul ; and tried to discover how souls and bodies were united, whether immediately, or by means of an intermediate substance. As the soul was thought to be the source of the instincts, propensities, faculties, it was made a great and very serious occupation to find its seat. Sometimes it was spread throughout the body, sometimes lodged in the brain ; and, keeping in view the simple essence of the soul, the metaphysicians, and with them the physiologists, have been obliged to compress it to a single point. It was from this point that the soul directed all the remainder of the body, that it made all its moral and intellectual force to radiate, without the intervention of any other cerebral part."

Ascending from the lowest organic beings, which have only a rudimentary nervous system and likewise a rudimentary intelligence, to the highest, Gall says we find as **the cortex of the brain becomes more and more developed so does the mental manifestation increase.** In man, who occupies the highest stage of the animal creation, with his large and highly finished brain, we have the most exalted intellect. But this dependence of the mind upon the brain does not end here. This is in fact only the beginning of it. **The brain in its turn depends upon the other organs of the body for its health and even for its life.** If the distribution of blood and nutrition

to the brain be imperfect, it must suffer in health and vigour, and the capacities of the mind will be at once disturbed by the weakness and imperfection of the functions of its physical organs. **A sound, well-developed, well-proportioned, well-nourished brain is necessary to a well-balanced intellect and a moral character.**

To Gall the cortex of the brain was exclusively the organ of the intellectual faculties, moral sentiments, and animal instincts.

"The instincts, propensities, sentiments, intellectual faculties, and all the distinctive characteristics of humanity, owe their existence and modifications solely to the brain. Without a brain, there could be no perception, sensation, ideas, enjoyment, suffering, or individual consciousness. This study of the brain enables us to trace the gradual development of the sentient beings, from the lower to the higher animals, and to man. The physiology of the brain discloses to us the cause of the diversity and the antagonism of our propensities, the strength and weakness of our understanding, the internal motives of our will and actions. It explains to us the modifications of our propensities and faculties at different ages, their successive and gradual development, and their gradual decline in old age. It explains to us the diversity of the moral and intellectual character of individuals, the diversity of talent, and the variety of motives which determine our tastes and actions; finally, why the animal propensities are opposed to reason and moral sense.

"The external senses are no longer regarded as the origin of our faculties. **It is the brain which receives their impressions and operates upon them,** according to the nature and degree of its inherent force. Understanding, affection, instinct, volition, etc., will be no longer personified beings; they will be recognised as cerebral functions. The philosophical physician and physiologist, instead of sounding their course amid the straits of speculation, will sail confidently along the sea of observation. The time will soon arrive, when, convinced by evidence, all will agree that the phenomena of nature are based upon the organisation in general, and that all the moral and intellectual phenomena are based upon the brain.

"A few drops of blood extravasated in the brain, a few grains of opium, are enough to demonstrate to us, that in this life, volition and thought are inseparable from cerebral organisation. Affections of the brain interfere with the mental operations. When the brain is incompletely developed, idiocy is the result. Provided the brain is not affected, all the other portions of the corporeal system may be diseased or separately destroyed; even the spinal marrow, at a certain distance from the brain, may be compressed or vitiated, without the functions of the mind being immediately impaired. If, on the contrary, the brain is compressed, irritated, injured, or destroyed, the mental functions are partially or totally deranged, or become altogether extinct. If the compression of the brain is removed, the extravasated blood or the pus evacuated, or the cerebral inflammation allayed, consciousness and the power of thought return, sometimes instantaneously."

SPRENGEL (1766-1833), **RICHERAND** (1779-1840), and others had asserted that the intellectual and moral faculties remained unimpaired even after complete destruction of the brain.

Gall was not the first to note, but he was **the first to lay stress on the double nature of the parts of the brain,** and that each presumed function was doubly represented. In other words, each hemisphere of the brain was a distinct organ, capable of separate volition, though usually the two hemispheres were working simultaneously; but if one became diseased the other would continue the function. He confessed that *he himself had seen one hemisphere of the brain destroyed by suppuration, and yet the intellectual faculties remained intact;* and he explained this phenomenon by the fact that the brain consisting of two hemispheres, just as the nerves of sense are double, the remaining hemisphere in these cases carried on the work. If, he said, those authors were correct who state that all parts of the brain can be destroyed and yet its functions remain entire, this would be "not only demolishing, at a single blow, the whole of my physiology of the brain, but also destroying the

possibility of any kind of cerebral physiology." He quoted authorities who assumed that in hydrocephalus there is a distension but not necessarily a destruction of the structure of the brain, and if it could be shown that the mental powers are not retained, then "it must be acknowledged that the brain is not necessary to the exercise of the mental functions."

Not regarding the emotions and propensities as belonging to the brain, the loss of them in injury of the brain, or their change, is disregarded, so long as the intellectual faculties remain entire, and the statement is made that "considerable parts of all the cerebral areas can be destroyed without impairment of any of the essential functions or faculties of the mind." This statement is repeated even at the present day, chiefly by surgeons, who may be excused for their lack of psychological observation, but when an eminent psychologist, like **G. J. LADD** (1842-) repeats it, from whom these words are quoted, we must ask "what faculties of the mind" are not lost in destruction of considerable parts of the brain ?

Gall's theory of the **evolution of the mental powers** of man from those of animals **running parallel with the evolution of the brain** naturally excited violent opposition in many quarters ; for it was felt to endanger the privileged position which man had assumed to be his, and to be inconsistent in many ways with the generally accepted doctrines of religion. Hence Emperor Francis I. prohibited Gall's lectures in Vienna in 1802 : "His Majesty entertaining the apprehension, that Gall's theory appears to lead to materialism, and consequently to militate against the first principle of morality and religion." Gall addressed a protest and remonstrance to the Emperor against the order, from which we quote the following passages as bearing upon the subject under discussion in this chapter :

"The first principle in my doctrine concerning the functions of the brain, which appears liable to the objection of materialism, can be no other than this—that *the brain is the organ of the mind.*

"We, physicians and surgeons, limit our investigations to facts cognisable by the senses, and leave everything else to the clergy and revelation. It is, however, highly important to know how the soul operates in this life in its alliance with the body, and according to what law it acts. The most decided and undeniable experience teaches us that the brain, of all parts of the body, is the one by means of which the mind manifests its powers ; that human beings who are born without brains exhibit no mental functions ; that all mental manifestations cease when the brain is destroyed or the head cut off ; that effusion into the cavities of the brain, inflammation and injuries of this organ, etc., derange the mental functions and produce insanity, imbecility, or general or partial obstruction of the mental powers ; that too small a size of the brain, or a skull fractured or deformed by violence, also water in the head, and cretinism, degrade man almost below the level of the beasts, in regard to manifesting the mind ; that our powers of thinking are very different in childhood, in manhood, and in old age ; that men think and feel differently from women ; that we think and feel differently in the full vigour of life, in drunkenness, and in the heat of fever, from what we do in times of exhaustion, through affliction, hunger, sickness, and so forth.

"These phenomena prove the dependence of the mental manifestations on the bodily organs—or that influence of the physical world on the mental functions which, from time immemorial, no philosopher, moralist, theologian, physician, teacher, judge, or legislator has ever doubted.

"It leads no nearer to materialism when, instead of maintaining the dependence of the mental manifestations on the whole body, we limit the proposition to the brain, as being the special organ of the mental functions ; a proposition on which also all physicians and philosophers are long since agreed."

The metaphysicians argued—and so did many scientists, obsessed by metaphysical notions—that the *ego* remained always the same, whereas the brain and body undergo changes ; the *ego* could, therefore, have no relation with matter.

But Gall showed that it is untrue that the *ego* always remains the same; even in adult years a personality of to-day is not what it was, say, five years ago. It is only in fundamentals that we remain the same, and these fundamentals depend on the permanency of the main constitution of the brain.

F. BÉRARD (1789-1828) was one of the thorough-going spiritualists who opposed Gall. He taught that all material theories are, in themselves, inadequate to account for the intellectual and moral phenomena of human life. There is not the slightest analogy between matter and the human soul. The idea we invariably entertain of the latter, instead of being that of extension, figure, and colour, is that of passion, sympathy, and intelligence. This soul is the active and vivifying principle of existence; and is that of which we speak when we say: *I* or *myself*. It is one, indivisible, but not material. That the soul or thinking principle cannot be the result of any peculiar organisation in the brain or nervous system generally, Bérard argued in many parts of his work. Thus he said:

"The mind is one and indivisible, immaterial, though united to the body; it cannot take part in this union except as *mind*; and not in accordance with those laws which unite body with body. The thinking principle cannot be separated from the body, or placed in the midst of its organs; but it is present in them; it perceives through them; it communicates activity to them; and receives it from them in return. It is bound in its movements by certain physiological and vital laws, without which it could not manifest its faculties or powers; but it does not owe these faculties to the organs of sense."

A. B. RICHERAND (1779-1840), vitalist, was another opponent, whom we shall quote frequently. He is known to history as having suffered from overweening ambition and vanity.

Other philosophers, as we have seen in Vol. I., alleged the concentration of the mental functions in one definite, circumscribed spot of the brain, the centre of all the nerves, in-coming and out-going, the seat of all sensations, where they were changed to representations, and where all voluntary and involuntary movements originated. In this centre-point, the *sensorium commune*, in this anatomical and physiological unity, they saw a strong point for the unity of mind.

To these metaphysical objections Gall replied:

"The metaphysicians have established that as the mind is simple, its seat in the brain ought to be equally simple, consequently the physiologists who had, as they supposed, discovered that the brain is the organ of the mind and human nature, had the complacency to reduce their organ of the mind to a single point. This single point was claimed by them with being the meeting-place of all the nerves, the common centre, the seat of all the operations of the mind. . . . The mind being simple, they concluded from this that all its acts, thoughts, understanding, will, judgment, reason, imagination, were also necessarily simple, and could not in their exercise be subject to matter. I do not know how they could elude the examples of imbecility, madness, delirium, in short, of derangement of all the functions, in consequence of defective organisation, disease of the brain, intoxication, etc.

"Those who took the whole mass of the hemispheres as the result of the concurrence of all the nerves of the body, how could they attribute other functions to the brain than those proper to the nerves? This error is the cause of that axiom, which has paralysed all physiological researches of the brain—that nothing is in the mind which has not previously existed in the senses. The same error caused them to believe, as long as the five senses were intact, the brain could be destroyed and the mind be preserved in a state of integrity.

"Supposing there were a central point from which all nerves radiate, and that it were the only, the exclusive organ of the soul, how shall we explain the successive development, the separate action, and the partial diminution of the different intellectual faculties?"

CUVIER (1769-1832), the great naturalist and authority on comparative anatomy, **acknowledged that only since Gall have anatomists ceased to search for a central point in the brain,** the point of union of sensory and motor nerves, for the seat of the soul as a unity.

We have seen that Descartes located the soul in the pineal gland ; Vieussens in the centrum ovale ; Willis in the corpus callosum. Sömmering, in 1796, located the soul in the fluid of the ventricles, believing the ventricular walls to be the centre for all the nerves, their activity beginning and terminating there, their influence on each other being exerted through the medium of the cerebro-spinal fluid.

The Report on Gall's discoveries by the Committee of the Institute of France showed the same metaphysical convictions :

" The functions of the brain," they said, " suppose a mutual influence, incapable of being comprehended, between divisible matter and an indivisible *ego*, the perpetual stumbling-block of all philosophers. Not only do we not comprehend, but we shall never comprehend, how impressions made upon the brain substance may be perceived by the mind and produce images there. . . . In a word, no one who has laboured upon the brain has been able to establish, rationally, a positive relation between the structure of this viscus and its functions, even those which are the most evidently physical."

Gall further pointed out that **XAVIER BICHÂT** (1771-1802) regarded the cortex of the brain as a simple envelope, destined to protect the parts which are found beneath it from injury ; that **R. B. SABATIER** (1732-1811) and **ERASMUS DARWIN** (1731-1802) regarded the brain as a purely secretory organ ; that some philosophers, with STAHL (1660-1734), thought that the soul is expanded throughout all the nerves, not only in its action, but also in its substance, and that thus the whole body becomes the organ of the soul ; and that, in the opinion of many others, the two superior faculties at least—reason and volition—act independently of matter.

In 1837, according to **THOMAS LAYCOCK** (1812-1876)—" Journal of Mental Science," 1876—many of the old school denied " that the brain had any essential connection with the intellectual powers ; sensations might have their seat there, but the reason was independent of brain-function."

W. B. CARPENTER (1813-1885), in his " Principles of General and Comparative Physiology " (1838), wrote :

" The complexity of the operations of the mind, and the impossibility of deriving from the study of the lower animals any assistance which can be relied upon in their analogies, have hitherto been a complete bar to the successful investigation of them as portions of the nervous system. *It is, as yet, quite uncertain how far mental acts are dependent on or connected with any changes in its condition.*"

With such views being held by acknowledged authorities, it is not surprising that Gall's doctrine was condemned as utterly false and without foundation.

Psychologists hitherto had had a sterile and narrow conception of their science as the science of consciousness, dealing only with the intellectual capacities of man and throwing no light on the life of emotion and the play of motives, for which it would have been necessary to observe the mental manifestation of their fellow-men, and not to limit themselves to introspective observation. Gall changed all that ; **he enlarged psychology to a science of human conduct and behaviour,** based on comparative and physiological research, and relying largely on objective methods : the observation of the behaviour of men and animals under all conditions, in health and in disease.

For Gall, **the cerebral hemispheres are not alone the centres of ideas, but they are also the centres of the emotions and passions, and volitions** ; indeed, they are the sources of energy, which set the ends and sustain the course of all human activity

and the intellectual processes are but their servants, instruments, or means. There is the same essential connection between the moral sentiments and the brain that there is between thought and brain ; a fact still little appreciated and denied by many. But if so, asked Gall, might not the moral monstrosities, as well as the intellectual giants of our race, be explicable by their cerebral development ? **Might there not be diseases of one part of the brain causing emotional insanity,** while the memory or the imagination, being related to other parts, remain unaffected ? He continued :

" Reflect on the tumult which the affections and passions, whose immediate seat and original source is in the brain, excite in the whole man. Do we not behold jealousy, homesickness, misplaced affection, etc., devouring the principle of life ? How often has not a too sudden transport of joy, violent fright, or anger, destroyed life as suddenly as a thunderbolt. Who does not know the power of imagination, of attention, and of faith, in the production and cure of disease, especially of nervous disorders ? These most grievous afflictions, and all the mental alienations, have their principal and immediate causes in derangement of the brain.

" Volumes have been written on the reciprocal influence of the brain and the viscera of the abdomen and the chest. The instincts, the propensities, the sentiments, the intellectual faculties, the distinctive character of humanity, owe their existence and their modifications solely to the brain. Without a brain, there would be no perception, no sensation, no ideas, no enjoyment, no suffering, no individual consciousness.

" The physiology of the brain makes us acquainted with our entire dependence on the primitive laws of the creation ; the source of moral good and evil ; the cause of the diversity and of the antagonism of our propensities ; of the strength or weakness of our understanding ; the internal motives of our will and of our actions. Instructors, moralists, legislators, and judges, cannot, with impunity, neglect the influence of the organisation over our propensities, passions, and talents. It proves to them that there is no certain quantum, either of the power of doing good, or of avoiding evil, or of the degree of moral liberty with which each individual is endowed. It explains to us the modifications of our propensities and faculties at different ages, their successive and gradual development, their decline in old age, and the diversity of the moral and intellectual character in individuals."

Gall defined **affection and passion,** and explained why—being only the expression of energetic activity of a mental power—**they cannot have special seats in the brain** :

" Most authors confound the affections with the passions. By passion, I mean the highest degree of voluntary or involuntary activity, of which any fundamental power is susceptible. Every faculty, whether intellectual or affective, as soon as it attains a very energetic and resolute degree of action, must be called passion. In this sense, the philosopher may have the passion for thought, for seeking the relations between cause and effect ; the poet may have the passion for poetry, the musician for music. The affective qualities, the instincts, sentiments, and propensities, when they become habitually imperious, are also passions. It is thus that love increases to a passion ; excess of the sentiments of benevolence or of devotion is a passion ; the love of offspring, propensities for combats, ambition, etc., may become passions.

" But where are the affections situated ? They have no seat, neither in the plexuses, nor in the viscera, nor in the brain. They are common to all the faculties. There cannot be a particular organ for joy, or sadness, or despair, or discouragement, or hope, or any affection whatever. To admit one would be equivalent to admitting a particular nerve for pain, and a particular nerve for agreeable sensations. Every nerve may be the seat of pain and of pleasure. If we admit a single organ for all the affections, it would follow that every animal susceptible of one affection would be susceptible of all, and that this organ once set in action, all the affections, however unlike or opposite they may be, would simultaneously affect both men and brutes."

Gall held that **the sympathetic nervous system communicates with the brain,** informs the same of the state of the viscera of the chest and abdomen, and establishes a reciprocal action and re-action of the vegetative and nutritive life with the life of relation to the external world or animal life :

" There is no inward consciousness that the affections and passions are exercised internally. Their action is much more marked in the viscera of the chest and abdomen than in the head. We must seek for the seat of these feelings. The brain and its functions being unknown, they were consequently referred to the spot which was supposed to be most affected, that is, the heart, the stomach, or the diaphragm ; such was the most ancient and general opinion. As soon as even a superficial knowledge of the functions of the brain was acquired, several philosophers and physiologists regarded it as the seat, not only of the intellectual faculties, but also of all the affections and passions. Then came speculative philosophers and metaphysicians. They attributed to the soul all the phenomena of moral and intellectual life. They recognised no organ for any one of its functions. Impressions on the external senses gave birth to the instincts, the propensities, and the intellectual faculties ; and if the affections and passions were still placed in the viscera, this was rather with reference to their action than to their origin or seat. At a later period, and especially in France, it was judged that there was some internal source for what is called instinct, affection, and passion. As the brain at this time was held in no consideration, it was natural to make a present of them to the heart, etc. ; and when the anatomy of the nervous system was brought to some perfection, this was immediately proclaimed as their seat and origin. Hence the ancient reputation of the heart ; hence the zealous admirers of the solar plexus, the phrenic centre, and the ganglionic nervous system. But now that we are able to assign, with certainty, to each organ and nervous system its proper function, now that we know the graduated scale of beings and nervous systems, our ideas are altogether freed from these absurdities.

" We know that the ganglionic nervous system is intimately connected with the vascular system ; they always co-exist, and frequently where there is no brain or spinal marrow. All the branches of these ganglionic nerves accompany the arterial trunks, branches, and ramifications, and enter with them into the different organs, which evidently proves that this system has no other office than to preside over the functions of the life of nutrition, to establish a reciprocal influence between this and animal life, by the branches communicating with the nervous system of the vertebral column.

" We know the functions of the stomach, diaphragm, liver, and heart. We know that the mammiferous animals have these parts in common with man ; that in the larger species they are even more voluminous than in man, although the affections and passions are neither so various nor so energetic. We perceive the absurdity of assigning to the same part—the heart for instance—functions directly opposed to each other. It is still more extraordinary to constitute the heart the seat of cruelty in the tiger, of gentleness in the lamb ; of fidelity in the dog, of perfidy in the cat ; of courage in the bison, and of timidity in the hare. We know, also, that the fact of emotion being felt in certain parts in connection with the affections and passions proves nothing as to their seat. We no longer confound the origin of an affection with the reaction of it on a particular part, since experience has taught us that by doing so the same passion or affection would have a different organ in each individual. In one instance, jealousy chokes, commiseration painfully contracts the jaws and palate ; the sentiment of benevolence brings tears to the eyes ; anger produces colic ; and indignation causes the knees or lips to tremble. Let each individual observe, and he will discover in himself a different seat for jealousy, pity, the sentiment of benevolence, anger, indignation, etc.

" The slightest attention demonstrates to us the falsity of the notion that the brain is never affected by the affections and passions. Moral affections are followed by diseases of the brain, and diseases of the brain are frequently characterised by certain moral affections ; an evident proof that both spring from the same source.

" The affections follow only on the perception of an object ; no one is frightened

except at the unexpected approach of imminent danger ; anger is usually the offspring of wounded self-love ; we are not grieved unless disagreeable sensations or unexpected and unfavourable news has been received by the brain ; it is from the brain that flow those sudden and more or less violent movements, which radiate towards the principal organs of the system, and sometimes even towards them all. . . . How can we conceive general effects so varied as those which accompany or follow the manifestation of the affections, and sudden and severe mental shocks, without ascribing them to a common source ? . . . If we acknowledge the brain to be the true source of these disturbances, everything is explained : this organ is in relation with the whole system ; it is susceptible of receiving impressions, variable in their nature and degree of intensity ; its sympathetic reactions may be as various as its particular affections and as the organs over which it exercises its influence."

Gall went on to give the different views of philosophers :

There are those who seek the mainspring of conduct in some vaguely conceived intuitive faculty : " conscience " in man, and " instinct " in animals ; or they speak of the " will " as the source of all human action.

There are those who hold to the view that the motives of all human activity are the desire of pleasure and the aversion from pain. One is driven to suppose that the minds of the moral philosophers who maintain this view are either constitutionally devoid of the powerful impulses that so often move ordinary men to actions which they know to be morally wrong and against their true interests and destructive of their happiness ; or are so completely moralised by strict self-discipline that these powerful impulses are completely subordinated and hardly make themselves felt.

Then he quoted the contemporary physiologists who tried to locate the passions, and showed how they opposed him.

A. B. RICHERAND (1779-1840) considered courage as the moral function of the heart : " The heart is larger, stronger, and more robust in courageous animals, than in the weak and timid species." He pointed out that he meant the relative size and not the absolute size.

F. J. V. BROUSSAIS (1772-1838), " Examen des Doctrines Médicales," vol. ii., before he became a convert to Gall's doctrine, wrote : " Prof. Richerand agrees with Cabanis in referring the instinctive determinations to the viscera ; and *the truth of this fact seems to be no longer contested by any one except Dr. Gall.* The same professor attributes to the viscera the origin of appetites, whence spring certain passions ; but he refers these passions to the intellectual faculties, so that the passions would be composed of determinations issuing from the viscera, and consequently instinctive, and intellectual operations."

J. C. REIL (1759-1813) and others considered the seat of the affections and passions to be in the nervous plexuses and ganglia of the chest and abdomen.

C. L. DUMAS (1765-1813) and KURT SPRENGEL (1766-1833) sought them in the difference of temperaments.

J. J. VIREY (1775-1840), the vitalist, author of " De la Puissance Vitale," Paris (1823), in the " Dictionnaire des Sciences Médicales," vol. xxxix., on " Passions," said : " Passions may exist without the intervention of a brain, and in beings least capable of ideas and reflections ; for the passions belong in fact, not to the will, but to instinct, in all the brute creation. . . . If the passions existed in the brain, why should terror take away all presence of mind and energy from the brain so as to induce syncope ! It is therefore evident that passion is manifested in other parts than the organ of thought."

M. DELPIT (" Dictionnaire des Sciences Médicales, vol. xxxviii., p. 263) said that he could not agree with Gall that the brain is the organ of the affections and passions ; on the contrary, " the opinion of the philosophers of antiquity, as well as those of our own time, supported by the testimony of our own consciousness, have placed in the præcordial organs, or in those of internal life which are farthest distant and which appear the most independent of the brain, the seat of our most lively emotions and most impetuous passions."

We might add to these opinions another, nearly contemporary, writer, the well-known ethnologist **J. C. PRICHARD** (1786-1848), also a Lunacy Commissioner, who considered that *the emotions were independent of any material apparatus.* He said :

" So far from considering the propensities and sentiments as dependent upon or connected with any part of the brain, I am acquainted with no fact, either in physiology or pathology, which furnishes any ground for presuming that these mental phenomena take place through the instrumentality of any corporeal process whatever. I am sanguine enough to hope that the time will arrive when we may be enabled to ascertain the nature of the cerebral functions, and perhaps to understand thoroughly the whole of the process which is carried out in this part of our bodily fabric. At present, however, we must confess that we are not in possession of one fact that belongs to it.

" The higher powers of the mind, as well as the will itself, on which depends our moral responsibility, are entirely exempt from any connection with instrumental processes and any immediate dependence upon the organised structure of the brain. They are modes of operation of the immaterial soul."

According to Prichard, " the mind that reflects, reasons, deliberates, judges, or creates a world of its own in imagination is independent of the material organisation." He quoted a case reported by Gall, in which a " disorder of the propensities " followed an injury to the head caused by a fall from the fourth storey of a house, and calls attention to the absurdity of such a statement, adding that if such reports gained credit, " the College of Surgeons may expect one day to march in triumph and take possession of the vacant seats of the criminal judges ; and we shall proceed forthwith to apply the trepan, where now the halter and the gibbet are thought most applicable." (Treatise on Nervous Diseases, 1822 ; and Treatise on Insanity, 1835.) That such cases are by no means rare will be shown in Chapter XXXII., where there are a number of cases quoted of **criminal tendencies subsequent to brain injury, with complete recovery after surgical operation.**

Notwithstanding these views, Prichard laid claim to—and **DANIEL HACK TUKE** (" Prichard and Symonds," 1891) accorded him the merit of—being the first to describe " moral insanity," by which he did not mean derangement of the moral faculties or congenital moral defect, but derangement of the feelings and instinctive impulses without derangement of the intellect ; a mental condition which was described in a much more scientific and exhaustive manner by Gall, but was ignored by medical men and psychiatrists. (See Chapter XV. on this subject.)

JOHN ADDINGTON SYMONDS (1807-1871) read a paper before the British Medical Association, in 1869, on " Criminal Responsibility in Relation to Insanity," in which he discoursed on the subject of " moral insanity " and expressed his astonishment that physicians had not recognised sooner " the large share which the emotions and sentiments and passions bear in the mental constitution of man. . . and that the question should not have presented itself before, as to whether there are not actual cases in which mental derangement is confined to moral feelings and the emotions, just as in other cases the perceptive and reasoning powers are the sole subjects of disorder."

To-day we are agreed that insanity, at its onset at all events, is frequently an emotional disturbance ; and that insanity is due to a disorder or disease of the brain. In my opinion, the emotions are always the first deranged, and through them the conduct becomes changed. A man is not declared insane for what he *thinks*, but for what he *does*, or omits to do. This problem will be dealt with fully in succeeding chapters. Granted even that it is not always, but only frequently, that the emotions are involved in the onset of insanity, it would be a puzzle to most physiologists and pathologists to explain how the emotions originate, and whether

any particular locality of the brain is concerned with them. It is true that there is some scientific literature on the subject—**SIR FREDERICK MOTT** (1853-) has made by far the most important contribution to it—but while we have learned a great deal as to the nervous processes and bodily effects of emotions, we are still ignorant of their relation to the cortex of the brain.

SIZE OF BRAIN AND MENTAL POWER

Another leading argument which Gall developed and pressed home was *the connection of mental power with the size of the brain*, meaning by mental power not merely intellectual power, but the power of all the mental qualities, that of the intellect, feelings, and propensities. He laid it down as a fact that **where the brain is so small that the horizontal circumference of the head does not exceed thirteen or fourteen inches, idiocy is the necessary consequence.** "Complete intelligence," he remarked, "is absolutely impossible with so small a brain; in such cases idiocy, more or less complete, invariably occurs, and to this rule no exception ever has been or ever will be found."

Indeed, **FÉLIX VOISIN** (1794-1872), Medical Superintendent of Bicêtre Hospital, verified this assertion of Gall and found it substantiated by every one of his cases. In the lowest class of idiots, where the intellectual manifestations were nil, the horizontal circumference, taken a little higher than the orbit, varied from eleven to thirteen inches; while the distance from the root of the nose backwards over the top of the head to the occipital protuberance was only between eight and nine inches. When the size varied from fourteen to seventeen inches of horizontal measurement, and eleven or twelve in the other direction, glimpses of feelings and random intellectual perceptions were observable, but without any power of attention or fixity of ideas. Lastly, when the first measurement extended to eighteen or nineteen inches, although the head was still small, the intellectual manifestations were regular enough, but deficient in intensity. In a full-sized head, the first measurement is equal to twenty-two inches on an average, and the second to about fourteen inches. Deficiency in the size of the brain is not, however, the only cause of idiocy; mental imbecility may arise from disease of the brain and causes which indirectly influence the brain by affecting its nutrition.

Other things being equal, the greatest amount of mental capacity and vigour is allied with the largest quantum of cerebral substance. According to Gall, all observation of man and animals proves that the energy of any nervous centre always bears a direct proportion to its bulk. Every organ of our body increases in size in proportion as it is exercised within the limit of its physiological capacity, and this rule holds good as to the brain as well. With increased mental work the brain will show an increased growth.

That there are many cases of great men having small heads is not at all a surprising fact, says Gall. Many men regarded as great are not so in every respect, but are great only in a particular department; and as but few of the mental powers serve in such cases, the entire bulk of the brain may be comparatively small. That men of common everyday life are often met with having heads in configuration and quality equal to those of the greatest men that ever lived is no proof against our view; for a man's ability is judged by what is publicly known of him, but often the man who thinks and feels the most expresses the least. Besides, not all the big brains of normal individuals that we see are also stored with facts. Many an uneducated man possesses more wisdom than the learned man who has specialised in one department of knowledge. People with large heads sometimes show small mental capacity, which in many cases is due to unfavourable circumstances, or pathological conditions. Small heads rarely manifest great mental power, though they may show isolated talent.

Size is *cæteris paribus* a measure of power. This is a universal law of nature. The greater the normal bulk, the more power. A man who is noted for physical strength has large, powerful muscles. Yet Gall's opponents thought the brain formed an exception.

F. E. FODÉRÉ (1764-1835), *Traité du Délire*, vol. ii., p. 82, said :

" What proves more effectually than everything else that the intellectual energy is far from being proportionate to the cerebral mass, is the observation which every one can make, that the volume of the head predominates in the early stages of life, although this is the precise time when our understanding is characterised by the greatest weakness. The researches of anatomy demonstrate that the cerebral mass, which at birth constitutes a sixth part of the body, afterwards relatively decreases, so that in the adult it forms only a thirty-fifth part. It is not, therefore, by its mass that the brain can contribute to intellectual life."

To this Gall replied :

" I shall prove in this volume that the proportion which the brain bears to the whole body is a deceitful means of estimating the degree of intelligence ; besides, it is very natural that, with equal volume, a brain which has not yet attained its maturity should not exercise its functions in their full vigour. But, indeed, how can we expect sound views from writers who, like Fodêrê, have the most erroneous ideas of comparative anatomy ? Let any one compare a calf's brain, that of a sheep, that of an orang-outang, that of a lion (see illustrations) with the brain of a man, in order to satisfy himself whether these brains have the same extent, and a structure, in almost all respects, analogous to that of the human brain."

JOHN BOSTOCK (1773-1846), Lecturer on Physiology at Liverpool, a contemporary of Gall, said on this subject in his book, p. 785 :

" The position that the size of an organ is an indication of the degree of its power or capacity, a position which may be regarded as almost the fundamental principle on which the whole of Gall's doctrine rests, is in direct contradiction to fact. The perfection of the eye, either when considered with respect to the different species of animals, or to the different individuals of the same species, does not bear the least relation to its size, but depends entirely upon the nature of its organisation, and, except in those cases where the exercise of an organ is connected with mechanical force, as in muscular contraction, bulk has no relation to the perfection of a part."

Gall indignantly asked : " Who has ever said that the power of sight depended on the size of the eye ? The power of sight does depend on the optic nerve."

Modern authorities seem to deny that size is *cæteris paribus* a measure of power, when they speak of Gall's doctrine, and to assert it when it suits them in confirmation of their own views of localisation. For example, **ALLEN STARR,** the eminent American brain surgeon, declared (*Popular Science Monthly*, 1889) that " size has nothing to do with function," yet he goes on to say, " In the middle line (of the brain) lies the motor area, and it is interesting to know that on the left half of the brain, which guides the right hand, it is larger in extent than on the other side which controls the left hand ; because the majority of fine movements are performed by the right hand, and have to be learned by the left brain. The reverse is true of left-handed people."

H. WELCKER (1822-1897), of Halle, held the erroneous view, still common in recent times, that **abnormally small brains were due to arrested skull growth.** He did not know that when the brain wants to grow, the skull, which is a living substance, will grow with it. (See Chapter XIII.) He admitted (*Anthropological Review*, 1867) that a brain, below the average in size, will " rarely, if ever, be met with, in

conjunction with higher intellectual endowments," but he made the reservation, "unless the smallness of the brain is due to a checked development produced by synostosis of the skull." He believed that men highly endowed intellectually were found to possess a small capacity of skull and consequently a small brain—for example, W. v. Humboldt, Paracelsus, and Dante—because "the skull, in consequence of infantile obliteration of sutures, had become contracted."

Absolute size is not a measure of development among the brains of different animals, because the brain must bear a certain relationship to the size of the body in all classes of animals. Consequently a very large animal of a lower class will necessarily have a larger brain than a very small animal of a higher class. For example, the brain of a large shark is very small compared with the size of the animal, but it is much larger absolutely than the brain of a mouse, which, though absolutely small, presents evidences of a higher development than the other. We cannot, then, from the mere size or weight of the brain in any given case, arrive at a just conclusion regarding the state of development of the organ. Among animals of the same kind, after the medium size of their brain is known, the absolute size may lead to conclusions regarding the weakness or strength of their cerebral power, but no conclusion can be drawn from absolute size alone, regarding the mental capacities of the animal. As Gall said :

"If it be admitted that the brain is the organ of the mind, the conclusion that its functions must have a direct relation with this volume is perfectly natural. A much larger cerebral mass has been found in man than in the largest of our domestic animals—for example, in the ox or the horse ; and, without more accurate researches into the animal kingdom, the predominant qualities of man were attributed to the greater cerebral mass : the world generally maintained, with Aristotle, Erasistratos, Pliny, and Galen, that of all animals, man had the greatest mass of brain ; an opinion which has been embraced by many of the present day.

"At a later period it was found that the cerebral mass of the elephant and several of the cetaceous order was more considerable than that of man. This circumstance would naturally embarrass the partisans of the opinion to which we have just referred. In vain shall we extol the faculties of the elephant, and constitute the whale king over the inhabitants of the deep ; we shall scarcely be authorised to attribute to them these qualities, which form the pride of man. It became necessary, therefore, to renounce the opinion that the intellectual faculties were to be estimated by the absolute mass of the brain.

"The dog and the ape have less cerebral mass than the horse, ox, or ass, and yet in regard to intelligence, the former generally surpass the latter. The wolf, sheep, pig, and tiger are nearly in the same position, relative to the cerebral mass ; and yet they are endowed with qualities the most different, and even the most opposite. . . . We see, moreover, that nature can produce the most wonderful effects by means of an extremely small nervous mass ; the ant and the bee are remarkable instances. Who has not observed the domestic economy, local memory, mechanical activity, anger, the revenge which they inflict in a body, the careful education of the young, the harmony which reigns in a hive or ant-hill ? What is better adapted to its purpose than the spider's web ? , . . Who will venture to say that nature is deficient in the nervous organisation of the minutest insect, or that she has exhausted her resources in the brain of a whale ? "

The **relative size of the brain to that of the whole body** of the animal is no measure of the mental capacity, said Gall. In general, as animals rise in the scale, so their brains become not only more complex, but larger in proportion to the size of the whole body. But although this is a fact applicable to the great majority of animals, still the exceptions are numerous, and the laws of nature have no exceptions. The brain of the canary, and many other birds, constitutes a twenty-fifth part of their whole weight ; whereas the brain of the elephant, in every respect more fully developed than that of birds, does not weigh a thousandth part of the huge body of

the animal. The relative size of the brain, then, to the whole body, cannot be viewed as a test or measure of cerebral development.

HALLER (1708-1777) remarked that children had a larger brain than adults in proportion to their body, and consequently that, if the mental powers were measurable by the proportionate size of the brain, they ought to excel grown-up persons in understanding. It may, however, be replied that the brain of children is not yet completely developed and is, therefore, unfit to manifest the intellectual capacities.

Gall continued :

"Physiologists have shown some reluctance in abandoning the idea that the volume of the brain furnishes a scale for the measure of instincts, inclinations, and faculties ; they could not deny that the elephant and whale have a more considerable mass of brain than man ; but, they held, the cerebral mass must be compared with that of the entire body ; and it is very evident that the mass of the elephant's or whale's body, divided by that of its brain, gives a greater quotient than the mass of man's body divided by his cerebral mass. Moreover, they added the spinal marrow and the nerves, both of which should be considered as continuations of the brain, and which constitute in these animals a much larger mass than in man ; hence, a great part of the cerebral mass of these animals is destined to the use of the organs of sense, and to the voluntary motions ; in a word, to the functions appertaining to nervous systems of a secondary order. In man, on the contrary, whose nerves are generally smaller, it is quite the reverse. According to calculation, a much smaller cerebral mass is appropriated in the elephant or whale to the superior functions than in man. It follows that the elephant and whale have, in proportion to the mass of the body, a much smaller brain than man.

"Many phenomena strengthen these opinions, both with respect to the proportion of the cerebral mass to that of the whole body, and with respect to the proportions of the absolute mass of the brain. Reptiles, amphibious animals, and fishes have extremely small brains, in regard to absolute mass, and in comparison to the entire mass of the body. The brain of a crocodile twelve feet in length, of a serpent eighteen feet long, or of a turtle weighing from three to eight hundred pounds, weighs, at most, but two or three drachms. The brain of the great vulture is not more voluminous than that of the crow. The turkey-cock has less cerebral mass than the grey marrot ; facts which favour the opinion that it is the proportion of the cerebral mass to that of the whole of the body which furnishes a scale, by which the instincts and faculties are to be estimated.

"But the facts above mentioned are subject to many exceptions. Wrisberg, Sömmering, Cuvier, and others found that the sparrow, green canary, robin, wren, and especially several kinds of monkeys, have a much larger brain than man in proportion to the size of the body. These animals, then, ought to surpass man intellectually, and be infinitely superior to the stag, dog, or elephant. Several species of animals, in which nearly the same proportion exists between the mass of the brain and that of the whole body, should likewise have nearly the same instincts and faculties and in equal degrees of perfection ; but that it is not so experience proves. Besides, it is almost impossible to determine the proportion between the mass of the brain and that of the body. Cuvier and others attempted it ; but without producing satisfactory results. The brain of an adult, according to Cuvier ('Anatomie Comparée,' vol. iii., p. 149), is to the body in the ratio of one to thirty-five. But, in fact, it is much more frequently as one to forty, fifty, and even sixty ; for, suppose an adult to weigh from a hundred and twenty to a hundred and fifty pounds, and his brain from two and a half to three pounds, the proportion is that which I have stated above. Cuvier, therefore, in comparing the cerebral masses of man and other animals, sets out from false data. Furthermore, he does not say at what point he separated the brain from the parts adherent to it ; whether, when he weighed it, there were larger or smaller portions of nerves and medulla oblongata attached to it ; or whether he had stripped off the meninges ; or, if they remained, whether they were filled with blood, or free from it ; or what was the age of the individuals whose brains he weighed. There is also another source of inaccuracy. Individuals possessed of very superior faculties have, other things being

equal, larger brains than those of ordinary talents. If, then, we compare the weight of a man's brain, endued with extraordinary qualities and talents, with the weight of his body, we shall find a very different proportion from that which would result from the same experiment made upon a fool.

"Sömmering and Cuvier found another difficulty in determining the ratio between the weight of the brain and that of the body. The weight of the body, they say, may be increased or diminished by one half, by a change in the individual, from a fleshy state to that of leanness or the reverse, but the brain does not participate in this change. It is true that the brain is not susceptible of growing fat, that is, as little adipose matter is deposited in the cerebral as in the pulmonary substance; but it is certain that the contents of the cranium participate, with all the other integrant parts of the body, in the effects which result from very abundant or insufficient nourishment. Both in man and other animals, of a mean age and well fed, the brain is heavy, the convolutions are turgescent and compacted against each other. In decrepid, emaciated subjects, on the contrary, the brain, with equal dimensions of body, is sometimes not more than half as heavy as in the former case. The convolutions are flabby, and in some places even sunk. When persons have died of consumption, sometimes there is found upon the whole of the internal surface of the cranium the impress of the convolutions; because, in consequence of the emaciation of the convolutions, they leave wider intervals between them, and because the meninges become thin. I have made, with regard to this point, most careful observations upon rabbits, cats, monkeys, birds, and human beings."

The **relative size of the brain to certain parts of the nervous system,** and in particular to the spinal cord, in the opinion of Gall, will lead to no more accurate results regarding cerebral development. He says:

"Sömmering, and some other physiologists, finding the rule mentioned fail, then thought that the volume of the brain, compared with that of the nerves, would give an exact measure of the degree of intelligence. But some animals have large optic nerves, others large olfactory, in others the auditory nerves predominate, without any necessary proportion between them and the brain.

"Cuvier, for a time, regarded the proportion between the size of the brain and that of the spinal cord as the most infallible measure of intelligence, but he soon had to acknowledge exceptions—the dolphin as one.

"In fishes, the spinal cord is absolutely larger than the brain. In reptiles, this is also the fact, but to a less degree. In birds, the spinal cord is smaller than the brain, 100: 30, and in mammiferous animals the spinal cord is relatively so small, 100: 22, that it appears as a mere appendage to the encephalic mass. Again, those animals that are lowest in the scale of each class, have the spinal cord relatively largest; and those highest in the class, relatively smallest. Thus the proportion in the mouse is 100: 22, but mammiferous animals lower in the scale than the mouse have the relative proportion of their spinal cord larger than the above statement indicates, and all animals higher in the scale than the mouse have the cord relatively smaller. Man has the smallest spinal cord compared with the size of the brain, and we know that the brain of man is in a higher state of development than that of any other animal."

The size of the brain bears no relation to the dimensions of the face, says Gall, in opposition to several of his contemporaries.

"Other physiologists, as Richerand, Duméril, and even Cuvier, and Sömmering, too, affirmed that intelligence is in exact proportion to the degree in which the size of the brain preponderates over that of the face. Cuvier, indeed, tells us that ancients had perceived this rule, and, on this account, gave to their heroes, sages, and demi-gods large and prominent foreheads, in combination with moderately-sized faces. **The superiority of intellect is,** however, **due to the large size of the frontal lobes**; and it is a matter of perfect indifference to the corresponding mental functions whether the adjoining face be large or small. Leo X., Montaigne, Racine,

Mirabeau, had all large brains joined with large faces. Bossuet, Kant, and Voltaire had, on the contrary, the same large size of brain, but with proportionately much smaller faces."

Gall explained that mere size of brain indicates brain **power** only—as the large boiler will generate more steam than a small one—but does not indicate its direction whether in intellect, emotional feeling, or animal passion. A man, like an animal, may have a large mass of brain, and yet not manifest much intelligence ; but both will exhibit power of some sort or other.

The two terms, which most men confound, are " mental " and " intellectual." The former means the whole mind : feeling, thinking, acting ; but the latter means or refers to only one of the three divisions of mind—namely, the thinking property. Now, the word *mental*, as applied to its organ, embraces the entire brain ; but the word *intellectual*, when used to designate its organ, merely refers to or embraces the part of the brain to which the intellect is more especially related, namely, according to Gall's theory, the frontal lobes. Size and weight of the whole brain are, therefore, not measures of the intellectual capacity of a man ; but they are measures of his mind, his mental power, without determining whether that power lies in extent of intellect, in strength of moral feeling, or in force of passion or affection. Through ignorance of this fact the objection arose, that while some great men have had large heads, other men of eminence have had small ones.

Speaking roughly and generally, the size of the purely intellectual region of the brain is about one-fourth of the whole, or from that to one-third. Hence a man with great intellect, combined with little sentiment and passion, should have a small brain and small head, while, on the other hand, a man of strong passions, great impulsive energy, and strong sentiment should have a large head, whether his intellect be strong or feeble. This should suffice once for all to refute the people who dispose of Gall's doctrine by such stories about Leigh Hunt's hat being too large for Shelley's head, and so forth.

A number of writers have repeated this old cavil—that large heads are not peculiar to high intelligences, and small heads to weak intelligences—on the assumption that Gall said they were. A whole set of stories turns on this absolutely false presupposition. It is often mentioned, for instance, that Napoleon, though he had a large head, could get the hats of some of his soldiers right over his ears. As a matter of fact, Gall was at special pains to repudiate the notion, current before his time, that the larger the brain the greater the intellect. He said :

" It has been objected that a bee has no perceptible brain, and that yet it manifests great intelligence. The objector intends that we should infer from this fact, either that man also may manifest the mind without a brain, or at least, that in him, size in the mental organ has no influence on the power of manifestation. But no two creatures can be more unlike than a bee and a man ; and it is unsound in philosophy to draw conclusions relative to the one from facts observed in the other, when we can ascertain the truth by a *direct* investigation of the structure and functions of each by itself. By the same mode of reasoning, we might prove that lungs are not necessary for respiration in man, because some insects, such as the butterfly, the bee, the worm, and the louse, have no lungs, and yet live in air.

" I have heard the objection more than once, especially at Paris, that Voltaire with all his vast genius, had a small head, and that we frequently see men of limited abilities with large heads. Voltaire's skull, however, especially the anterior part had pretty large dimensions ; but Voltaire had a small face, and this occasions the illusion.

" Let me be permitted to show that in animals also a large cerebral mass is singularly favourable to the manifestation of the instincts and faculties. The mastiff, of a powerful breed, is the largest and least intelligent of all dogs. Although its head appears very voluminous, it does not contain more brain than that of some

pug-dogs. It is remarkable that many of the smaller species of dogs have generally almost as much brain as the larger, such as the mastiff, the great greyhound and the bulldog; and very frequently the former have a greater quantity than the latter. Among the large species, the spaniel and pointer have the greatest cerebral mass, and their heads are the most prominent and arched in front. On examining different individuals of the same species, we shall always find that the most intelligent, and those distinguished for any particular quality or faculty, have larger heads than the others. It is the same with regard to horses, and to such a degree, that, in Suabia, the peasants know perfectly well the most intelligent horses, by their foreheads being broader and more arched. When they pass over dangerous roads they put a horse or an ox distinguished by this conformation to lead the way. I know a jockey who, from long experience, can distinguish many qualities of horses by the form and dimensions of the forehead. He prefers those in which this part is broad and much arched. For several years I have attended to this sign, and have never found it to fail."

We must attend to the quality of the brain, said Gall, when we estimate capacity.

" Some say that size of brain is not a measure, and bid you to look at the fleetness of a racehorse as compared with the slow and clumsy movement of a cart-horse. But the example referred to is not a fair one; the racehorse is of a different breed from the cart-horse. We ought to compare the effects of size in two individuals of the *same* kind. If we see two cart-horses of very unequal size, are we not certain that the larger one is more powerful? Among men the same law holds good.

" In calculating the power of an organ, **quality** and **internal activity** as well as size must be attended to, and this may depend on a variety of conditions. Activity is as important to the brain as it is to a muscle.

" Size of particular parts of the brain is a measure of the power of the particular function with which it is associated, although not always when individual is compared with individual, because these often differ in temperament or constitutional condition."

Gall's proposition is now almost universally accepted, as the following quotations will show:

QUAIN, " Anatomy," vol. ii.: " All other circumstances alike, the size of brain appears to bear a general relation to the mental powers of the individual."

ALEXANDER BAIN (1818-1903), " Senses and Intellect ": " Just as largeness of muscle gives greater strength of body as a general rule, so largeness of brain gives greater strength of mental impulse."

SIR WILLIAM TURNER (1832-1916), Professor of Anatomy in the University of Edinburgh: " One almost insensibly associates the ideas of power and strength with size and weight, and when one sees a large-headed, big-brained man, one is disposed to say that such a person must be endowed with great intellectual capacity. . . . But that the size and weight of the brain are accurate measures of the degree of the intelligence is a proposition which must not be accepted too absolutely. . . . The brain of a lion is both bigger and heavier than that of a domestic cat, and yet we cannot say with any certainty that the intelligence of the former animal is higher in degree than that of the latter." This point has already been discussed.

Professor **JOHANNES RANKE** (1836-), Munich: " Every organ of our body increases in size the more it is exercised within the limits of its physiological capacities—and this refers to the brain as well. With increased mental work, the organ of the mind—that is, the brain—will show an increased growth."

SIR DAVID FERRIER (1843-), " Functions of the Brain ": " Other things being equal, there are grounds for believing that a high development of certain regions will be found associated with special faculties of which the regions in question are the essential basis."

D. J. CUNNINGHAM (1850-1909), Lecturer on Anatomy in the University of Belfast and afterwards Edinburgh, at the British Association Meeting, Glasgow, 1901, said: " One of the most striking peculiarities of man when regarded from the

structural point of view is the relatively great size of his brain. Although with one or two exceptions the several parts of the brain are all more or less involved in this special development, it is the cerebral hemispheres which exhibit the preponderance in the highest degree. Insignificant in size and insignificant in functional value in the more lowly forms of vertebrates, a steady increase in their proportions is manifest as we ascend the scale, until the imposing dimensions, the complex structure, and the marvellous functional potentialities of the human cerebral hemispheres are attained."

Gall explained that the brain is not, like the liver, the heart, and other internal organs, capable from the time of birth of all the functions which it ever discharges ; for while, in common with them, it has a certain organic function to which it is born equal, its high special character in man as the organ of conscious life, the supreme instrument of his relations with the rest of nature, is developed only by a long and patient education. Though the brain, then, is formed during embryonic life, its highest development only takes place after birth, and the same gradual progress from the general to the special, which is exhibited in the development of the organ, is witnessed in the development of our intelligence.

At what age does the brain attain full development ? According to Gall, " The brain of most men hardly acquires its ultimate development till the age of **thirty,** often even not till **forty.** After the brain has completed its growth, the cranium thickens by degrees, in the following manner. . . ."

It is astonishing that on such a simple question—how the brain continues to grow—there should be such a diversity of opinion ; some authorities agreeing with Gall ; others making the most absurd statements.

S. T. SÖMMERING (1755-1830), supposed the brain finished its growth as early as the **third** year.

C. WENZEL (1769-1827) thought the brain finished growing between **six** and **seven** years of age.

F. R. TIEDEMANN (1781-1861), famous as an anthropologist, assumed the **eighth** year as the limit of the brain's growth.

SIR WILLIAM HAMILTON (1788-1856), the Scotch philosopher, wrote : " In man, the encephalon reaches its full size about **seven** years of age," and he adds, " This was never before proved," as if he regarded his proposition as an incontestable fact.

WILLIAM A. HAMMOND (1828-1900), the American neurologist, was still more dogmatic. In the *Popular Science Monthly,* 1887, he asserted : " A fact which is somewhat astonishing to those not aware of it is, that the head of a boy or girl does not grow in size after the **seventh** year, *so that the hat that is worn at that age can be worn just as well at thirty.*" (!)

HENRY HERBERT DONALDSON, Professor of Neurology in the University of Chicago, " The Growth of the Brain," 1895 : " The brain has pretty well approximated its full size by the end of the **seventh** year, and but little growth takes place after the fifteenth year."

DAVID F. LINCOLN, " Sanity of Mind," 1900 : " The head and brain get almost their entire growth in bulk by the end of the **seventh** year."

W. W. IRELAND (1832-1909), well-known authority on Feeble-Minded (*Journal of Mental Science,* 1888) : " The brain is fully developed at about **ten** or **twelve** years of age."

Other observers have come to the conclusion that the brain not only goes on increasing in size and weight to a much later period of life, but that, under favouring circumstances, it may increase in weight long after the body has attained its maximum ; thus agreeing with Gall. For instance :

SIR WILLIAM TURNER (1832-1916), the anatomist, wrote : " The human brain, in all probability, attains its full size and weight at or about the age of **thirty,**" and he added, " whilst the body not only increases greatly in weight after

this period, but in one and the same individual may vary considerably in weight at different stages of adult life, without any corresponding fluctuations taking place in the weight of the brain."

The celebrated Austrian neurologist, Professor **MEYNERT** (1833-1892), found the brain to reach its greatest weight in the **fortieth** year.

SIR JAMES CRICHTON BROWNE, F.R.S. (1840-) : " It is certain that the brain may continue to increase in size until upwards of **thirty** years of age, and that in every nerve centre structural complexity may be augmented long after the limit of bulk has been reached."

Gall's brain physiology is continued in Chapter XIV. (The quotations from Gall in this chapter are all taken—as already mentioned—from his small work : *Sur les Fonctions du Cerveau*, 1822-6, in six volumes.)

CHAPTER XII

FRANCIS JOSEPH GALL: A GREAT PSYCHOLOGIST

EXCEPT in GEORGE HENRY LEWES'S "History of Philosophy," we shall find *no mention of Gall as a psychologist;* or, at most, only one or two brief references. Yet, if Gall was not a psychologist, in the strict sense of the word, his influence on psychology was tremendous, as will be shown in Chapter XXII.

Gall did not study mind; he studied mental phenomena. He broke away from all the traditions of the schools, abandoning every theory and preconceived opinion, and started out on an original course of investigation of mental activities, which included amongst other subjects:

1. **Animal Psychology,** showing the mental development of animals and the concurrent evolution of their nervous structure.

2. **Infant Psychology,** following the harmonious development of brain and mind in human beings.

3. **Social and Race Psychology,** being the manifestation of mentality in the progress of mankind from a condition of barbarism to present civilisation.

4. **Normal Psychology and ethology,** by studying the mind and character of man, especially the character, which had been almost entirely neglected until his time.

5. **Abnormal Psychology**—mental pathology—by observing mental and moral dispositions in disease, injuries, malformations, and arrested growth of the brain. **He showed that the morbid state does not differ radically from the normal, but is only an exaggeration or reduction of some of its elements beyond the limits of variation habitually proper to them.** In the insane we can watch the manifestation of a particular faculty or moral tendency, acting in an intensified degree, and uncontrolled by thoughts and feelings by which it is habitually directed or restrained. Indeed, the insane man is in some measure like the animal. His feelings are not under the control of the intellect.

There is no doubt that, by attending to their own consciousness, metaphysicians have ascertained and described the relations of their own thoughts and feelings, and that occasionally these may be found to correspond with the thoughts and feelings of others; but their systems do not exhibit complete and practical views of human nature. They studied the intellect, but not the feelings which give the impulse for the mind to act. **Gall's method was not that of self-observation for the delineation of human nature, but observation of his fellow-beings.** If we compare the results of metaphysical thinkers with the wonderful insight into mind and character which, for example, a writer like Shakespeare possessed, we cannot be in doubt which is the more practical method. Nearly every metaphysician has been the exponent and founder of a new school, so that we read of a Cartesian, Spinozian, or Kantian philosophy of mind—because metaphysicians did not practise the observation of their fellowmen, but limited themselves to introspection. How strange it would seem if we heard of every eminent chemist having his own system of chemistry!

We cannot study the feelings and emotions by introspection. Whosoever aspires to give an adequate account of the emotions should devote himself to a careful

investigation of their simplest manifestations in the higher members of the animal kingdom; to the study of the different grades of their evolution in the savage and the civilised man, in the child and the adult, the woman and the man, the idiot and he who is not right in his mind. Introspection may disclose our own desires, but cannot disclose those of others; and we may be very much mistaken about our own aims, for the desires naturally attaching to them are often transferred after a time to the means by which that aim is attained, so that there ensue in this way manifold secondary formations. For instance, the end of wealth is to give enjoyment and comfort; but how often does a passion for the means supersede the desire for the end!

The normal mind in its reflection is not conscious of any relation to the brain, or of being hampered in any way. Introspection does not reveal any physical mechanism, the condition of which may either favour or impede its operation. Indeed, the healthy man is not conscious of any apparatus for any of the functions; he is not conscious of the mechanism of digestion, circulation, or of the mechanism of his thought processes. The objects of metaphysical speculation are the immaterial properties of an immaterial being; the brain has no existence for the metaphysician. He studies mind only. Gall proceeded from the brain to discover the processes of the mind. All the metaphysicians naturally ignored him.

He began by following the natural history method and **studying mind in the lower animals.** His work contains a mass of information of the mental dispositions of animals, mostly of his own observation, that is simply wonderful. Hitherto this study had been neglected by most philosophers.

That **Gall was a naturalist of the first rank** is shown in every chapter of his work. Take his discussion with K. A. RUDOLPHI (1771 1832), for example, that birds lack the sense of taste or have an obtuse taste only; Gall wrote:

"Blumenbach has found the organ of taste in the duck comparatively much larger than in the goose; and so also have I observed that the palate of many birds, such as birds of prey, heath-cock, etc., is garnished with nervous papillæ, very numerous and strong. A great number of birds do not swallow their food at once; the tom-tits, for instance, in a manner lick it; most birds, that live on insects and grains, crush and bruise them. What reason should we have in this case to attribute to them a less perfect taste than to other animals? Let anyone give to the canary, bullfinch, nightingale, or cuckoo, many different kinds of food, each will select without fail that which he likes best. The canary prefers dogs-grass. If we give to nightingales, that are newly caught, the larvæ of ants, a great number will die of hunger, because they do not know the kind of food; if we put them in their beak, they usually reject them; but if we crush them, they swallow them with avidity. This evidently proves that they have a very distinct taste. Even birds that swallow their food at once, such as hens, pigeons, etc., distinguish berries and grains by touching them with the end of their beak. Let any one mix the grains of vetch with those of the *robinia caraguna*, the *systisus* of the Alps, etc., the hens and pigeons will take them all without distinction, but they will soon reject the two last. Thus the horny extremity of the tongue does not exclude taste; it seems, on the contrary, to be a prolongation of the lingual nerve, destined to give this part a more delicate taste. If storks have been accustomed to receive in their beak rats and frogs, that are thrown to them, they swallow them with avidity, after having tossed them many times in the air, re-caught and crushed them; but if we throw them a toad, they instantly reject it; they greedily swallow large flies and bees; but, if they catch an insect they do not like, they reject it. Swallows, and all birds that live on insects, do the same. It is an error, then, to suppose that a humid solution is first necessary to cause the sensation of taste. The surface of grains and insects certainly excites on the tongue oleaginous, alkaline impressions, that the taste instantly perceives, by means of instruments organised for this purpose. Add to this, that the dog, when hungry, swallows without chewing, greedily chews filberts, almonds, chestnuts; that he laps milk with great delight; that, like

almost all other animals, he loves sugar ; that the hog and duck, who root and dabble in the mud, tear and chew roots, insects, frogs, etc. ; roebucks and pigeons, who greedily seek dirty slime ; is it possible to deny a distinguishing sense of taste to all these animals ? It is then the less conceivable how Rudolphi can maintain that the sense of taste is wanting in most animals."

Some psychologists, like Descartes, denied to animals any conscious mentality at all, or they attributed all their mental phenomena to the operations of that conventional faculty, termed Instinct. The comparison of the mental powers of man and animals offers the same advantages for the investigation of man's moral and intellectual nature as comparative anatomy furnishes in general biological research. This comparison Gall found especially useful in determining the really innate and universal attributes of men, unmodified by systematic cultivation or social influence. According to Gall, **mind cannot be comprehended without a study of its development and a comparison of animal and human dispositions.** The gulf between the two, he declares, is not so great as has hitherto been assumed. The bodies of brute and man are fashioned on the same plan ; so are their minds.

Gall regarded man as the highest summit of the animal kingdom, not merely in a purely anatomical sense, but also in a physiological sense, and in a further, namely, a psychological sense. He taught that man in his psychological relations does not merely reach this summit in a partial development, but that **all the psychological elements of the animal kingdom are present in man,** and occupy qualitatively and quantitatively the highest grade of development. The manifold mixtures of character are the result.

He said :

"Those who presume that the moral and intellectual acts of man flow from understanding and will, independent of the body, and those who, ignorant of natural science, believe brutes to be automatons, may consider the comparison of man with animals revolting and absolutely futile. Not so those who are familiar with the works of Bonnet and Condillac, and those who have any knowledge of comparative anatomy and physiology. Brutes are objects of contempt because of the ignorance and pride of man, but they share so many things with him, that the naturalist is frequently embarrassed to determine where animal life terminates and humanity commences. Animals are produced, born, nourished under the same laws as man ; their muscles, vessels, viscera, and nerves are similar ; they are endowed with the same senses, which they use in the same manner ; they are subject to similar affections, such as joy, sadness, fear, alarm, hope, envy, jealousy, and anger ; they have the same desires of propagation, and love and foster their young ; they have attachment for each other and some for man ; they are courageous, and fearlessly defend themselves and their offspring against enemies ; they feed like ourselves on vegetables and other animals ; they have the sentiment of property ; and while some are cruel, sanguinary, and vindictive, others recollect benefits and injuries, are sensible to blame and approbation, mild, docile, compassionate, and mutually assist each other ; some are cunning and circumspect, foresee the future by the past, and take necessary precautions against dangers which menace them ; they correct their false judgments and their unsuccessful enterprises by experience ; they have the idea of time, and foresee its periodical return ; they have memory, reflection, and comparison, and even form abstractions ; by means of articulate language or gestures, they communicate their ideas, wants, and projects ; some have a capacity for construction, some can sing, or are sensible to the harmony of music, some can even count ; and to a certain degree they are susceptible to individual perfectibility. There is no moral quality or intellectual faculty of which the germ may not be found in the animal kingdom. If it be thought that this comparison is degrading to man, I, with Pascal, reply that **if it be dangerous to show man in how many respects he resembles brutes, without pointing out his superiority, or to show him his greatness without pointing out his inferiority, it is still more dangerous to leave him in ignorance of both.** We shall not fail to give due recognition, in this

work, to the distinguished place which the Author of nature has assigned to man. His superiority is so conspicuous that there is no need to have recourse to distinctions which experience and natural history disavow. The real detractors of the human species are those who think they must deny the intelligence of animals in order to maintain the dignity of man. To concede to the brutes what God has given them is surely not to degrade our own species."

Hitherto all actions of animals had been referred to instinct, and all the thoughts and actions of man to his understanding. This is certainly a very easy manner of explaining facts: instinct is the talisman which produces every variety in the actions of animals. Gall asked: What is instinct? Is it a personified being, an entity, or a principle? or does the word, according to the Latin etymology, signify only an internal impulse to act in a certain way in ignorance of the cause? He took it in the latter signification; thus the word "instinct" denoted to him every inclination to act arising from within. It is merely an effect and does not express the cause that produces the inclination. Thus when we say that one animal sings and that another migrates, we specify some sorts of instincts, but leave their individual causes undetermined. He explained:

"Instinct is an impulse that impels a living being to certain actions, independent of reflection and volition, *i.e.*, without its having a distinct idea of the means or end. . . . If instinct were a single, general power, not only ought the instincts to be manifested all at once, but also in the same degree. The truth is, however, that while certain instincts act with great force in the young animal, they are completely inactive in others; certain instincts act at one season, others at another season."

The dividing line between man and the other animals, according to Gall, **is not drawn between instinct and reason.** Brutes also reason, and man is not without his animal instincts. Instinct belongs to both, and the lower animals have, to a limited extent, knowledge of the relations of cause and effect in the world around them, and have, to a limited extent, the intuitions belonging to the reasoning faculties that nothing happens without a cause, and that like causes will produce like effects. The mind of man differs from that of the lower animals, rather as to the *degree* in which the reasoning faculties are developed in him than by anything peculiar in their *kind*. Even moral affections are enjoyed by animals—the horse is docile, the lion courageous—and they are excited by the same emotions as ourselves: terror acts on them in the same manner as on us; suspicion, the offspring of fear, is eminently characteristic of most wild animals. Gall said:

"Hitherto a complete line of demarcation was established between man and animals, and no connection could be tolerated between them. . . . 'The brute acts from instinct, man from understanding'—such is the language of philosophers. In the former, say they, instinct supplies the place of intelligence, which is peculiar to men. But do they act solely from instinct? Are they destitute of intelligence? Is man exempt from all instinctive impulses, and beyond the influence of instinct? We have only to obtain a precise idea of instinct, and of understanding or intellect, and the truth will spontaneously present itself to our minds. Instinct is independent of reflection and volition—an inward movement, an impulse that impels a living being to certain actions, without its having a distinct idea of the means or ends. Instinct is not a universal power, that explains all the actions of animals, but it varies as much as the fundamental propensities. For example, some animals build themselves a dwelling, others do not; some hoard food, others do not."

Animals are not mere machines. They do not act solely from instinct, for many animals modify their actions according to external circumstances; they even select one among different motives, and often resist their internal impulses or instincts.

Nor are the instincts of animals rigidly fixed ; they are plastic, and their plasticity renders them capable of improvement or of alteration, according as intelligent observation requires. In the words of Gall :

" They are susceptible of much more extended instruction than their immediate wants require. Do we not teach all sorts of tricks to domestic animals ? They also modify their own mode of action according to the position in which they find themselves. But this ability of receiving education is always proportionate to their primitive faculties. They cannot, any more than man, learn things of which they have not received the first impress from nature. If the dispositions are not innate, why do animals do things which they have never seen done ; and why do they almost always execute them as well the first time as their progenitors have done ? "

Instinctive actions are displayed in their purest form by animals not very high in the scale of intelligence. In the higher vertebrate animals, few instinctive modes of behaviour remain purely instinctive—*i.e.*, unmodified by intelligence and by habits acquired under the guidance of intelligence or by imitation. And even the human infant, whose intelligence remains but little developed for so many months after birth, performs few purely instinctive actions, because in the human being the instincts, although innate, are, with few exceptions, undeveloped in the first months of life, and only ripen, or become capable of functioning, at various periods throughout the years from infancy to puberty. If, in later years, man is moved by different principles, and is better able to govern his passions than animals, it does not follow that in him these passions or instincts are more feeble.

While it is doubtful whether the behaviour of any animal is wholly determined by instincts quite unmodified by experience, it is clear that all the higher animals learn in various and often considerable degrees to adapt their instinctive actions to peculiar circumstances. Gall continued :

" Let us now examine whether, in the manifestation of their fundamental powers, animals always obey a blind impulse ; whether they act exclusively from impulse, or are conscious of their propensities and faculties ; whether they modify their instincts by a clear idea of the means or ends to be used ; in other words, can they be considered to possess intelligence, understanding ? If animals acted only from a blind instinct, their manner of acting would be always uniform. Experiences and external influences would never be able to make them deviate one hair's breadth from their ordinary routine ; their actions, and the order of their occurrence, might be submitted to calculation, like the course of a machine, which, in fact is the common doctrine ; but experience teaches a very different lesson. At the very moment that the wolf scents the flock enclosed in the fold, the thought of the shepherd and the dog comes to his recollection, and counterbalances the present impression which he receives from the sheep. He measures the height of the fold, compares it with his strength, judges of the difficulty of leaping over it with his prey, and concludes the attempt would be useless, or dangerous. Yet, from the midst of the flock, when scattered over the field, he will seize a sheep before the eyes of the shepherd, particularly if the nearness of the woods affords a chance of concealment. He undermines the park or sheepfold, when he can find no other means of penetrating it. He needs but little experience to learn that man is his enemy, and that he must fear his snares. Thus he is always on his guard. The older he is, and the more dangers he has encountered, the more distrustful he becomes. Wolves will hunt in packs, and the mutual aid they afford renders the chase easier and surer. If a flock is to be attacked, a female goes and shows herself to the dog, which she leads away in pursuit of her, while the male leaps over the fold and carries off a sheep which the dog is unable to protect.

" We have daily opportunities of seeing the difference between a trained and an untrained horse, and the changes which education effects in the manner of dogs. Whoever has, in the slightest degree, observed animals, must concede to them a certain degree of perfectibility, of which I have mentioned a great number of

examples in this work. It cannot be denied that they remember past facts, and that their conduct is regulated in reference to them; that they compare, reflect, and judge; and that in emergencies they take measures well adapted to the circumstances. All this cannot be the impulse of a blind instinct—it must be admitted, that, to a certain extent, they are endowed with understanding. But as this understanding is only the faculty of modifying the manifestation of their natural instincts, according to accidental circumstances, it follows that there is a portion of understanding peculiar to each species, and in virtue of this law, each species remains confined to the circle in which nature originally enclosed it. Still, it is established that animals exercise their mental powers with more or less intelligence or understanding."

Instincts are a chain of impulsive acts which have become simplified and connected through continual repetition of the same actions following upon the same stimuli, so as to become finally fixed into the physiological organsiation. Consciousness has gradually disappeared from them, though not entirely. Taken in this light, all our primary mental powers might be regarded as instincts. The sexual instinct, parental love, social attachment, all actions of self-preservation as fighting and concealment, making provision for the future, etc., are all primitive dispositions and instinctive, the moment they create an impulse impelling to action.

Gall, like G. H. SCHNEIDER ("Der thierische Wille," 1880) and WILLIAM JAMES ("Principles of Psychology," 1891), nearly a century later, maintained that man has at least as many instincts as any of the animals, and assigned them a leading part in the determination of human conduct and mental processes. Take away these instinctive dispositions with their powerful impulses, and the organism would become incapable of activity of any kind; it would lie inert and motionless like a wonderful clockwork whose mainspring had been removed, or a steam-engine whose fires had been drawn.

The affections, the propensities, the passions are the great springs of human life. They do not result from intelligence; on the contrary, their spontaneous and independent impulse is indispensable to the first awakening and continuous development of the various intellectual faculties.

The feelings in animals are generally of a less complicated character than in man, and consequently better adapted in that state for observation. They are also less under the control of the intellect, and therefore are nearer the essential or primitive type.

Even what we consider specifically human in the mind exists in its rudiments in the animal. The super-added powers are largely due to man's erect attitude, the development of speech, manual dexterity, the progress of civilisation, and "individual" education. We must imagine a human being without these influences and then compare him with the brute.

"Now let us inquire," said Gall, "whether man also acts from instinctive impulses, or exclusively obeys the dictates of reason. Is he the author of his propensities, or are they involuntary in him, as in the brute?

"I do not speak of those reflex movements that some authors confound with instinct, and which both man and brute do unconsciously, and without any possible premeditation. For instance, we recoil suddenly from the sight of danger, and in falling we stretch out our arms, either to come on our hands, or to preserve our equilibrium. I here speak of instinctive propensities—true instincts. I have proved in the section on innate dispositions, and when treating of the fundamental qualities and faculties, that man neither invents nor creates his propensities and faculties. I know not to what degree of ignorance are to be attributed the dogmas of that arrogant philosophy which pretends that man is beyond the reach of those laws which govern the animal kingdom. When man burns with physical love and seeks a companion; when he loves his children, and takes care of them; when he defends himself and family against his enemies; when he is proud, vain, benevolent, cruel,

avaricious, cunning, and circumspect, who does not know that this takes place without his participation or resolutions? Who does not perceive that all these sentiments are movements, dispositions independent of reflection? They are not the result of attention, of deliberate thought, of premeditation, of volitions. They are genuine instincts. The intellectual faculties also are in most cases exercised instinctively. The primitive capacities are inborn, and so little are we conscious of them, that when our attention is called to them subsequently, we are astonished to find such extraordinary qualities or gifts. The more brilliant the genius, the more instinctive the activity of the organ, at least in the early period of its manifestation.

"If men of genius manifest talents at an age when they do not know that such faculties exist; if they calculate, sing or draw, without any previous education, do they not do so by some internal impulse or instinct, as well as the animals which sing, build, migrate, and gather provisions? Instinct, then, is not confined to animals, and understanding is not a prerogative of mankind.

"My admiration was deeply excited by the following lines of Voltaire, who has achieved so much himself by the force of instinct, addressed to Diderot, under date of April 20th, 1773:

"'All the philosophers together could not have written the *Armide* of Quinault, nor *Les Animaux Malades de la Peste* of La Fontaine, who was unconscious of what he had done. It must be granted that, in the performances of genius, all is the work of instinct. Corneille conceived and wrote the scene between Horace and Cornelius as a bird builds its nest, with the exception that a bird always does its work well, which is not the case with us.'

"It is only when man turns his attention to his innate internal powers, compares them with the powers of others, learns their use and how to employ them under change of circumstances, and reflects upon himself, that his instincts gradually acquire the character of intellect or understanding.

"The qualities common to man and animals are ennobled in man: the animal desire for propagating the species is transformed in man to moral love; the love of female animals for their offspring becomes, in women, that amiable virtue which inspires tenderness for their children; the attachment of animals increases in man to friendship; their sensibility to caresses, to ambition and a sentiment of honour; the same faculty which produces the song of the nightingale, produces in man the art of music; and that which produces the nests of birds and the huts of beavers, produces man's temples and palaces. Man with his more complex organisation presents elevated faculties, but the elements are the same, and it is doing violence to reason to place him out of the domain of those natural laws which govern both animals and man.

"Man, knowing that he possesses no member and no part of his body peculiar to his species—that he propagates his kind after the manner of animals, that he nourishes himself on the carcasses of other animals, that he lives, fights, and dies like an animal—has his pride ruffled. **Yet the man who is endowed with strong physical powers and mental force has no more right to plume himself on their possession, as if they were acquirements due to his voluntary energy and perseverance, than need the man to whose lot has fallen physical and mental poverty be ashamed of his misfortune as if he had the option by voluntary effort of becoming a Hercules or a Solomon.**"

Gall was thus the first to show that **there is no fundamental difference between man and the higher mammals in their mental powers**; a fact confirmed three-quarters of a century later by CHARLES DARWIN (1809-1882), in his "Descent of Man," 1871.

Neither the *ego* nor consciousness are the sovereign powers to which metaphysicians have raised them, said Gall. Man can receive sensations without consciousness. Moreover, **consciousness varies in degree according to the state of the brain and changes entirely in insanity.** The *ego* is no entity; it varies from time to time, and is sometimes split up. He continued:

"Inanimate bodies are unconscious of their existence. They have no *ego*; nothing tells them that they are individuals independent of other beings; and

alone, though infinitely multiplied, they would constitute a perfectly dead nature. Life, *ego*, consciousness of the existence of the world, begins with sensation, with the nervous apparatus. When the individual perceives that it is distinct from surrounding things, it has an *ego* whose capacity will be in proportion to the variety and intensity of its sensations; and consequently, to the number and energy of the organs of internal sensibility and external relations. The more numerous the organs in contact with external objects, the more extensive will be the world of the animal. To the general, vague, indefinite sensation, add sensations that are determinate and essentially distinct from one another, and you gradually modify and enlarge its world. Each sense, each organ, becomes a new revelation. Taste, smell, hearing, vision, touch, each make known to him existences, and different relations in the world, and whether wholly or partially combined, the aspect of this world must essentially vary. Applying these remarks to the organs of the moral qualities and intellectual faculties, we may consider them also so many points of contact with the external world; so many sources of new kinds of sensations, sentiments, instincts, propensities and faculties; but we have seen that they are unequally shared by the different species of animals. Their internal and external world must therefore vary to infinity, diminishing or increasing in the same proportion as the number of these organs diminishes or increases."

The anatomy and physiology of the brain alone can furnish rational notions of the human understanding. I ask you, psychologists—said Gall—do you really believe that you have explained the nature of man by depicting—and that on a gratuitous supposition—an immaterial "ego," charged with the duty of cognition, feeling, and willing?

"Your answer to all my questions is: My consciousness tells me that it is so. But I tell you your consciousness deceives you. Instead of trusting so fallacious a guide, interrogate your senses; apply yourself to the observation of your fellow-men, and they will instruct you as they instructed me. As a physiologist I will demonstrate to you the organs of the different mental powers not only in man, but in the whole series of animals. **I must confess that my investigation is far from complete, but I am at least certain that no other method can lead to a knowledge of the moral and intellectual man.**"

Gall was opposed to regarding the mind as entity and unity. He knew only a mental organisation. The notion of the soul or mind as an absolute unity long prevented, or, at least, obscured the recognition of the great variety of different powers and more or less discordant tendencies existing in the same individual, and led metaphysical thinkers to reduce all the sentiments and affections as modes of self-love (Hobbes), and all the intellectual phenomena as transformed sensations (Condillac). No one had so far attempted to explain why souls differ. If the soul were an immaterial substance, all souls ought to be alike, only varying during the life of the body according to the influence of circumstances; otherwise they must be originally unlike.

Gall strenuously opposed the "faculty" psychology (Wolff), which was so popular in his day. The faculties are simply different directions of activity of the mind. When he used the term "faculties," the word had not the same meaning with him. He meant not entities, but powers and aptitudes, and then generally with reference to the intellect—intellectual faculties—as distinguished from the sentiments, emotions, and propensities.

He told us that while the metaphysicians were engaged in their elaborate propoundings of perception, conception, memory, abstraction, imagination, reason, and so forth, they never suspected that they were dealing but with terms that refer to qualities which merely characterise the various degrees and modes of operation of the fundamental mental powers, and that such terms did not even serve to nominate or define the nature of a single elementary power. "They are not

radical, fundamental, primitive qualities at all ; they are only abstractions, general attributes of the true fundamental powers." For example :

" Take the musician. He would not be a musician if he did not *perceive* the relation of tones, if he had no *memory* of music, if he could not *judge* of melody and harmony ; and certainly not a composer, if he had not the *imagination* to invent new combinations. Thus attention, perception, memory, judgment, and imagination are nothing else than the different modes of action of every one of the fundamental capacities. When the primary mental power is energetic, so will these attributes be ; when it is feebly developed, there will be a feeble degree of attention, of perception, of memory, a defective judgment, and no imagination. This explains how it happens that one may have strong attention, easy perception, a tenacious memory, and an extremely correct judgment, an inventive and brilliant imagination in one particular direction, and be almost imbecile in any other.

" **We have to discover the fundamental powers of the mind, for it is only these that can have separate organs in the brain.** But how are we to derive this knowledge ? Whenever we inquire we get this common answer : ' What need have you of seeking other powers of the mind than the faculties of intelligence and the will ? Man is an architect, mathematician, poet, solely because he applied his understanding to architecture, mathematics, and poetry. He gives himself to love ; he takes care of his children ; he is ambitious ; because such is his choice.' I had in vain to ask why it was that one man applied himself by choice to architecture, rather than to anything else ; why another took pleasure in hoarding money, another in seeking honours, etc.

" In order to invalidate this unsatisfactory appeal to the will and the understanding, I referred them to the mole, the rabbit, the ant, who construct their subterranean galleries with astonishing foresight ; I referred them to the beaver, the bee, the penduline, who construct their cabins, their hives, and their nests with inimitable art ; I referred them to the quail, the cuckoo, the stork, and the swallow, who, after a long absence, return to their old habitation ; I referred them to the bloodthirsty weasel, the cunning fox, the bold wild boar, the singing nightingale, and the imitating mocking-bird. But still my ears resounded with the cry of the philosophers : it is ' instinct ' ; and one would have believed that all the means for explaining these phenomena had been exhausted."

Aristotle held that " there is no power of mind which has not been derived from the external senses," and Locke held a similar view that the whole intellectual content comes through the senses ; but how can we believe in the sensation theory, when we see that a word heard by one individual can determine in him an intense psychic reaction, which may lead to a series of actions, whilst in another it may pass almost unheeded ? It is evident, said Gall, that in such a case the effect cannot be explained without assuming the intervention of some organic predisposition.

" When by sensation we understand nothing more than impressions produced by the external world on the senses, as most authors do, we wholly neglect the internal feelings of man and animals, and forget that **the external world is known only to the extent of our perception of it, which varies according to our own individuality,** although all men are surrounded by the same objects. We all have the same senses, but the world we live in appears different to each one of us. What is it that makes the world different to each individual ? Psychologically, it is the individual character. The elements of the individual character determine the individual outlook. These elements, though they can be modified, are permanent in man, and we know him by them during life and remember him by them after death.

" The five senses will not help us to explain the great variety in the animal instincts, the nest-building of the bird, the constructive instinct of the beaver, the migratory instinct of the nightingale.

" If animals were so susceptible to impressions from their surroundings, why does not the female nightingale imitate the song of her mate, and why does each

animal, notwithstanding intercourse with other species, preserve its peculiar manners? Why does the cuckoo not imitate the note of the bird which has reared it? Who instructs the spider, hardly escaped from the egg, to weave a web and envelop the captive flies?

"If the propensities of animals are not determined by their organisation, how can you explain the fact that these propensities are always found in harmony with their external organs? Will you maintain that nature acts without object in giving to the beaver strong gnawing teeth and a flat tail; to the intelligent elephant his trunk; to the sanguinary tiger his terrible claws and teeth? Will you tell me that the bear, the tiger, and the elephant employ their instruments for the sole reason that they find them fitted for certain purposes? That the mole lives under ground because his eyes are too small, or that the swan chooses of necessity his abode in the water because his feet are natural oars? Neither man nor animals have any limb, any instrument, in order to use it, but they use them because they have them! If we give the teeth and claws of the lion to the sheep, we do not change the sheep into a lion.

"Man does not invent because he has hands; but animals and man have these organs, because their internal organisation is endowed with the faculties which are in relation to them."

The foregoing criticism is evidently in reply to the attempt made by BUFFON, VICQ D'AZYR, CUVIER, and others, to deduce instinct, or mechanical aptitude, from the tail of the beaver, the trunk of the elephant, the eye, ear, and hand. Gall went on to say:

"The capacity of perceiving impressions, of retaining and comparing ideas, and making application of them, is by no means in proportion to the senses either in man or animals. Could it even be demonstrated, that man, of all animals, has the most perfect senses, we should not obtain the explanation of his surpassing all others in intellect. Experience teaches us that greater or less superiority of mind is not produced by greater or less perfection of the organs of the senses.

"If all our ideas arise from the senses, what becomes of the general and purely intellectual ideas, the signification of which is wholly independent of the material world? For example, 'there is no effect without a cause.' As we generally attribute to savage nations the most delicate senses, it would be from them that we ought to expect the most profound philosophy, and the feeblest instinct.

"Are idiots, who possess their five senses in perfection, more gifted than the men born blind? Is it not apparent that the internal powers alone modify the impressions received by the senses? For this reason external objects act very differently on men and animals, and on different individuals.

"Age and sex produce no essential difference in the number and nature of the senses; why then are the intellectual faculties and the passions so different in the child, the youth, the man, and the woman?

"The great diversity of intellectual functions, feelings, and instincts is not due to the five senses. For example, musical ability does not depend on a fine sense of hearing, and constructive ability on superior sight; there must be a fundamental capacity and disposition for such abilities.

"The senses are not the immediate generators, but merely the *mediators* of mental qualities. They conduct external impressions to the brain, which receives, digests, and reproduces them, according to its own energy."

The eye does not see, nor the ear hear. Behind ear and eye there is something which changes all that is supplied by the senses into percepts and concepts. There are brain-centres for sight, hearing, etc.; and if these are injured, the eyes, ears, etc., are useless.

"People err when they believe that the eye sees, and the ear hears, and so forth. Every external organ of the senses is, by means of its nerves, in connection with the brain. At the origin of these nerves, a proportionate mass of cerebral matter, the

proper internal organ, completes the function of the senses. Although, therefore, the eyes themselves be ever so sound, and although the optic nerves be perfectly entire, yet if the internal organ be diseased or injured, the eyes and optic nerves are no longer serviceable. Consequently, the external instruments of the senses have also their operating organs in the brain ; and these external instruments are only the means by which their internal organs are brought into communication with external objects, or, on the contrary, are excited into activity by them. This is the reason why, without the interposition of external objects, or of the external organs of sense, we can experience in our minds representations of tones, of light, and so forth, as in dreams."

There is no independent faculty of reason, intellect, intelligence. Reason is an abstraction, not a real thing. There are as many possible " reasons " as there are particular minds and particular exercises of mind in the different domains of thought and situations of life. Nor is it from reason that the motive impulse to action comes. Reason only devises the means to it. Animals can reason on the objects which arouse their instincts and on no others.

" Every fundamental disposition accompanied by a clear notion of its existence and by reflection is intellect or intelligence. Each individual intelligence could not constitute reason, which is the complement, the result of the simultaneous action of all the intellectual powers. It is reason that distinguishes man from the brute. There are many intelligent men, but few reasoning ones. Nature produces an intelligent man ; a happy organisation cultivated by experience and reflection forms the reasoning man. . . . There are as many different kinds of intellect as there are distinct qualities. . . . One individual may have considerable intellect relative to one fundamental power, but a very narrow one in reference to every other. Man, by reason of his more complex organisation, is much more capable than the brute of acquiring a clear knowledge of his propensities and capacities ; and, in consequence of this prerogative, he is endowed with intellect, not exclusively, but in a higher degree than any other animal. . . . From what has been said, we draw the conclusion that a special faculty of intellect or understanding is as entirely inadmissible as a special faculty of instinct."

For these reasons Gall held that **the special capacities of the intellect might have circumscribed centres in the brain, but that the intellect, per se, cannot be localised.** As MUNK (1839-1912), within recent years, has said : " Intelligence is localised everywhere, and nowhere in particular."

Gall held similarly that **each mental quality had its own memory,** and that therefore memory could not be localised in the brain. This is in accordance with the most advanced observations of the present day ; but many writers erroneously accuse him of having localised it. Each mental power, having a corresponding agent in the mechanism of the brain, is the exclusive agent for the conveyance to the memory of its own impressions. Hence it is that we find that the capacities of memory vary, not only in various persons, but in the same individual. We remember what we are fond of, whether it be art, or poetry, or philosophy. Emotionally we also remember what we hate. This is due to the attention aroused by the emotional interest. But there is also disinterested " retentiveness " ; such retentive power is the gift especially of what we call talent, as the reproductive power is the gift especially of genius. Gall showed that memory is not a single, an individual faculty, but the property of each fundamental power, dependent on the physical apparatus with which that power is connected. Accordingly, as this apparatus is physically sound or unsound, each kind of memory is either feeble or active, be the other faculties what they may. He said :

" Perception and memory are only attributes common to the fundamental psychical qualities, but not faculties in themselves ; and consequently they can

have no proper centres in the brain. If perception and memory were fundamental forces, there would be no reason why they should be manifested so very differently, accordingly as they are exercised on different objects. There would be no reason why the same, and, in fact, every individual, should not learn geography, music, mechanics, and arithmetic, with equal facility, since their memory would be equally faithful for all these things. But where is the man who, after the greatest possible application, does succeed with equal ease in these different branches of knowledge, and does not evince, however astonishing his capacious memory in certain respects may be, an extremely small endowment in other subjects?

"One man remembers facts, and forgets dates; another recollects faces and not names; some never lose from their minds the places where they have been, yet have no power to recall a tune; therefore, memory is not a simple fundamental faculty."

Gall applied the same reasoning to the supposed faculties of **judgment** and **imagination.** They, too, are not fundamental powers, but attributes of all the fundamental qualities.

"A man's judgment may be prompt and correct, relative to certain subjects, while he is almost imbecile in regard to others; a man may manifest the most rich and brilliant imagination, relative to a certain class of subjects, while he is cold and barren upon every other. It is impossible for him to possess judgment and imagination respecting subjects, for which nature has refused the fundamental endowments. For example, whosoever is endowed with a very active sense of tones, perceives concords, readily judges of the correctness, or incorrectness, of the relations of tones. In the same manner, whoever has the artistic sense, has a good judgment of works of art. When, however, the fundamental endowment is weak or absent, the judgment relative to the objects of it must necessarily be weak or absent also.

"Judgment is no fundamental faculty; but every intellectual faculty has its judgment. The most profound thinker will form an imperfect judgment of music, painting, etc., if he is not gifted in that direction, if the brain centres for these capacities are imperfectly developed in him.

"I apply the term 'imagination' to the activity of the primary mental powers independent of the external world; it is the creative power of each fundamental capacity. The imagination of the sense of locality creates landscapes; that of the sense of tones, music; that of the sense of numbers, arithmetical problems; and that of the mechanician, machines. . . . Then there is the imagery of the timid man, of the bold fighting man, and so on."

Some philosophers held that "attention" was the source of all the faculties of man, but, said Gall, attention varies according to the innate disposition. We pay attention to such subjects as we are disposed to study, and no attention to those for which we have no innate disposition. One pays attention to music, the other to mechanics, another to natural history; some to dress, women, money, etc. Attention is not an independent faculty. **We are attentive to what pleases us**; and what pleases us is what is agreeable to our organisation. Hence intelligence is not the regulator of attention, but the primary powers of our organisation move us to pay attention. **Attention depends on the feelings and propensities.** The animal crouching for its prey, the child gazing at a commonplace spectacle, the assassin waiting for his victim, the mathematician studying a problem, are attentive, because the prey, the spectacle, the thought of the victim, the problem to be solved, arouse in them an intense and durable emotion. Without emotion there would be no attention; but while emotion lasts, so does attention.

"I cannot conceive," said Gall, "how it ever entered the heads of certain philosophers to maintain that attention is the source of all our faculties and propensities. I admit, for a moment, that attention is exerted in everything done by

man or brute ; but it must proceed from a fundamental power—it never can be the source of any fundamental power whatever. A partially imbecile person may give the most untiring attention to everything relative to mimicry, to order, and to the sexual functions ; but none whatever to the sentiments and thoughts of a different order. The educated and thinking man is very soon fatigued, when fixing his attention on subjects that are out of his sphere, while it is mere sport for him to give unwearied attention to subjects that belong to his province.

" It has long been one of the favourite notions of many philosophers that attention is the source of all the faculties of man ; that one may acquire such or such a capacity, according as one directs one's attention to such or such an object in question. Helvetius has gone so far as to say that there is no well-organised man who cannot exercise his attention with all the force and the constancy which would need to be employed in order to elevate him to the rank of the greatest man. Such is the eager zeal of deriving from a single principle all the phenomena of animal life ! Condillac made sensation the source of all the faculties. According to him, recollection, memory, comparison, judgment, reflection, imagination, and reasoning, are included in the faculty of perceiving.

" When an animal or a man is excited by the relation which exists between him and his relative object, the man or the animal is found in a state of attention. The hungry fox scents the hare ; the falcon, gliding through the air, perceives the lark ; they are then attentive. The philosopher is struck with a happy idea : he is then attentive. This will explain why each animal has the habit of fixing his attention on a different determinate object, and why each man fixes his on different objects. The roebuck and the pigeon regard with indifference, without attention, the serpent and the frog, objects of the attention of the hog and the stork. The child fixes his attention on playthings ; the woman, on her children and on dress ; men, according to their individual dispositions, on women, horses, battles, the phenomena of nature, etc. The difference which travellers manifest in their descriptions of the same country and the same nation, the diversity of the judgments which different men pass on the same objects, arise from the diversity of predispositions. Every instinct, propensity, and talent has therefore its attention. Attention is, therefore, an attribute of a pre-existing innate power, and anything rather than the cause of this power.

" If the special instincts, propensities, and talents are feeble, their relations to their objects are equally so, and neither man nor animal will have a long or a strong attention. It is for this reason that, in infancy, when certain powers are still undeveloped, and again in old age, when the brain organs have lost their energy, that we regard with coldness the same objects, which, at the age of manhood, excited our liveliest interest.

" In other respects, I leave attention and exercise, as well as education, possessed of all their rights. It is not enough for one to be endowed with active faculties; exercise and application are indispensable to acquire facility and skill. To awaken the attention of men of coarse minds, we must either make a strong impression on their senses (propensities), or we must limit ourselves to the ideas and objects with which they are familiar ; that is to say, with which they have already points of contact."

All that has been said with reference to attention, memory, judgment, and imagination is also true of the **desires, propensities, and passions.** They are only different degrees of some fundamental power, whether intellectual or appetitive. We can have no desire, propensity, or passion in regard to objects for which we are not endowed with a primary or fundamental power. With a poor tone-sense, there can be little desire, no propensity, and no passion for music. Gall continued :

" The gradation that takes place in the intellectual capacities is still more sensible in reference to those fundamental powers, that are only sentiments and appetites. While the cerebral organ of the sexual instinct remains undeveloped, as in the child, there is no difference to him between the two sexes. But, according as this centre is developed, the boy and girl begin to fix their attention on whatever relates

to the sexual functions, whether in themselves or others; and, in the same proportion, there arises a sentiment, a propensity, which at last is raised to a passion. The same is true of the love of offspring, of the sentiment of property, etc.

"Desires, propensities, passions, are only different degrees of the activity of some fundamental power. We can have no desire, propensity, or passion, but in regard to objects for which we are endowed with a primitive or fundamental power.

"Our desires vary with the organisation, hence desire is not an independent faculty. We can weigh different desires and decide for one or the other, but the strength of any particular desire will depend on the energy of the particular primitive mental power which has awakened the desire."

"In recapitulation, then, we observe, that wherever there exists a fundamental faculty, a particular and definite intellectual power, there also necessarily exists a power of perception relative to this faculty. Whenever this faculty is actively exercised upon its appropriate objects, there is attention. Whenever the ideas, or traces, which the impressions of these objects have left upon the brain, are renewed, either in the presence or absence of these same objects, there is passive memory, reminiscence. If this same renewal of impressions is done by a deliberate, voluntary act of the brain, there is active memory. Whenever a fundamental faculty compasses and judges the relations of analogous and different things, there is judgment. A series of comparisons and judgments constitute reasoning. Whenever a fundamental power creates by its own inherent energy, without the concurrence of the external world, objects relative to its function . . . there is imagination, invention, genius.

"The history of insanity and idiocy proves to us, that when one of the fundamental qualities has been lost or enfeebled, its perception, memory, judgment, imagination, attention, all its attributes, in short, are equally lost or enfeebled.

"The intellect, desires, attention, judgment, etc., do not act capriciously, but always in accordance with the organisation of the innate fundamental qualities."

The "will" is not a fundamental power of the mind, but is a general attribute of it, according to Gall.

"According to the metaphysicians, it is because a man wills, that he defends himself or his property, that he builds, that he sings; and it is from instinct that the animal kills, defends its property, constructs, or sings, etc. **There is no abstract will existing**; we each will differently, and the same person wills differently at different times; and even with regard to the same object, he does not always will alike."

We have seen that philosophers considered **the desire of pleasure and the avoidance of pain** to be the only motives of human actions. Gall's study of animal behaviour led him to see that this theory of motives was false. Many an animal mother strives with all the energy of her being against overwhelming odds and, unflinching, meets death in its most cruel form, rather than desert her young to seek an easy safety in flight. Fear is not a pleasurable emotion; we cannot avoid it, if we are strongly organised towards it. There is no pleasure in anger or jealousy either. Besides, even the passions ranked as pleasurable are seldom wholly pure or unmingled with pain, and it is most rare that we find the painful passions wholly unmitigated by those which are pleasurable.

In Gall's opinion, **desire and aversion are felt in accordance with the energy of the innate dispositions.** One man feels the most vivid pleasure in generously pardoning offences, another rejoices when he succeeds in satisfying his vengeance; some men place their happiness in the possession of riches; others in a philosophy which elevates them above human vanities.

The continued obstruction of instinctive striving is always accompanied by a painful feeling; its successful progress towards its end by a pleasurable sense of satisfaction. The instinctive impulses determine the ends of all activities and supply the driving power by which all mental activities are sustained; and all the

complex intellectual apparatus of the most highly developed mind is but a means towards these ends, is but the instrument by which these impulses seek their satisfactions, while pleasure and pain do but serve to guide them in their choice of the means. Conduct does not proceed primarily from a calculation of satisfactions to be yielded by this or that course ; but every creature, whether animal, child, or man, behaves in this or that way, because the impulses with which he is intimately endowed are set towards this or that end.

Sir FREDERICK MOTT (1853-), "Physiology of the Emotions," *British Medical Journal*, 1908, agrees with Gall that "neither pain nor pleasure can be said to constitute an emotion."

We are all a mixture of dispositions, and one or more passions usually preponderate over the rest—for example, fear, anger, or ambition—rendering us constitutionally timorous, irascible, or aspiring. **Education can teach us to control our disposition, but cannot eradicate it.**

Gall also showed that **the differences of constitution,** *i.e.*, of "temperament," **are insufficient to account for the great diversities of intellectual ability and emotional disposition, as well as conduct.** Cabanis, Richerand, Pinel had sought for the moral and intellectual character of man in the temperament, by following the doctrines of the ancients. Gall said :

"Whenever I read expositions of the temperaments, I imagine myself surrounded by fortune-tellers, such as Porta, Penchel, Pernetti, Huarte, and de la Chambre, who, if they know whether a person has black, fair, red, stiff, straight or curly hair, hazel or blue eyes, straight or arched eyebrows, the base of the nose wide or narrow, small or open nostrils, thick or thin lips, round or pointed chin, can draw his horoscope, and determine his qualities, vices, and talents."

This passage shows that Gall was against character-reading by physiognomy, yet many critics held him liable for the extravagances of his followers in that direction.

There are a number of **innate mental powers,** or rather dispositions to such powers, in every individual of the human race and animal species. They are possessed in very different degrees of endowment in different individuals, and can be improved but not eradicated. **We do not all possess the different intellectual capacities in the same degree ; nor are we alike in our emotional dispositions.** Some mental power or combination of powers generally predominates, and it is this difference of development which constitutes the endless varieties in the characters of men.

Our elementary capacities and dispositions, according to Gall, are innate ; but if innate, **what becomes of our Free-Will** ? This is a very important problem, on which even to-day men are not agreed. Gall has dealt with it ably and fully :

"If the fundamental elements of our capacities and dispositions be innate, it is urged, then we are the instruments rather than the masters of our actions, we are slaves to our internal impulses. What then becomes of our moral liberty, and how can good and evil be ascribed to us ? Condescend to hear my explanation.

"You say that it is the brain *en masse*—as a whole—which is the organ of the different mental powers, and I explain that I substitute a compound organ for a simple one. One is as material as the other. You admit an instrument, so to say, with a single string, to produce the music of mind in all its varieties and at all ages —infancy, adult years, and old age ; and I show you that the instrument has a number of strings to produce the different tones.

"Has any one drawn the conclusion that the soul is material or mortal, from the essential differences of the senses ? Is the mind which sees, different from the mind which hears ? We do not see with the eye, nor hear with the ear, but with the material brain-centres for sight and hearing ; and the same mind, which sees through the centre of sight and smells through the olfactory centre, remembers words,

figures, or tunes, by other distinctive brain-centres, and experiences the emotions of fear, anger, etc., through still other definite parts of brain-matter.

"The spiritualist admits that the mind moves the arm by means of the nerves, and sight is owing to the action of light on the eyes and optic nerve; why should not the soul require for its various attributes structurally distinct parts of the brain? The brain centres determine the disposition or tendency but not the actions themselves. The only difference is this, that he who has well-developed centres will have a stronger inclination to exercise the activity united with it, and more difficulty in abstaining from that exercise, than he will have whose organ is feeble. It has long been acknowledged that men are born with different inclinations, some of which manifest themselves very early in life, so that in children of the same parents, and educated together and alike, very different dispositions and inclinations may be observed. What the theologians used to call the temptations of the devil are just those violent inclinations and desires opposing our better knowledge and will. Finding a brain-centre for these inclinations does not alter anything. Only knowing that they are bound to a physical structure, we learn that exercise stimulates a structure to growth, and neglect diminishes its power; and this law we can apply to morals, especially in the training of children.

"It is true that man cannot change his organisation, nor the results which follow directly from it. Moreover, he has no control over accidental impressions produced by external causes. As it is impossible for him not to feel hunger when his stomach acts in a certain manner, so it is impossible for him not to feel the desires of the flesh, or any other propensity, whether for good or evil, when the centres or organs of these propensities are stimulated. But we must not confound propensities and desires with Will. Desire, propensity, passion, are different degrees of the activity of each fundamental power. There is reason to deny freedom with regard to the existence of desires; but it is a false inference to conclude that will and actions are equally devoid of freedom. Desires, propensities, passions, are the result of the activity of certain centres; Will, on the contrary, is a decision, a determination, produced by the examination and comparison of several motives. Oftentimes man is incapable of controlling the violent action of some one of his organs; in which case, the desire, propensity, or passion that results is involuntary; and thus arise temptations, which are the first conditions of vice and virtue. While we only desire, we deserve neither reward nor punishment. Most often, the brutes have only desire without will, and the same is the case with man in a state of idiocy or insanity or when the organs are unusually active. It is only when the will is exercised that our actions become morally free, and subject to merit or blame.

"It is not the impulse that results from the activity of a single organ, or as some term it, the feeling of a desire, that constitutes the will. That man might not be limited merely to desire, but might exercise will also, the concurrent action of many of the higher intellectual faculties is required; motives must be weighed, compared, and judged. The decision resulting from this operation is called the Will. There are as many kinds of desire, propensities, and passions as there are fundamental powers. The will is the result of the simultaneous action of the higher intellectual capacities, and supposes attention, reflection, comparison, and judgment. The will is often in direct opposition to the desires, propensities and passions.

"With only one propensity, there would be only one motive and no choice of action. If an animal has a variety of brain organs, it will act according to the one which has the greatest energy and thus supplies it with the most powerful motive. **The more complex the organisation the greater the choice, the greater the freedom.** Man, in addition, has reason and moral sentiments, which act as a check to the propensities; hence he may will quite contrary to his desires and inclinations. All the facts quoted by metaphysicians in favour of a free will are only met with in the conditions where the intellect predominates over the instincts and sentiments.

"It is evident that there must be as many motives to our action as there are primitive qualities and faculties. Here too the comparison of man with the lower animals will be of great utility. The actions of the lower animals are simple, while those of man are almost always more or less complicated, and the individual himself is very often unable to render a reason for them. Their motives are doubtful, and never entirely free from capricious subterfuges. The most powerful springs of the

actions of brutes are the instincts of propagation, of love of offspring, of social attachment, of self-defence, of the sentiment of property, etc. Their actions are very often determined by envy, jealousy, hatred, anger, etc. Man being endowed and governed by the same desires, the same propensities, and the same affections, his actions must be determined by the same motives. Our social, civil, and religious institutions are due, in a great measure, to the instincts of propagation, of love of offspring, of self-defence, of the sentiment of property, of vanity, ambition, the desire of independence and domination.

" The existence of an internal sense of individual freedom is commonly alleged in opposition to those who reject an absolute free-will. It is said that every one has a consciousness, that when no physical or moral constraint forces us to act, we act freely—that is, that we might have acted in a different manner. But it is a fact, that even when acting under the influence of desires more or less imperious, without choice or will, man experiences a sentiment of satisfaction associated with the accomplishment of his desires, and which is more or less vivid in proportion to their intensity. It is this satisfaction which misleads the individual, and induces the belief that in this case he acts with freedom. Thus, he thinks he acts with freedom when he walks erect, although his organisation obliges him to do so ; the man agitated by jealousy, or the desire of revenge, and he whom the fire of love is consuming, consider themselves free, so long as they feel satisfaction from the accomplishment of their desires. When the storm is calmed, they change their tone and acknowledge that they were carried away by the impulse of passion. We are often entirely strangers to every idea of a sensual appetite ; but scarcely has an object excited our organs than without the least desire to gratify our sensual feelings we experience the desire of possessing what we should have disdained an instant before, and we believe that we have determined with freedom.

" **Animals do not enjoy perfect liberty ; yet they act without feeling any restraint.** Like men, they experience the pleasure which follows the accomplishment of their desires. In certain circumstances, even our judgments are accompanied by a pleasurable sensation, without being, in consequence, the result of our reflection. Hence it is that we judge differently of the same object, according as circumstances alter our internal feelings. On the other hand, animals themselves are not altogether subject to their dispositions and propensities. Strong as may be the instinct of the dog to hunt, repeated punishments will, nevertheless, prevent the action of his instinct.

" But man possesses, besides the animal qualities, the faculty of speech, and unlimited educability—two inexhaustible sources of knowledge and action. He distinguishes truth from error, right from wrong ; he has the consciousness of free-will ; the past and future are able to influence his actions, etc. Thus armed, man may combat the inclinations that lead him into temptation ; his inclinations can be subdued and kept under by opposite or stronger motives. Responsibility ceases, even according to the doctrine of the most rigid theologians, if man is either not tempted at all, or if he is absolutely incapable of resistance when violently excited. There is no merit in the continence of those who are born eunuchs.

" **It is this struggle against our propensities which gives rise to virtue, vice, and moral responsibility.** What would that self-denial, so much recommended, amount to, if it did not suppose a combat with our internal inclinations ? The more we multiply and fortify the counteracting motives, the more we gain in free agency and moral liberty. The stronger the propensities are, the more do controlling principles become necessary. From this fact arises the necessity and utility of education, law, reward and punishment, and religious influences On it also is founded the utility of the knowledge of mankind, and of the present doctrine concerning the origin and difference of the human faculties and dispositions.

" **If man could act without a motive, and solely from caprice, there would be no certainty, nor even probability, that, under given circumstances, he would act in such and such a manner.** Why should we expect of our friends fidelity rather than perfidy, virtue rather than vice ? Man must have determining motives. If man had an absolutely independent will, he would act according to the caprice of the moment, and we could never rely on him.

" Cæteris paribus, the desires and passions will prevail in a rough uncultivated

man; the Will will triumph in a refined and educated man. The brute, the violently excited man, the idiot, the maniac, have ardent desires and passions, but hardly any will. The actions of those who are solely guided by the desires and passions are easy to foresee and calculate, however little we may know of their organisation. The decisions of the will, however, cannot be foreseen with such certainty, but require a profound examination of the nature of all the motives, which are furnished in part by the organisation, and in part by the external world.

"That we are not entirely masters of our feelings nobody doubts. But let us suppose several human faculties to act together, and let us suppose that they have been enlightened and improved by education, by social converse, by knowledge of the laws, and by the dictates of the sentiments of religion, and the knowledge of right and wrong; and that the powers of judgment and control resulting from all those combined causes are directed against any powerful impulse acting singly—then a contest will arise between it and the controlling influences; the possibility of choice will be enjoyed; and at last, and often in spite of strong and counteracting desire, a resolution will be formed, which is **the free act of the soul** itself. It follows that if you would always have actions to be the result of deliberate reason, you must cultivate the innate qualities and faculties; and you must multiply, ennoble, and enforce the outward motives. It follows, too, that the virtues and crimes of man may as justly be imputed to those who are charged with education and government, as to the individuals themselves.

"I have shown that an unlimited and absolute liberty is opposed to the nature of a created being, but that man, by virtue of those faculties, the number and dignity of which elevate him above brutes, has the power of fixing his attention on the highest motives of his nature, whether springing from internal or external causes, and will be thus determined either by existing motives or by new motives which a well-organised man can continually call to his aid; that, whenever a sane and well-organised man has willed a thing, he might have willed the contrary, not without a motive, which would be absurd, but by seeking for and adopting other motives than those which have determined him; that this power constitutes true moral liberty, and that on this notion of liberty is based education, morals, legislation, rewards and punishment."

The contemporaries of Gall were under the influence of JEAN JACQUES ROUSSEAU (1712-1778) and PESTALOZZI (1746-1827) and their followers, who under-estimated the hereditary disposition, on which Gall laid so much stress, and thought education could make anything of man.

Gall showed that **education was not the source of our mental powers.** If man's mental stock-in-trade were entirely acquired and not instinctive, we ought to be able to train any child into any speciality, make Mozarts, Michael Angelos, and Newtons of them. We are not born with equal mental faculties, nor are the differences observable due only to education and external circumstances. The mind is no mere **tabula rasa** or magic mirror whose function it is passively to receive impressions from the outer world or to throw imperfect reflection of its objects; the desires, the sentiments, are not generated by the experiences of the individual; there are "innate" aptitudes or fundamental peculiarities of mind, to which, at least as strongly as to education or accident, we must attribute each special bias. Not only bodily peculiarities, but even moral dispositions and tendencies in many instances, descend from parent to children Not only do children partake of the character, habits, and tendencies of their parents, but we are surprised when they do not.

Gall was a close observer of human character and a serious student of that part of psychology which can be applied to the practical affairs of life. He held that great men were what they were, not by dint of will-power or education, or even to any great extent owing to the influence of their surroundings, but by inherent ability, and that the fact held good whether in the physical field, where it is generally admitted, or in the moral. He tried to get at the secret of greatness, which many

people try to attribute to schoolmasters, and found that it resided invariably, so to speak, within the four corners of one's personality, implanted there by nature in the mysterious distribution of her gifts. The man who has the qualities of a poet or an artist will never make a good horse-dealer or an expert mechanic.

Education will not create talents. No amount of taking pains can atone for the lack of aptitude. Education creates nothing ; it can only with care and diligence bring out that of which the germs already exist. It can only improve the natural faculty ; it can never supply it. There are "innate" aptitudes or fundamental peculiarities of mind, whether generic or individual, to which at least as strongly as to education or accident we must attribute the precocity of genius. Each man becomes what he is quite as much by the individual peculiarities of his mind as by the culture to which he may be submitted. Some men have by nature certain of their faculties in greater degree of energy than others, and would take more naturally to certain pursuits than others. **During life these rudimentary tendencies are modified and developed by experience and environment.** Not only the various abilities, but also the moral qualities necessary for intellectual supremacy, such as ambition and perseverance, are natural endowments depending upon certain formations of our brain, and can be developed : the fighting instinct in the prize-fighter, the hoarding instinct in the financier, the sense of colour in the painter, the sense of tune in the musician, of construction in the inventor, of imagination in the poet, of deduction and induction in the philosopher, etc.

Philosophers, as we have seen, laid great stress on the **unity of mind,** which, being a purely spiritual entity, was thought to be independent of bodily influences, and in consequence the various mental powers were attributed to accidental circumstances, the necessities of life, the activity of the five senses, and other sources except the true one—the hereditary disposition.

Gall taught that the primitive mental powers are not the accidental product of the fancy of the mind, of sensorial impressions, of education, or other external circumstances ; but that the disposition to them is innate and determined by Nature herself.

The mind of the human infant is not at birth a mere blank sheet of white paper on which anything, either good or bad, may be inscribed. Each individual is born with a physical and mental constitution which he has inherited from his parents, together with certain feelings and tendencies, certain habits and modes of thought ; at first, no doubt, slumbering in embryo, but still none the less certain to show themselves when the opportunity occurs. Gall said :

"If human superiority resulted merely from the environment and the gift of language, it should be possible, by careful training, to raise the mind of an animal much nearer to the human level than it can actually be brought.

"**The inequalities of the intellectual and moral development of children placed under similar conditions and influences are much greater than any that could be attributed to favouring or retarding influences.** For we see sometimes a child growing up under the most unfavourable conditions of every kind, and yet rapidly and easily attaining a high level of development ; and we see others under the most favourable conditions remaining stupid and of low moral level, or exhibiting special intellectual defects or moral deformities. Again, among those children who develop exceptionally high powers, we commonly find that the development of these powers cannot be accounted for by the influence of their environment. And in many cases it is obvious that their special excellences are innate or have an innate basis ; for the same peculiarities can be traced in their ancestry through several generations ; they are, therefore, hereditary, and whatever is inherited is innate. The most striking instances are those in which the hereditary peculiarity takes the form of excellence, or defect, in highly special forms of mental activity, such as musical or mathematical talent ; but similar evidence of highly special innate powers and tendencies

is afforded by the appearance of numberless family traits, idiosyncrasies of thought and feeling, and special mental excellences and defects of many kinds.

" Every part of our nature has its use as well as its abuse. Our propensities and passions not being evil in themselves, but evil only in their excess and misdirection —it is wonderful what effects may be produced by the judicious guidance of their energy towards worthy objects.

" **The elementary qualities of the mind are innate, but they have to be drawn out and cultivated.** The differences, intellectual and moral, in children are due to material causes, that is, due to differences in brain structure ; therefore, *there is no human equality, either at birth or in adults,* and education must be adapted to the individuality of the child.

" **The development of the mind of the child,** far from being a mere moulding of it by the impressions made upon it by its environment, **is itself a process of evolution** in the proper sense of the word, **an unfolding of latent potentialities.** In other words, though education may do much, heredity is all-important, and education can but refine, perfect, or restrain the native tendencies of the mind.

" There is no fault of character that may not be destroyed, or at least rendered harmless, if right treatment be applied to it in time. Even the most powerful and deep-seated passions may be overcome or indeed rooted out ; and that which naturally tended to evil may be made productive only of good.

" **The means by which any faculty can be trained and cultivated is exercise.** Each faculty has its appropriate exercise. But all exercise is not training. Some seek to cultivate and train certain of the faculties, not by exercising them, but by means of certain others. Thus people fancy that they can make children moral by storing their minds with moral precepts, and lecturing them on the results of this or that course of conduct, without any regard to the practice of what is enjoined. But it is only by the practice of morality, by the exercise of the moral faculties, that men are made moral.

" **The greater the strength and activity of any faculty, the greater the pleasure attending its exercise.**"

The primary mental powers do not develop simultaneously. Some develop early in life and speedily reach maturity, while others are late in coming into activity, and may continue to improve down to old age. The order of development is quite distinct from that of importance, for in general the most important mental powers are the last in making their appearance.

Education cannot create new faculties, but it can arouse faculties that are slumbering uselessly, and whose existence was perhaps unknown and unsuspected ; and it can impart right training to, and render useful, those qualities that otherwise might be worse than useless—evil and mischievous. All men are not equally capable of education, nor will it be productive of the same results in everyone ; for the original dispositions are not the same. The senses may be so strong as to dwarf the intellect ; the memory so powerful as to interfere with reason and judgment ; active imagination may take the place of observation, and give all the appearance of reality to the most airy creations of the brain ; the reasoning faculty may be so vigorous as seriously to interfere with the activity of the other powers.

Further, **none of the mental powers is self-governing ; each is dependent upon others, and the efficiency of the highest rests in great measure on those of lesser quality.** The mind is dependent upon the body, the intellect upon the senses, the reason upon memory and imagination, and so on.

The human mind has certain innate or inherited tendencies which are the essential springs or motive powers of all thought and action, and are the bases from which the character and will of individuals are gradually developed under the guidance of the intellectual faculties. These primary innate tendencies have different relative strengths in the native constitution of the individuals and are favoured or checked by the social environment. These tendencies, in stronger or weaker degree, are present in the whole of humanity, and we find all of them, or at

least the germs of them, in animals. Education perfects, deteriorates, represses, and directs the innate faculties, but can neither destroy nor produce any. As Gall explains :

" The antagonists of innate dispositions persist in saying that man, being from his birth surrounded by men, appropriates to himself their faculties and their character. Might I not ask whence the first men, who were surrounded only by beasts, obtained their faculties, and how they created or invented them ? If children had not the same dispositions as their parents and instructors, how could they be capable of receiving their instruction and profiting by their example. In the first years, when children are almost solely in the hands of their mothers and nurses, boys always distinguish themselves from girls, and one child is perfectly distinct from another. Do we know any art by which an instructor can create in children envy, love, attachment, anger, goodness, or wickedness, ambition, pride, etc. ? Do we know how to create any talent ? Education cannot take place except by imitation, and the imitator must have the faculty of receiving what is communicated to him and of transforming it into his own nature.

" The influence of education, instruction, example, and of surrounding circumstances acts principally when the innate dispositions are neither too feeble nor too energetic.

" In the midst of the general resemblance of men, each individual is distinguished from another by a peculiar character, just as he differs by the external form of his body. Such a quality is given to one and denied to another. Each has a predilection, or a more decided talent, for a particular pursuit. There is, then, in every man, something which he does not derive from education, and which even resists all education. The individuality of character peculiar to each individual shows itself in a thousand modes at all periods of life, without education having any effect upon it. From his infancy, man shows the character which will distinguish him in adult age.

" How can we attribute to education those most decided dispositions which are sometimes observed even in children and which, consequently, are anterior to all instruction. Most great men have manifested their future greatness in their early years. Experience proves the small power of education, when we have to deal with energetic dispositions. Men, endowed with striking characters and superior intellect, push on and raise themselves, notwithstanding the greatest obstacles. The greatest men, it is true, bear the impress of their age, and cannot entirely defend themselves from the impression of the objects which surround them ; still, we constantly see that he who possesses a dominant energetic quality or talent pursues his route, and seizes with force the object which nature has pointed out to him. Thomas, in his oration on Descartes, did well not to dwell much upon his education. ' For,' said he, ' when the question relates to extraordinary men, we have to consider education much less than nature. There is an education for ordinary men ; the man of genius has the education which he gives himself, and which consists principally in destroying and effacing that which he has received.' The same holds good of character. Good education does not make a great character, nor does a bad one destroy it. Almost all great men have either been educated by inferior masters, or have received no education whatever.

" But geniuses, say the antagonists of innate propensities, make an exception, and form a separate class ; we cannot conclude from them that the qualities and faculties are innate. I answer that genius is only the energetic activity of some quality or some faculty which is inherent in the organisation. If, by a concurrence of circumstances, a man endowed with certain very active faculties has been prevented from following his inclination, this dominant faculty or propensity determines the choice of his hobbies and amusement.

" If precocious geniuses are the result of education and the circumstances of their surroundings, why do they not raise themselves above their companions in their other faculties ? Helvetius, himself, is forced to confess that education would never have changed Newton into a poet, or Milton into an astronomer.

" To sum up :

"1. The impressions received through our senses from external sources are not the origin of our aptitudes, talents, sentiments, instincts and propensities.

"2. The propensities and instincts, the aptitudes and talents, the intellectual abilities and moral qualities of men and animals are innate.

"3. Education perfects, or represses, or directs the innate powers, but can neither destroy nor produce them."

Before Gall, the prevailing notion seems to have been that men are not naturally adapted by mental constitution to one pursuit more than to another; but that when any such peculiar aptitude is evinced, it is due to the direction given to the mind by casual events or surrounding circumstances. Gall has greatly assisted in dissipating such erroneous views of human nature, and by the instances which he has industriously brought together, of extraordinary aptitude for music, mechanical invention, calculation, languages, and other activities, as well as of peculiar proneness to certain emotions and sentiments, he has widely spread the conviction that there is an infinite variety in the degree and combination of constitutional qualities by which men are adapted to as great a variety of functions and fortunes. Some philosophers say we might all be great poets, or inventors, or philanthropists, if we chose; but, asked Gall, why do some choose and others do not? Even ambition and perseverance, mental powers that enter largely into many kinds of intellectual supremacy, though not into all, are shown by Gall—as we have already quoted—to be natural endowments depending upon certain developments of our brain. If a boy has natural aptitude for learning, he will acquire it, no matter in what circumstances he may be placed. What is of value to a youth is the mental organisation which enables him to do well in the world; but he does not acquire that at school; it is his from the hour of his birth. The schools cannot fashion a great poet, a great painter, or a great musician out of a lad who had no native capacity for literature or art.

In connection with this problem, it may be of interest to hear what Gall has to say on the **origin of the arts and sciences**:

"The origin of the arts and sciences is almost universally attributed to chance, necessity, or reflection. Even the earliest and most indispensable of human occupations are supposed to be derived from the same source. Hunting and fishing, it is said, were invented, because the spontaneous fruits of the earth were insufficient for the nourishment of families; and when families became so numerous, as to form tribes and nations, they have been obliged to resort to agriculture; the women and children not finding sufficient food, man is obliged to attach himself to one woman only, and to share with her in the domestic cares. Here is the origin of marriage and of society, which go on increasing in numbers, and giving rise to all the wants. The inclemency of the weather is to be guarded against, and thence spring the arts of making clothes, and building houses and palaces. Thence also arise the factitious wants, all the desires and passions, which are the result of inequalities of condition, vanity, love of distinction, and glory, ambition, avarice, war, luxury, with the excesses it cherishes, laws, police, religion, the thirst for strong emotions, music, eloquence, poetry, and shows.

"If outward accidental causes are the source of all these inventions, why have they not produced the same effects in the lower animals? Why does not the dog build a house to protect him from the inclemencies of the weather? Why do the partridge and raven perish of cold, rather than migrate like the swallow? Why is it that each animal satisfies its wants in a manner peculiar to itself? that each man has different wants, though outward circumstances are very nearly the same in all? Because the true source of the arts and sciences is our innate instincts, propensities, and faculties—our inward wants. Without a brain centre for music, there would be no musicians. The dispositions are innate. Chance may furnish a faculty, the occasion of displaying activity; but when the faculty does not exist, it accomplishes nothing. Pythagoras, passing by a blacksmith's shop, was struck with the

gradations of the different sounds of hammers. He examined them carefully, and made one of the most brilliant discoveries in acoustics, and one which has most contributed to the perfection of music. To Newton, the fall of an apple from the tree was the occasion of discovering the laws of gravitation. How often has the sound of hammers been heard, and apples been seen falling to the ground, without giving rise to the slightest presentiment that these phenomena take place by virtue of certain laws of nature ? Often, the first *instinctive* efforts of genius are masterpieces. It is not until after he has constructed machines, and built houses, for ages together, spoken language, whether of words or signs, cultivated painting, sculpture, music, poetry, eloquence, that man thinks of seeking for the rules of these arts, and of formulating their laws. During the same time, too, he has reasoned correctly, without inquiring for the rules of logic ; he has compared and judged, without suspecting that the flow of his ideas was confined to any necessary catenation. He was a logician long before he had learned any logic ; and in the same way he decided what was just, and what unjust, long before having any acquaintance with jurisprudence.

" The progressive improvement of inventions and discoveries is not to be attributed to any particular power, but is the result of application and experience ; the first invention is the work of genius. Neither let it be objected that, upon my principles, any man, supposing him to have lived under favourable circumstances, might have invented all the arts and sciences. A man of moderate powers—and of such is the majority of mankind—invents nothing and creates nothing of himself. His faculties only are competent to appropriate what is already invented. It is only remarkably developed brain organs, whose activity is exercised on things without, that leave their impressions on the external world—that, in a word, create.

" Banish music, poetry, painting, sculpture, architecture, all the arts and sciences, and let your Homers, Raphaels, Michael Angelos, Glucks, and Canovas be forgotten ; yet let men of genius of every description spring up, and poetry, music, painting, architecture, sculpture, and all the arts and crafts will again shine out in all their glory. Twice within the records of history has the human race traversed the great circle of its entire destiny, and twice has the rudeness of barbarism been followed by a higher degree of refinement. It is a great mistake to suppose one people to have proceeded from another, on account of their conformity of manners, customs, and arts. The swallow of Paris builds its nest like the swallow of Vienna. But does it thence follow that the former sprang from the latter ? With the same causes, we have the same effects ; with the same organisation, we have the manifestation of the same powers.

" The arts and sciences were not invented because of the necessities arising for them, but because of our innate dispositions : just as a spider constructs its web, the bird builds its nest, the bee its cell, the wolf hunts, and the nightingale sings. The cause of these inventions, therefore, lies in the (brain-)organs ; or, in other words, animals have received from nature, by means of (brain-)organs, certain definite powers, propensities, talents, and faculties, which produce their habits, that have so often the appearance of spontaneous and deliberate actions. It is precisely the same with man. The same organ, which in the nightingale produces singing, in the beaver the faculty to build, in the hamster the propensity to lay up provisions, produces correspondingly in man music, architecture, love of property, etc."

Gall proceeded to discuss the problem—**How far is the Human Species perfectible** ? This is what he said :

" The hope of a constantly increasing improvement of our species is a pleasing and animating sentiment. But alas ! the laws of organisation and the records of history destroy the illusions of metaphysicians. It is idle to object to me the distance between brutal ignorance and refined learning—between the savage and the civilised man. Cast a careful look at the various conditions of the human family, even in the civilised, and you will see depicted with equal fidelity both its littleness and its grandeur.

" Surrounded as we are by refined and cultivated men, we readily attribute to mankind in general that progress and perfection for which we are indebted to a few

individuals. As long as we have had any knowledge of our race, the generality of men have been the slaves of ignorance, error, prejudice, and superstition. Slavery, brutality, and sensual gratifications of the grossest description have ever been the main features of its history. Even the hunters, fishermen, and tillers of the earth, have hardly possessed the knowledge necessary to their employments. Everything is done mechanically; to deviate from the old routine, to alter, and improve is to them absurd, ridiculous, and criminal. Mechanics, too, are scarcely any better, the majority resemble automata more than intelligent beings. Labourers, and, in short, all who are obliged to spend the most of their time in obtaining the necessaries of life, either do not think at all, or have but few ideas relative to the satisfaction of their wants. Though encompassed by the wonders of nature, they scarcely ever arouse their minds from indifference and supineness.

"Again, as regards the higher classes, their fortune and influence dispense with the necessity of reflection, and form the propensity to idleness, so natural to the majority of mankind. Hence it is that pomp and ignorance are as inseparable as dissipation and misery; hence the sad truth, that the class, which from their imaginary elevation, looks down on the people with disdain, is moreover, in point of intelligence, on the same level with them. There is the same indifference, the same prejudice, and the same aversion towards new truths; the same tenacious adherence to old errors, the same credulity and the same superstition. The fatidical flight of birds, the fatidical oaks of Dodona, the sorceress of Thessaly, the magic of Egypt, the oracles of Delphos, are replaced by fortune-tellers, prophets, interpreters of dreams, presentiments and inspirations, hobgoblins, ghosts, and unlucky days and numbers. We still live with Romans and Spartans, who seek to know the future, in the motions of the bills of birds, and in the entrails of beasts; we have yet our Mithridates and Alexander, who employ conjurers to interpret their dreams.

"Penetration and prudence, and great military and political talents, and the height of civilisation, are as incompetent now, as they ever were, to guard ignorance from the most puerile, absurd, and superstitious practices. Can those even, who are led by the energy of their faculties to reflection and the search for truth, fortify their minds against error? Can they save themselves from the wildest extravagances? The fatalism of Zeno, and the absolute and indefinite liberty of Ancillon; the Iroquois notion of the immortality of brutes, and that of Descartes of their automatic nature; the doctrine of Parmenides, that God includes all ideas, and that of Malebranche who saw all things in God; the belief of Empedocles in the transmigration of souls; the numbers of Pythagoras, which the Supreme Intelligence used for direction in the creation of the world; the tabula rasa of Helvetius; the doctrine of Lucretius, which attributes the creation of the universe to the concourse of atoms; Berkeley's disbelief in the existence of matter; the molecules of Buffon; the monads of Leibniz; the atoms and the voids of Leucippus and Democritus; the approval of suicide and contempt of all property of Antisthenes and Diogenes; the voluntary sufferings and abstinence of Epictetus; the merry philosophy of Aristippus and Epicurus, etc., etc., are but specimens of the efforts of philosophers, most of whom were the admiration of their age.

"We need not speak of the interminable, and often bloody, controversies of theology, the eternal vacillation of the forms of government, of the present infancy of criminal legislation, of the fluctuation of the principles of civil law, supported as they always are by force and violence; let us look where we might have some grounds to expect indefinite perfection. Compare with modern works of art the temple of Dendera in Egypt, the Pantheon in Rome, the temple of Nîmes in France, the vast temple at Heliopolis in Syria, now Baalbeck, the immense colosseum at Rome, the arenas in the city of Nîmes, the theatre of Marcellus at Rome, Trajan's column, the Antonine column, the vast temple of Pœstum, the temples of Pola in Istria, the ruins of Thebes, of Sienna, of Persepolis, and, most astonishing of all, those of Palmyra, the baths of Titus and Caracalla, and the excavations of Herculaneum and Pompeii. Compare the poets, painters, and orators of our days with Homer, Virgil, Horace, Ovid, Tasso, Cicero, Michael Angelo, and Raphael, and then maintain, if we can, that the productions of the mind are always progressive in improvement.

"All that man can immediately attain by the force of his powers; all that is

the result of great genius, he has and will attain, whenever favoured by nature with a large development of his organs. But, where the progress of the arts and sciences requires a particular concourse of fortunate circumstances and combinations, it is impossible to fix a limit to our knowledge. The positive arts and sciences, geometry, astronomy, experimental physics, navigation, chemistry, anatomy, surgery, medicine, agriculture, natural history, bear no resemblance to their former condition. Still, since our capacities are always limited, we necessarily lose as many old ideas as we obtain new ones, and when the mass of society shall be enriched by innumerable discoveries, individuals will no longer be astonished. Every one is obliged to confine himself to a particular sphere, to make ever so little of his privileges, and scarcely has he begun to flutter on the height of his domain, when he is precipitated into the abyss of nothing. We see nations remaining for thousands of years stationary in mediocrity, and none have gradually risen for any length of time towards moral and intellectual perfection. Athens and Rome have sunk into barbarism, and the flux and reflux of the ocean everywhere represent the history of human affairs.

"Philosophers have always drawn an argument in favour of the indefinite perfectibility of our species from the uniformity of the actions of brutes. But the sum of man's dispositions, and consequently their principal actions, are everywhere alike. People the most remote in time and place are united together in their interests and institutions. We deceive ourselves when we consider the maxims of the present day as the results of modern reflection and experience. The morality of Pythagoras, of Socrates, and of Christ are all equally founded on the sentiment of benevolence and the good of society.

"Finally, when I see the greater number of people despising the arts and sciences, and with all the arrogance of ostentation and power, consuming all their powers in commercial pursuits, or sensual enjoyments ; when I see the proneness of men to sloth and the commonest ideas, and their invincible aversion from every mental effort and innovation ; when in travelling among people styling themselves the most cultivated in the world, I find at every step entire provinces still plunged in barbarism, and see that the same men not only bear with indifference the vilest condition, but shrink from whatever would point them to a lot worthy of humanity ; when history teaches us that sometimes nations, which have risen to the summit of distinction, relax their efforts, and that after a few ages of light and knowledge, either in consequence of their own sloth, or the jealousy of their neighbours, again find themselves in the depths of ignorance and barbarism—who, after such reflections, can help maintaining that the moral perfectibility of the human species is confined within the limits of his organisation ?"

Some writers have attributed the origin of the mental dispositions of man to **chance** circumstances. To this Gall replied :

"It is, they say, by insignificant impressions that sometimes one mental power is determined and sometimes another. Demosthenes became eloquent because he was attracted by the eloquence of Callisthenes. Shakespeare made tragedies in consequence of being an actor ; Corneille became a great poet, because, falling in love, he wrote verses ; and Newton saw an apple fall ; what more was wanting to enable him to divine the laws of gravitation ? All that can be concluded from these facts, that our propensities and talents do not always put themselves in activity ; and that it is often necessary that the impulse be given them by an external impression, or that the material object, on which they are to exercise themselves, be offered them. The cock will not fight unless he finds a rival ; the beaver does not build if he has no branches of trees ; without obstacle there can be no firmness ; without an enemy, no generous pardon. In all ages great events have given rise to great men ; not that the circumstances produce their intellectual capacities, but because they furnish an ample field for the free exercise of their faculties. Taking children to art galleries does not make them into artists, unless there is an innate disposition for the talents which make an artist."

Necessity does not create a disposition, said Gall. Lamarck supposed that the

sense of necessity exists before the internal organs, and that the exercise of the external organs preceded the existence of these organs. The cunning and, in general, the inventions and ingenious actions of animals, arose from a strong sense of want. But, said Gall, the rabbit, which we keep in our stable, though not incommoded by the cold, still digs its burrows. And why does not the hare, pursued by the hounds, feel the urgent necessity of seeking an asylum under ground? The cuckoo has need of a nest, yet it does not build one; some birds die of hunger and cold in rigorous winters, but they do not migrate as others do.

"Some naturalists would have the necessities of man and of animals regarded as the principal source of their instincts, propensities, faculties. True, discomforts cause animals and men to exercise their faculties in order to rid themselves of them; but it does not follow that these necessities give rise to their faculties, otherwise the same external causes would produce the same qualities; whereas each animal, and each man, reacts in virtue of his organisation on things without, and in the manner peculiar to himself. All that can be attributed to external circumstances is, that they put the various internal dispositions into operation."

A great many animals are susceptible of much more extended instruction than their immediate wants require. They also modify their own mode of action with reference to the position in which they are placed. But the capability of receiving education is always proportionate to their primitive faculties, and they cannot, any more than man, learn things for which nature has not provided them with innate capacity. Gall continues:

"There cannot be any necessity without there existing an active organ, an impulse from within. Without certain vital forces in the interior, there could be neither hunger nor thirst, nor necessity for respiration. Thus the exterior necessities always suppose an interior force.

"The internal organisation gives rise to desires and wants, which impel the animal to action. The weaver-bird forms her tissue even when encaged; and the beaver builds, however well lodged he may be already. They follow the impulse of an internal disposition, without being determined by any external necessity. There are, likewise, men for whom travelling, music, etc., are almost matters of necessity, because these individuals are so organised that these propensities possess a predominant activity. It is, again, by the same principle, that we must explain why men who have several (brain-)organs eminently developed experience a greater number of wants than those whose (brain-)organs are less energetic. The idiot has few desires, consequently few wants; and he has few desires because few of his (brain-)organs arrive at complete development, or any considerable degree of activity. With the advance of old age, our internal wants diminish, because the activity of the organs is impaired."

Gall's **classification of the mental powers,** of which we shall speak in a succeeding chapter, was very crude, but it did not deserve the sneers of psychologists, for Gall was the first philosopher to proceed in a classification of the primitive impulses, sentiments, and capacities of man and animals on "natural history" lines. He rejected the summary distinction of "cognition," "feeling," "volition" as separate entities. There cannot exist cognition unattended by feeling and will, nor feeling and will without presentation to govern them. He also showed that there is a cognitive, an active, and affective experience in every emotion, and that the emotions are expressed in certain instinctive acts and conduct. On the other hand, the propensities give rise to emotions which influence our conduct.

Gall did not recognise an intellect as an entity; he knew only of intellectual "capacities," and of these such only as he observed in nature, and which could be lost in lesions of the brain. Thus he distinguished a capacity for language, for

number, for the appreciation of tones, a time sense, a sense of locality, a sense of form, and so on.

As regards the propensities, **he originated the inquiry into human behaviour and philosophy of character,** which has been taken up within recent years by RIBOT, WILLIAM JAMES, M'DOUGALL, MERCIER, SHAND, PARMELEE, SUTHERLAND, HYSLOP, MOTT, DREVER, CORIAT, BORIS SIDIS, ARMSTRONG-JONES, HARRY CAMPBELL, and others, who apparently were quite unaware of the work accomplished in this direction by Gall.

Gall was the first to treat of the propensities, the appetites of man and animals. (See Chapter XIV.) According to him, the affective impulses, which he calls also propensities and appetites, and which we have in common with the lower animals, are implanted in us for important purposes. He divided them in two : the personal and self-protecting, and the social. The sentiments, both egoistic and ethical, such as self-love, religious feeling, benevolence, etc., modify the propensities. The entire moral life of man consists in a permanent struggle between the two groups of motive activities. The intellect is not a sovereign power, but the servant of the propensities. Surely not much fault can be found with that statement.

Gall was the first to regard fear and anger as primary emotions, though he thought they could not be localised. They are found neither in Descartes, Spinoza, or Hume. Too much influenced by introspection, these philosophers took into account only the ideational fears which spring from desire, and overlooked the primitive forms aroused by sensations.

CHAPTER XIII

GALL'S METHOD

PROOF OF PLURALITY OF CENTRES IN THE BRAIN

GALL was the founder of the modern localisation theory. Since we cannot imagine the manifestation of mind without a material instrument, and the various attributes of mind differ very essentially (intellectual capacities, moral sentiments, feelings, and animal propensities), so there must be different structures for them ; that is to say, there must be a plurality of organs in the brain. To be angry is so different from casting up a sum in arithmetic, for example, that we can hardly suppose the two different functions otherwise than acting through different localities in the brain.

Gall pointed to the fact that not only have not all men the same abilities in the same degree, but that they vary also in their emotional dispositions—one is frank, another is reticent or suspicious ; one is self-assertive, another is modest ; one loves approbation, another does not mind in the least the opinion of his fellow-men, etc., etc. There is no end to the diversity that obtains among men, intellectual and moral.

Having shown that there is a great variety in the mental qualities, Gall drew the inference **"that the whole brain cannot be regarded as a single organ, but that its entire mass is composed of so many distinct and independent organs, as there are different, independent, primary mental qualities."**

It was this theory which aroused the antagonism of three schools of thought. The theologians called it blasphemy ; the introspective philosophers of the time called it materialism, and the current scientific opinion was committed to the belief that the brain acted as a whole and not in parts.

Psychologists opposed Gall with the argument that the brain must be a single organ, since the whole mind acts at a given stimulus, and no attribute of the mind ever acts by itself. Similarly the physiologists interposed that the brain always acted as a whole, and not in parts. And both, psychologists and physiologists, accused Gall of trying to destroy the ego.

Now, the brain is acting as a whole because its various parts are called into play simultaneously, though—as Gall pointed out—**the whole brain is not concerned in each of the component sensations and volitions associated with any particular mental state.** He admitted, it is true, that several mental powers are generally active at the same time ; but their elementary distinctions and independence of each other are shown, not only by their different degrees of strength bearing no constant relation to each other, but by the ever-varying combinations, in number and in kind, in which they manifest themselves. For if they were all general results, of one general power, operating through one organ, there would be in all instances a fixed proportion in the manifestations of feeling and thought, and a definite order in their sequence and arrangement, in harmony with the unity of action of a single organ.

Gall did not destroy the unity of the "ego." It was already destroyed by the Creator, who gave us five different senses instead of only one. How can Gall have

destroyed the " ego " by asserting that there must be special centres in the brain that enable one man to become a great orator, another a great mathematician, another a great painter, and still another a poet or a musician. He did not create these. They exist. The only novelty is that he assumed that whatever element there is at the basis of each talent must be dependent on the degree of development, quantitatively and qualitatively, of a definite area of the brain, as it is not probable that the same part should be able to perform such a great variety of functions. The same reasoning was applied by Gall to the elementary feelings and instincts.

The physiologists, **P. H. BÉRARD** (1797-1858) and **A. F. J. DE MONTÉGRE** (1779-1818), in the " Dictionnaire des Sciences Medicales," vol. vii., objected that : " If the intellectual and moral qualities were merely a result of the relative development of certain brain organs, appropriated to them, the individual would exert them, nearly like an automaton, or a machine, which goes as soon as it is wound up. There would be no relation between the exercise of the moral qualities and external causes ; the poet would always compose verses ; the musician, music, etc. ; but it is known that education has a sovereign influence even on the greatest men ; and moral motives are the causes of most actions ; it must then be admitted, that the moral self often acts independently and without material instruments ; where, then, is the necessity for this apparatus of distinct and separate organs ? "

Gall replied that the unity of the mind depended on the unity of its organ ; disturbance of the brain causes disturbance of the mental functions ; that the mind of the infant develops with the development of its brain ; and that the mind in old age decays with the decay of the brain ; that if there be any faculty independent of organisation, why are we not all alike in that faculty, when we desire to be so ? Why does intoxication, apoplexy, and cerebral inflammation affect the mental manifestation ? And why can we not uninterruptedly indulge in the exercise of any faculty, if it be purely spiritual ?

Another objection made by the same authors was that *the unity of the personal entity requires a unity of brain functions.* Though those anatomists and physiologists were wrong who sought in the brain for a common sensorium, still there must be some union.

Gall replied : " I have shown that there cannot exist in the brain either a mathematical point, or even a physical point, wherein all the organs or all the nerves are united, or towards which all the cerebral functions converge ; they, therefore, who regard such a centre as indispensably necessary, grasp at a phantom." This is metaphysics, he said, not physiology ; and he gave the example of our being simultaneously engaged in a variety of occupations ; he pointed to the variety of the five senses ; to the struggle within us between intellect, morality, and passion—the flesh and the spirit ; and to the disintegration of personality and insanity.

Bérard and de Montégre continued : " If we pursue the reasoning of Gall into all its consequences, the multiplication of organs will be infinite, because the ideas of insane people are so. Did Malebranche, who saw a shoulder of mutton hanging from his nose, and who, in other respects, possessed a superior understanding, have an organ corresponding to this idea ? Do those who believe themselves changed into worms, or animals, have special organs for these ideas ? "

The answer Gall gave was : " Does not each particular sense—for instance, the sense of sight—give rise to a great variety of hallucinations ? So each special organ for each **primitive attribute** of the mind gives rise to innumerable varieties of delusions in mania. Not each delusion has a special seat in the brain, but the **primitive power** has, whose derangement gives rise to the delusion."

ERNST PLATNER (1744-1818), of Leipsic, another defender of unity, said :

" With the five fingers or with one hand the most complicated pieces of music are executed ; why, then, may not a single organ suffice to execute all the intellectual faculties ? "

Gall replied : " We require for the execution of music not only a hand and fingers, but also an instrument, composed of different parts, and above all, a brain ; and musicians not only perform music, but other acts essentially different."

C. A. RUDOLPHI (1771-1832) objected that :

" If there were several special organs in the brain, how could the slightest lesion possibly suspend or destroy, at once, all the powers of the sensorium ? If these organs be independent of each other, as Gall is compelled to admit, it is difficult to form a conception of complete insanity, or absolute cessation of consciousness."

To which Gall replied : " If Rudolphi cannot form an idea of total alienation, on the supposition of the plurality and duplication of the organs, how can he understand a general disease of the body, with its plurality of viscera, and multitude of constituent parts ? If he cannot imagine how a slight lesion can at once suspend or destroy all the powers of the sensorium, he will still be less able to comprehend how an inconsiderable lesion, or compression of a cerebral part, sometimes suspends or annihilates the manifestation of the functions of the five senses, each of which has its distinct and independent instrument."

Because anatomists and physiologists could see no **difference of structure** of parts, they assumed there were no parts. It was not till the discovery of motor and sensory centres in the brain, seventy years later, that differences in the structure of the cortex of the brain were admitted. The microscope then disposed of the fiction of the homogeneousness of the brain. It proved the brain to be an immense instrument constituted of nervous elements, living cells of varying shapes and sizes, each gifted with its proper individuality, and yet intimately connected with one another. But in Gall's time it seemed sheer nonsense that the brain should have different areas each with its own function.

As **JOHN BARCLAY** (1758-1826), Lecturer on Anatomy in Edinburgh, said : " The convolutions of the brain exhibit as little difference in their form and structure as the convolutions of the intestine."

GEORGE HENRY LEWES (1817-1878), in his " History of Philosophy," in the chapter on " Gall," made a similar statement.

C. A. RUDOLPHI (1771-1832) said : " The pineal gland and the striated bodies differ very slightly," to which Gall replied : " The functions can very rarely be inferred from the anatomical structure."

BÉRARD and **DE MONTÉGRE** (just quoted) also wrote : " The brain is characterised everywhere by unity ; no marked division can be observed ; this anatomical disposition proves the impossibility of placing in it distinct organs."

Such were the opinions based upon the apparent similarity of structure of the different parts of the cortex. One would have thought that the simile of the nerves for motion and sensation would have sufficed. The structure of a part must be in accordance with its function ; but it does not follow from this that it invariably reveals its function. Not only is there no distinction between motor and sensory nerves, but there is none between optic and acoustic or any other nerves—thus showing, as Gall said, how little weight ought to be attached to our notions of what ought to be, when placed in opposition to what is.

As the nerves of the five senses all terminate in different parts of the brain, and as each of them performs a function entirely different from its neighbour, and as their duties are found never to be interchangeable, it surely must be plain that the centre with which any one of them is connected must have a function peculiar to itself, and consequently that **the brain into which they are all inserted must be a compound organ.** If one centre in the brain be specially connected with seeing, another with hearing, and a third with smelling, and the centre which is for smelling cannot take the place of that which is for seeing, it surely requires no further proof to establish that there are a multiplicity of centres in the brain. Vision may be in a morbid condition, and hearing be normal. Of the other external senses the same is true. They are so independent of each other, that either of them may be sound or unsound singly. **Yet they have their real seat in different portions of the brain.** Vision is not seated in the eye, hearing in the ear, taste in the tongue,

smelling in the nostrils, nor touch in the fingers, neither are they seated in the nerves of those organs. The eye, ear, tongue, nose, and fingers are but the externals of the senses, while the nerves are but the intermediates.

" He is mistaken," Gall said, " who thinks that the eye sees, that the ear hears, etc. ; each external organ of sense is in communication by nerves with the brain ; and **at the origin of the nerves is a proportionate mass of brain which constitutes the true internal organ** of each sensory function. Consequently, the eye may be ever so sound, the optic nerve may be ever so perfect. and yet, if the internal organ is impaired or destroyed, the eye and the optic nerves are of no avail. The external instruments of sense have, consequently, their organs also in the brain, and these external instruments are only the means by which the internal organs are put in relation with external objects."

The very fact, then, that **different areas of the brain are appropriated to the external senses,** and that the functions of these brain areas are as different as the function of the nerves they receive—for each area must be in harmony with its own nerves—this fact alone, we say, proves the brain to be a compound viscus. In confirmation of the general view here taken, it is well known that blindness, deafness, and an extinction of the other external senses, often depend not on any diseased condition of the external or intermediate apparatus, but *on a morbid affection of the brain.*

Gall was thus the first to lay stress on the fact, which had been surmised before him, but not proved ; that the various senses have their centres in the brain ; though his observation received confirmation only three-quarters of a century later. One of his opponents, **LORD JEFFREY** (1773-1850), wrote in the *Edinburgh Review* (1826), that if Gall be right as regards his localisation of mental functions, " it would seem to follow that all the five senses must have *organs in the brain,* as well as a connected apparatus beyond it " ; showing that it was not the accepted view then.

Throughout the whole of his writings, Gall was forever insisting upon **the absolute necessity of studying the evolution and comparative anatomy of cerebral structure in the different classes of animals** ; and with this increasing structural complexity, he correlated an ever progressive functional advance. He showed that as the cortex of the brain from the lowest animal up to the highest becomes more and more complex, so there is also a greater diversity and a gradual perfection of the mental functions ; and as the cortex of the brain is partially or wholly destroyed, so diminishes the manifestation of the intellectual capacities, sentiments, and emotions, though automatic life is still possible. He said :

" All the species and all the individuals of the same family have essentially the same brain ; for the principal convolutions do not differ. The brain of the lion or tiger, in regard to its principal convolutions, is the same as that of the cat ; the brain of the wolf is the same as that of the fox, the dog, and all the canine varieties, whatever difference may be found in the external forms of these animals. All human brains, if they are not naturally defective, exhibit the same parts and the same principal convolutions ; they are distinguished from each other only by the relative proportions of the convolutions, and by some differences of accessory convolutions. Therefore, the essential qualities of each species are the same, and the differences observable in the faculties of the varieties arise wholly from the various degrees of development in the different cerebral parts."

Gall laid down the principle that **the differences of structure in the encephalon of different animals,** which are the most striking, **correspond to decided differences in its functions.** He pointed to the difference between animal and human brains, between carnivorous and frugivorous animals, between the brains of the various types of animals, and concluded that these differences must correspond to a difference in the

mental functions. "I defy any one," he said, "to examine only a dozen brains, of different species of animals, and not be strongly impressed with the fact that different cerebral parts are appropriated to distinct functions, and, consequently, that the brain is compounded of many organs."

"The brain is more complicated, and the convolutions more distinct and numerous, as we ascend the scale of the animal kingdom. The essential differences obtaining in the encephalic structure correspond to decided differences in its functions, and the complexity of the structures is proportionate to the number of aptitudes and propensities displayed. What can be the purpose of the difference in the organisation of the brain in different animals, unless it be the difference prevailing in relation to the variety of their instincts? If it be admitted that their instincts are hereditary, then it must also be admitted that they are due to some peculiarity in the brain structure. **One species of animals is endowed with mental powers, in which another is deficient, a fact that would be inexplicable, did not each particular cerebral function reside in a particular portion of the brain.** Suppose that I should inquire of my readers how it happens that certain species of animals are devoid of the sense of smell, or some other sense, whilst they are in full enjoyment of the rest. They would find no difficulty in such a phenomenon. The functions of each sense, I should be told, required a particular apparatus, and certain species may not possess one or other of them. But, if they admitted only one organ, through which all the senses executed their functions, the absence of one or more in any animal would be inexplicable. Now let the like reasoning be applied to the primitive mental powers, the manifestation of which depends on the brain. There is scarcely any species of animals which does not enjoy certain aptitudes and propensities not to be found in other species. The unwieldy beaver and the nimble squirrel are both admirable architects; the dog, the docile, intelligent and unwearied companion of man, has no skill in building. The horse and the bull have not the bloodthirsty propensities of the weasel and the falcon. The sparrow and the turtle-dove do not utter the sweet notes of the nightingale. Sheep live in flocks and rooks form communities; the fox, the eagle, and the magpie dislike the confinement imposed on them by the care of their young, to which they impatiently submit some weeks only. The swallow, stork, fox, etc., are faithful in their attachment to a single mate; the dog, so susceptible of affection, the stallion, and the stag, gratify their desires with the first female of their species which they meet. **The natural history, from beginning to end, exhibits in each species of animals different propensities and aptitudes.** Does not, then, the conclusion necessarily follow that the distinctive propensities and aptitudes of these animals are relative to different cerebral parts. Were the brain the single and universal organ of them all, each animal ought to possess them all indiscriminately. Or, if the brain, as some suppose, subserved the intellect alone, it would be no longer possible to conceive that man is elevated by superior intellectual faculties above all other animals to a far greater extent than the mere size and weight of the entire brain would warrant. But, if it be supposed that each primitive mental power, like each particular sense, depends on a special cerebral part, it is not only conceivable that any one animal may be destitute of a certain cerebral part possessed by another, but likewise that all animals generally may be lacking in certain encephalic parts with which man is solely endowed."

It is beyond one's comprehension how physiologists can have assumed that the brain is a single organ, for that would mean it to have a single function. If this were the case, the only possible difference that could exist between animals with large brains and animals with small brains would be simply a greater or less degree of the same qualities of intellect and of propensity; and that thus a sheep, whose brain is nearly of the same size as that of the tiger, ought necessarily to possess the same ferocity and energy which distinguish the latter. The same is true if the brain is regarded only for movement and sensation, as is the view of some modern physiologists. Gall said:

"According to the physiologists, whom I have cited, and who measure the

cerebral mass, either in reference to itself or to the other parts of the body, if the mass of the brain be the same, we must expect not only the same mental powers, but that they will exhibit nearly the same degree of manifestation. But experience teaches us that the reverse is true. With equal mass of brain, we find the most marked differences in regard to the moral and intellectual character. We do not here refer to those shades of difference which might arise from the constitution of the body, etc. We speak of essential differences, the manifest work of nature, which, in these cases, triumphs over all external influences.

" Consider the great differences in the brains of the various species of animals. Are they an idle freak of nature, or are they material conditions of the diversity of their faculties ? But all this language of nature, so clear, so precise, is not understood by the physiologist, infatuated with the idea of centralisation and of the unity of conformation ; by those who pride themselves in a high and elevated conception, in regarding the cerebellum as a reversed brain, the brain as a repetition of the spinal marrow, and the most distinct parts of the brain as the simple repetition of the same homogeneous parts ; by physiologists who seem to be ignorant that **when nature repeats an apparatus, she repeats also the function,** and that **when she has for an object functions essentially distinct, she creates also essentially distinct apparatus.** . . . The idea of the centralisation, unity, homogeneity of the nervous system is, as I have already said, a reverie of the transcendental philosophy of Germany. It has been warmly received, (1) because it was thought proper to combat my theories of the plurality of the cerebral organs, and (2) because it favoured the juggleries of animal magnetism." This was the standpoint of the Committee of the French Academy, who reported on Gall's doctrine. Mesmerism, then in vogue, showed that sensations could be transferred from one organ to another.

" Carus had already said, with a thousand other credulous and metaphysical German physiologists, that the whole cerebral mass is homogeneous : that nothing prevents the functions of one part from being transferred to another, and that it would not be contradictory to anything we already know if, after the entire destruction of the hemispheres, the intellectual faculties, or consciousness, should still remain. On this supposition, the spinal cord and nerves, the nerves of the senses, the plexuses and ganglions of the sympathetic nervous system, may all, indiscriminately and reciprocally, exercise any function whatever of the nervous system. Nothing hinders an ox or a horse from being equal in understanding, at least, at the moment of magnetic influence, to Plato, Locke, or Kant ; since the identical and preponderant nervous mass of their senses, spinal cord and sympathetic nerve will amply supply the deficiency occasioned by the much smaller mass of their brains."

EMIL HUSCHKE (1797-1858), of Jena, taught in a dissertation of 1821 that to the three vertebræ of the skull there correspond three main divisions of the brain, and that, therefore, we must also assume three main intellectual faculties. To the medulla oblongata and the cerebellum is assigned *willing*, to the parietal lobes *feeling*, and to the frontal lobes *thinking*. Of course, " polarity " plays a part in all this. The cerebellum is opposed in a polar way to the cerebrum ; the former serves for motion, the latter for sensation and thinking ; the former has active, the latter receptive activity. In this respect the structures at the base of the brain are completely attached to the cerebrum ; but then, again, within this mass there arises polar opposition.

CARL G. CARUS (1789-1869), of Dresden, the discoverer of the central canal in the spinal cord (1814), in his " Neue Cranioscopie " (Stuttgart, 1841), following Gall's lines, formulated a similar theory of the three cranial vertebræ and the tripartite division of the soul, which met with some acceptance. He took the divisions of the brain, as then known—the anterior, middle, and posterior lobes—and declared them to be in relation to the intellectual, personal, or individual, and the social or affectional attributes of the mind.

According to Carus, there are in the three cranial vertebræ positive indications of

the three faculties of the soul, viz.: will, sentiment, and intelligence. Each of these vertebræ bears a definite relation to a certain portion of the brain: mental tendencies and the will are clearly indicated by the posterior or occipital vertebra; vegetative life and the sentiment by the intermediate vertebra; acuteness of sense and intelligence by the anterior or frontal vertebra. The development of the vertebral bones composing the nose, the orbits, and auricular apparatus, is always remarkably significant, not only of the development and preponderance of the sense of smell, vision, and hearing, but also of the influence of these organs upon the psychical individuality.

Carus thought the seat of the soul to be in the corpora quadrigemina, while Huschke claimed also the optic thalami, the posterior lobes of the cerebrum, and other portions of the brain. For the latter, the corpora quadrigemina were too insignificant for so important a function as that of the life of the soul, especially as they visibly lose in importance in the development of man, as well as in the ascending animal series. This circumstance did not disturb Carus, since he started from the *original disposition*, and thought it "an absurdity to regard emotion, intelligence, and will, as so localised in the developed mass that they would be, so to speak, imprisoned each in one of the three divisions of the brain." But it must be very different "if we speak of the primary disposition of these structures, when as yet the conducting fibres are not developed, or only imperfectly so, and when, therefore, there can as yet be no question of the finer shades of intellectual life." Only, then, in this mere disposition to a later developed intellectual activity are its three main tendencies to be considered as localised. As Carus conceived this whole localisation as at bottom only the symbol of the peculiar development of the mind, his standpoint evades refutation by losing itself in metaphysical vagueness.

Another argument in favour of the localisation theory, mentioned by Gall, is **the appearance of dispositions in the child before it has had the slightest experience**; and the inequality of the dispositions it manifests. He said:

"If you have ever been a parent or teacher, you cannot have failed to observe that many a child or pupil has certain predominant intellectual or moral dispositions, which cannot rationally be accounted for, either by education or preceding exclusive application; that, in many instances, it is even impossible to divest these children of their natural tastes and inspire them with others; it is even the earliest foundation of a good education, to learn and profitably manage the strongly-marked dispositions of children." The same observation may be made in the animal species. "The most quarrelsome dog, that bites at everyone, has often not the least propensity for the chase; another, on the contrary, is the mildest and most peaceable animal in the world, and yet he is devoured with the desire for hunting and killing; a cowardly bitch, without any instinct for the chase, passionately devotes herself to her young; another abandons them with indifference, and defends the life of her master at the risk of her own."

Another proof of the plurality of organs in the brain Gall found in **the successive development of the different powers of the mind** in infancy and youth, considered **in conjunction with the gradual development of the brain.** Gall said, "the nervous fibrils are first visible in the posterior and middle lobes, and only at a later period in the anterior lobes." Now, this **development of the nerve-fibrils in the infantile brain** was confirmed and worked out eighty years later by **PAUL FLECHSIG,** of Leipsic, who studied the human brain in both the fœtus and the infant, paying special attention to the maturation of the nerve fibres, *i.e.*, the conducting organs. He found that the paths to the centres of sensation and motion matured earlier than those to the centres of perception and association. The process (myelinisation) is hastened sometimes by precocious functional stimuli, and sometimes retarded by causes influencing nutrition. Thus he explained anatomically individual differences in psychical development. The subject will be dealt with more fully in Chapter XX.

Another fact in favour of the localisation theory, according to Gall, is that **the**

mental powers prevailing in every individual of the same species exist in very different degrees, a circumstance which can be explained by the different development of the several parts through which these powers are manifested. Men possessing first-rate talents of a certain order are sometimes quite insignificant in every other respect. Genius is in well-nigh every instance partial, and limited to the exaltation of a few mental powers, which could not be the case were the organ of mind single. Could this be, if the brain were not multiplex ? If the same portion of nervous matter were engaged in all studies equally, then a man with a brain to excel in mathematics must be able equally to excel in drawing or music ; but we find great metaphysicians who cannot learn the multiplication table, poets who do not like music, religious people without morality, and moral people without religion ; some who can draw well but cannot colour, some colourists who cannot draw, musicians who cannot keep time, and so on. He continued :

" There is a natural inequality in men. No two are alike in character. There prevails among individuals an infinite variety of intellectual endowment, of moral sentiment, affections, and instincts of self-preservation. The force and order of the impulses differ in every one. Some young folks, though lacking in intelligence, possess an astonishing faculty for learning by heart ; others, again, remarkable for their intelligence, have great difficulty in committing to memory. So with grown up men. One will remember dates, another localities, a third individuals, and a fourth events. One lacks wit and gets angry at all mirth and fun, another is deficient in dignity, another dislikes children. One expects to find the enjoyment of life in wealth, another in power, a third in rank, a fourth in fame, while not a few are found to seek it in a mere round of excitement. Some folk are noted for their cruelty, others for their courage, others again for their slyness. Then there are persons who never had any friends and do not want any. Again, a little observation shows us that some men, apart from all training, have a decided capacity for certain pursuits. One man excels in history, another in geography, a third in mathematics. Some become great musicians, others eminent painters, others distinguished poets or actors. Most of us are wholly devoid in some mental power : some are baffled by arithmetic, some have no skill for drawing, some are a dead weight at music. Such mental quality is vouchsafed to one and denied to another. Each has a predilection, or a more decided talent, for a particular pursuit. **There is,** then, **in every man something which he does not derive from education,** and which even resists all training. We follow the line of least resistance, that is to say, the line along which our most active dispositions and abilities drive us. **From his very childhood does a man show the character which will distinguish him in adult years.** He is haughty or humble, prudent or careless, affectionate or cold, harsh or kindly, because it is in his nature to be so ; in other words, because his brain organisation is so constituted. Admitting a multiplicity of centres in the brain, we can at once understand how it is that one man may excel in one thing and be stupid in another, just the same as a man may have strong eyesight and be very deaf, or a fine sense of touch and no power of smelling.

" Were the brain a single organ, then the innate dispositions of each man would be similar. But if the main and accessory convolutions of the brain be appropriated to different mental powers, then does every modification of character depend on a different degree of development attained by these particular parts of the brain, and their varying degree of activity. There are no two skulls nor two brains alike in their configuration, nor are the characters of any two individuals found to exactly correspond. Moreover, genius not infrequently appears at so early an age as to put study or training, as a producing cause, entirely out of the question. No one will deny that it is a natural gift. Have you not noticed that prodigies are quite as childish as other children in everything but the talent by which they are particularly distinguished ? "

Gall argued further, that **in insanity frequently only a limited number of faculties is disordered,** while the others remain sound ; and when due to disease of the brain,

not the whole organ is involved, but very often only certain regions of it. Based on this fact, Gall made a strong point in the treatment of insanity, to give the patient whenever possible occupation, and to divert his attention from his morbid ideas by fixing it upon other subjects, thus bringing into activity the healthy cerebral parts and giving the morbidly irritated a rest.

Gall saw another proof of the plurality of the functions of the brain in his observations on **idiocy.** When imperfect development of the brain occasions idiocy or imbecility, the individual is deficient in most of the intellectual powers, and frequently in some of the moral sentiments, and yet may possess a few of them in considerable vigour. Thus some idiots commit to memory with great facility, some have a talent for imitation, for drawing, for music, without being capable of comprehending a single abstract idea ; or they show a hoarding inclination, a destructive tendency, or the sexual instinct, without manifesting any other power to a perceptible extent. Gall mentioned idiots who, though they had hardly any understanding, yet "learned, by themselves, to play tolerably on the organ or harpsichord ; and others who understood, without having been taught, how to repair clocks, and to make some pieces of machinery." "This," he said, "probably depends on the more perfect organisation of the organ or centre with which such an act is connected, and not on the understanding." Anyone with experience of this class of idiots—the idiot-savants—must agree with Gall. **But what do most psychologists, and even physiologists, the one meditating in his study, the other examining dead brains in his laboratory, get to know of these peculiar manifestations of the mind ?** Hence the one-sidedness of so many of them. If the brain acts as a whole, or if it is nothing more than an organ for motion and sensation, as some of our modern laboratory-men would like to make us believe, how shall we explain the extraordinary talents of these imbeciles ?

Injury to the brain, too, does not involve the whole mentality, but only that manifestation of which the injured part is the seat. But were the brain single, *i.e.*, did it act as a whole, then disease of any part of the cortex should always affect the whole mind.

Gall's opponents produced as chief evidence against his localisation theory cases of injuries to the brain affecting different parts, while the mental powers supposed to be related to these parts have not been diminished or impaired. Even to this day, numerous cases are quoted of cerebral wounds without any injury to the mental powers, by surgeons in every country. Destruction of part of the brain has been observed after death, while in the living subject no diminution of intellect had been perceived. I shall have to deal with this question fully at a later stage ; here I will confine myself to Gall's rejoinder :

" If all these observations were as correct as their authors state them to be, not only would my whole theory be false, but it would be impossible to maintain that the brain performed any intellectual functions, or indeed any functions. But the vague, indefinite manner in which all these examples are produced save the head and its contents from the imputation of being useless appendages. In order to ascertain whether an injury done to any material organ is followed by the disuse of any function, the direct method is to observe whether the function attached to that organ is altered or abolished, or not. If the seat of the organ of music is damaged, we should inquire into the power to appreciate tones after the accident ; if the seat of another mental power is destroyed, I should expect that power to suffer in its manifestation. If we confine our inquiry to faculties which do not belong to the part affected, we should obtain as satisfactory answers as we should if we were to conclude that, because smell and taste were not directly impaired when their respective nerves were cut across, the patient suffered no injury. The surgeons who have gone before me and my present-day opponents did not possess the necessary means of observing accurately the facts which they have stated ; for, instead of looking for the faculties which I attach to the injured parts, they endeavoured to

find there, not merely powers which do not belong to these parts, but powers which we do not allow to exist in man as simple fundamental faculties, namely—perception, memory, judgment, imagination, etc. Moreover, **the brain is double,** and the mental power will continue to exist on the uninjured side, as the power of vision will continue after the loss of one eye."

Finally, Gall reminded us of **the differences existing in the national character and the corresponding differences in the brain and skulls** of the different nations and races —the basis of the science of anthropology.

An objection that is often brought against Gall's doctrine at the present day, and which is really due to its authors never having looked at Gall's work to see for themselves, is : that his doctrine favours the " faculty " psychology.

Now, Gall distinctly said that **no one centre of the brain is competent to manifest itself by itself.** The more highly developed the mental powers, the more numerous will the various centres of the brain become by means of intricate channels of the freest intercommunication. Though the centres themselves are distinct, all of them are inter-united, and the activity of each depends on its relation to the others. Each acts as a portion of the brain to modify the general result of cerebral action. It is through this solidarity and inter-dependence that no portion of it can be injured or exhausted without its interfering in some way with the functions of the other portions. There is, however, a great difference between saying that the various brain parts exert a mutual influence, and saying that each part does not perform its own particular functions.

ABNORMALLY DEVELOPED BRAIN CENTRES INDICATE ABNORMAL ACTIVITY

Gall, from his earliest infancy, was devoted to the study of natural history, and even when a boy was noted for quick perception and talent of observation. He was very early induced to remark the various shapes of the heads of his companions and fellow-students, and to connect these peculiarities with their moral and intellectual character. Having remarked in some cases a striking conformity between the form of particular parts of the head of those who resembled each other in certain mental characteristics, and an absence of these dispositions in those where the same part of the head appeared deficient, he—after years of observation—formed the theory that the elementary qualities were located in definite parts of the brain. At the same time, he called to his aid the observations of comparative anatomy and professional experience of brain lesions.

It is now generally admitted that **the size and shape of the skull give a fair indication of the size and shape of the brain.** But even admitting difficulties in drawing conclusions of one from the other in the case of average individuals—a subject with which we shall deal presently—we must remember the fact that Gall studied the *abnormally* active and the *abnormally* deficient to discover the normal. He did not make his observations on common every-day persons, but **limited himself to the observation of extremes** in talent and character, true, mostly on living persons, but verifying his observations whenever possible on actual brains. Average heads could have conveyed to him no information, for they belong to average men with average capacities and average character ; Gall confined himself to extremes, to the extraordinary. For example, he studied the brain-organ for the appreciation of " tones " (music) in the great composers of his time, who were then very numerous in Vienna—to mention only Haydn, Mozart, Beethoven, etc.—and he compared their heads with tone-deaf persons. His observation was by no means superficial, for he took casts of their heads, some of which are still in existence, and sometimes he got permission to dissect the brain after death. That he was not superficial in his work is proved by the fact that modern observers with their much improved methods and much ampler facilities have found the tone-sense or music-sense in

approximately the same locality. Such persistent investigation as Gall indulged in costs time and money ; and this shows that Gall cannot have been the charlatan that his opponents pretended.

We have mentioned that Gall compared the skulls and brains of composers with tone-deaf persons ; similarly he compared these structures in men of genius in other directions with those of idiots in the same field. He did not confine himself to intellectual capacities, but he made the same observations regarding character excesses and deficiencies, as, for instance, comparing the brains of misers and spendthrifts, *i.e.*, excess and deficiency of the hoarding instinct ; the eunuch with the Don Juan, to discover the location of the sexual instinct ; and so on. This method would be insufficient, and certainly would lead to errors, if we confined ourselves to it. But Gall did not do anything of the kind. He made post-mortem dissections of the brains of men noted for these special capacities and character-tendencies ; and he watched for the effects of brain injuries and circumscribed disease. Altogether, it must be admitted, he proceeded on scientific lines. Most of his critics have merely expressed opinions ; they have not repeated his investigations by his methods, and they have given no facts. Let the reader therefore have no preconceived ideas as to the merit of Gall's investigations, but follow with unbiassed mind the evidence which I am going to submit.

This method of first observing such persons as presented any special mental power in great action, generally in its abuse, led Gall to designate it accordingly—hence the **awful terminology,** which choked off many a favourably disposed student and did Gall a great deal of harm. He was fairly accurate, as we shall see presently, in naming the primitive intellectual capacities ; but as regards the primary instinctive tendencies, he generally used the name of their abuses, under which he had observed them in the first instance. For example, he called the hoarding instinct the *thieving instinct,* because it was on incorrigible thieves that he made the first observations. He did not attempt to ascertain the original or fundamental power—probably because he recognised how difficult is psychological analysis—and confessed that he left that part of the work to those who came after him.

That Gall did not first found a system—as he is so often accused of—and then look for the localisation of the mental functions, is evident from his terminology. He made no claim either to have enumerated all the fundamental faculties of the mind.

Gall presented us with a simple statement, namely, that **when a primary mental power is constantly strong in its manifestation, we shall find a definite part of the brain highly developed,** except in cases of disease and old age ; and, on the other hand, **a deficient development of certain parts of the brain is accompanied,** as a rule, **by deficient strength of those powers of the mind related to these parts.**

We may hold preconceived notions that this statement is not true ; we may refuse the inquiry on the ground that this is lowering science to quackery ; we may speculate, quibble, abuse—anything you like—but we shall not have disproved Gall in the only way he can be disproved, that is, by repeating his observations. Not that the statement will *always* hold true ; because the development of the brain may arise from other causes than mere functional activity—the quality of the brain, the blood-supply, the effects of toxins, etc., have to be taken into consideration ; the function of the particular part may have remained latent—that is to say, the faculty may not have been brought into use for lack of stimulus ; but all this does not matter since we are not professing to read character, but are investigating only abnormal phenomena of development and manifestation.

Gall made nothing, but simply recorded what he saw existing in nature. **His teachings being simple statements of the results of observation, they can be refuted only by showing that the observations have been made incorrectly or that the results**

have been incorrectly stated. Any man who objects to them without attempting to do this is simply finding fault with nature. Gall did not, as so many have imagined, first dissect the brain and pretend by that means to have discovered the seats of the mental powers ; neither did he, as others have conceived, first map out the skull into various compartments, and assign a faculty to each, according as his imagination led him to conceive the place appropriate to each power. On the contrary, he first observed a concomitance between particular talents and dispositions, and particular forms of the head ; he next ascertained, whenever he could, by removal of the skull, that the shape and size of the brain are indicated by these external forms ; and it was only after these facts were determined that the brain was minutely dissected and light thrown upon its structure.

Gall attempted to compare the parts of the brain with the powers of the mind as inculcated in systems of philosophy. But he could arrive at no satisfactory result. He then compared the development of different parts of the brain with the *actions* of men, and he had some reason to congratulate himself on his success. And is it not an undoubted fact that some men show a disposition to certain actions from their earliest childhood : some to music, some to drawing, some to calculation, and some to construct mechanical instruments ? Is it not an undoubted fact that children often show an uncontrollable disposition to anger, fear, jealousy, etc., different from their brothers and sisters, and without previous experience and adequate external cause ?

The ancient philosophers maintained that all genius is inherent ; nay, they went further, some of them advocated the doctrine that every idea was innate. Gall's doctrine is different. He maintained that the **dispositions** of mankind are innate, in the same way that the power of locomotion or vision is dependent on organs that are born with us ; but as we cannot foretell what kind of muscular movements may take place, or what things may be seen, neither can the ideas which may arise in the mind be foretold, as they depend on circumstances which are contingent.

Gall had no preconceived notions regarding the primitive mental powers. He simply stated what he had observed. It was only after he had made a great number of localisations that he noticed that the situation of the mental powers corresponded with what one would expect psychologically. Contemporary critics reproached him with not first determining what the primitive powers were, and then seeking out their centres in the brain. He replied : " If you can tell me what the primitive faculties are, I will try to find out where they are located." But this they neither did, nor could do ; and we are not agreed upon them at the present day.

Gall at first spoke only of elevations and depressions on the cranium, as denoting the presence or absence of determinate dispositions and talents. It was this that gave rise to the " bump " theory, which persists to the present day. Considering that **there was no topography of the convolutions in those days,** how was he to describe his observations ? All his opponents judged him by these " bumps," that is to say, they condemned his whole doctrine. But how unfair ! **He marked all his localisations on the brain as well.** Anyone who will look at his magnificent anatomical plates of the brain can see his markings by numerals on the convolutions, where he assumed the centres of the highest activity of particular mental functions to be ; and they must recognise that *his diagrams look at least as scientific in their representations of the assumed functions of the brain as do those of our modern physiologists who have mapped out the brain in a sort of mosaic of sensory and motor centres.* He did not even circumscribe his centres, for he acknowledged that **the function of one merges into the other** ; so that those who accuse Gall of having created " bumps," speak of a creation of their own imagination.

That there is nothing wrong in the principle of it is shown by recognised authorities :

ROBERT JAMES GRAVES (1796-1853), of Dublin University (*London Medical Journal*, vol. ii.), wrote: "Accordingly we find that exactly in proportion as the encephalic portion of the nervous system is developed in the vertebrated animals we can trace the appearance of new faculties, which, few and obscure in the lower species, become, as we ascend, more numerous and more distinct until we arrive at man, in whom the brain attains a degree of pre-eminence sufficient to place him far above all other species of mammalia. . . . Through the various degrees of instinct and intelligence observable in the different classes of the animal kingdom, we perceive an uninterrupted gradation, an unbroken chain, until we arrive at man, when the nervous system and the intellect receive a simultaneous improvement, so great as to place man far above the rest of his fellow-creatures. But man does not only differ from other animals in the configuration of his brain and the capacity of his mind, but also exhibits the singular fact of a great difference, in these respects, between individuals of the same species; it being an obvious fact that different men exhibit as much disparity in their intellectual powers as if they were animals of a different genus. *In all such cases (where the difference between the intellectual powers is extreme) there also we invariably find a striking difference between the form and size of their skulls*, the most highly gifted always presenting a greater relative proportion of brain."

WILLIAM B. CARPENTER (1813-1885), the well-known physiologist, who was not a disciple of Gall, said (*Medical Gazette*, 1841): "When the brain is fully developed it offers innumerable diversities of form and size among various individuals and there are as many diversities of character. It may be doubted if two individuals were ever exactly alike in this respect."

J. BARNARD DAVIS (1801-1881), author of "Thesaurus Craniorum" (London, 1867), whose craniological researches have rendered such immense service to anthropological science, said that "the cranium is subject to variations of size and form, almost endless in the different races of man, and these diversities are coincident with and allied to disparity of powers, capacities, and character, which may be considered to a certain extent commensurate with the differences of conformation themselves." (*Philosophical Transactions*, 1867.)

GEORGES CUVIER (1769-1832), the great naturalist, wrote: "Certain parts of the brain are large or small according to certain qualities of the animals."

Professor **D. J. CUNNINGHAM** (1850-1909), at the meeting of the British Association for the Advancement of Science, Glasgow, 1901, said: "The cranial vault fits like a tight glove on the surface of the enclosed cerebrum. The cortical elevations which rise on the surface are due to exuberant growth in localised areas. There cannot be a doubt that the process is intimately connected with the development of function in the districts concerned. We know that functions of different kinds are localised in different parts of the cortex, and **when we see an area on the cerebrum rise up in the form of an eminence** we may reasonably conclude that the growth in the area concerned is the structural foundation of what will become later on a centre of functional activity of an acute kind." **He recommended the study of skull peculiarities,** brains seldom being available for investigation to any but medical men, and he admitted that his proposition was a return to the old doctrine of Gall.

DANIEL HACK TUKE (1827-1895), the well-known alienist, wrote: "The diversity, as regards the form and size of the human cranium, can only have escaped the notice of the least observant, or failed to excite some interest in the least reflective. This diversity is observable, not only in regard to the whole head, but also its several regions. The head of one is large and massive, of another small and ill-developed; but more than this, the forehead of one may be broad and ample, while that of another is shallow and retreating; these facts are notorious. On the other hand, the mental characteristics of one individual do not contrast less strongly with those of another. Between the two extremes of the highest psychical endowment and the helpless condition of idiocy, every conceivable shade of intellectual character or function is to be met with."

MORIZ BENEDIKT (1835-), neurologist and anthropologist of Vienna, said: "That types of skull are generally connected with types of character may be concluded with safety from the results of craniology in the animal world and from the study of the skulls in different races."

E. A. SPITZKA (1851-1914), the American neurologist, who dissected the brains of various celebrities, believed with Gall that some faculties could be definitely localised, and that taking two men, both of great but of different mental capacities, not the same but different areas of their brain would preponderate. He supported his contention by reference to his dissection of brains of eminent Americans. He claimed to have noticed the difference between one who was "more creative, constructive, philosophic, and brilliant in abstract generalisations," and another who was "a far keener observer, quick at seeing analogies, an excellent systematiser, and had a splendid power of memorising and recalling visual impressions." (*Transactions of the American Philosophical Society*, 1907.)

It would seem that **some of our modern anatomists and physiologists are quite willing to admit protuberances of the skull** when it suits their purpose, as the following quotations will show.

Thus we read the statement of one of the motor-centre enthusiasts: "Such an increase of the hinder part of the frontal lobes is usually accompanied by an **enlargement of the areas** which are connected with skilled movements of the hands and face, and in consequence the portion of the parietal bone along the squamous suture is *thrown outwards* and the width above the ears is increased."

Sir THOMAS LAUDER BRUNTON (1844-1916), *Journal of the Anthropological Institute*, 1887, said: "As regards the possible change in the shape of the skull from development of the different centres, it seems to me that if a cortical centre expands in all directions, the number of cells in a longitudinal direction being much greater than in the transverse direction, the *actual* longitudinal increase will be much greater than the transverse, the *proportional* increase to the original size being the same. The development of the visual centre will thus tend to **raise the vertex** and elongate the head from above downwards, while the development of the auditory centre will tend to push the occiput backwards, and elongate the head in an antero-posterior direction. Whether the development of the tactile centre will render the head broader or not I could not be sure, but it seems to me that this is just possible."

It is stated as a definite fact by some that it has been shown that in animals the occipital part of the cortex remains in a state of very incomplete development, if the animal is in any way deprived of the use of its eyes from birth onwards. (Notwithstanding the fact that the sight centre has been shifted since to the calcarine fissure). The same is said of the other centres, as, for example, the arm centre, that in men who suffered amputation of the arm in early years a deficiency was discovered, and that this deficiency was perceptible in the skull of the living subject.

Thus **HERMANN MUNK** (1839-1912), the well-known physiologist and experimenter on brains of animals, said: "When a limb has been absent from infancy or a sense has not existed since that time, those brain areas which correspond to them will remain undeveloped. **This may be seen in the living person from the part of skull covering it.** A skull area well arched, or striking flat, indicates a corresponding convexity or flatness of the corresponding brain area." This is justly ridiculed by KONARD RIEGER.

More recently Professor **G. SCHWALBE** (1844-), has shown that the position of the third or inferior frontal convolution was indicated by a prominence on the surface of the cranium in the anterior part of the temple. This human cranial speech bump was much more highly developed in man than in anthropoid apes and it was unusually easily demonstrated.

The dissectors of Gambetta's brain drew special attention to the fact that the cortical structure in the neighbourhood of Broca's convolution was **markedly augmented**, and a writer in the *British Medical Journal*, July 31st, 1886, said: "When we recall the fact that Broca, in his 'Memoirs,' attributes to this part of the cerebral cortex the functions of articulate language, the unusual development of this convolution in Gambetta and others confirms, to a certain extent, this opinion now generally accepted. Gambetta was a great orator, his memory for words being most remarkable; he had acquired a rapid and most exact method of expressing his ideas. It is therefore somewhat admissible to associate his great oratorical power with his increased growth of cortical tissue in the neighbourhood of Broca's convolution." This is, as we shall see presently, very much what Gall said, but Broca gets the credit.

MATHIAS DUVAL (1844-1907), in *L'Aphasie depuis Broca*, Paris, 1888, stated that in the brain of Gambetta the third left frontal convolution, in which the speech centre is located, was enormously developed, and he exclaimed: "Quelle person alité a jamais représenté à un plus haut degré l'orateur, improvisateur, le moteur verbal?"

HERVÉ ("La Circonvolution de Broca," Paris, 1888) expressed himself similarly.

NIC. RÜDINGER (1832-1896), one of those anatomists who thought the intellect had its seat in the upper part of the parietal lobe ("Beiträge zur Anatomie," 1882), and who had the opportunity of dissecting the brains of quite a number of distinguished men, asserted that **the higher the mental endowment of an individual the greater is the relative extent of that part of the brain.** Gall said no more, only that his localisation was different.

GUSTAV RETZIUS (1842-1919), ("Biologische Untersuchungen," 1898), made a similar statement, but he found "a marked exuberance of cortical growth in the *lower* part of the parietal cortex in people of undoubted genius."

PAUL FLECHSIG (1847-), the famous Leipsic neurologist, though he condemned Gall's method, claimed the discovery of the "bumps" of music in the skulls of Bach and Beethoven.

It is commonly supposed that Gall neglected **the convolutions on the median and under aspects of the brain** and arranged the whole of his localisations under the outer vault of the skull. (See C. S. SHERRINGTON in "Encyclopædia Britannica," article "Brain.") Such a statement can only be made by one who has never opened Gall's anatomical atlas, where it may be seen that all the gyri on the orbital, inferior temporal, and median surfaces of the hemispheres are marked with his centres. In the text Gall explains that the convolutions on the internal surface of each hemisphere which are divided by the falciform process, "are all prolonged more or less vertically to the surface, and are but a continuation of the superior convolutions in the middle line, having the same functions"; he shows how he estimates the orbital and inferior temporal convolutions, and the size of the cerebellum, "so that no part of the brain escapes our observation." Curiously, modern experimenters have done exactly the same. Their "leg" centre, for example, on the superior surface, extends down the side in the middle line. These locations might present difficulties for the practical "reading of heads," but Gall indignantly rejects such a notion and declares that his business is to discover the physiology of the brain.

Could Gall with the means available in his time have applied any other method than he did? Simple dissection of the brain would not have helped him to determine the functions of the brain. As he said:

"There are but few cases where the structure of a part has enabled the anatomist

to understand the functions which depend upon them ; and when it happened, his ideas were merely conjectures. Thus the bones and ligaments are examples of this kind. Before having seen the motion produced by muscles, their structure does not enable us to divine either their irritability or their contractility. The dissection of the stomach, the liver, the kidneys, has not taught the functions of these viscera. What purpose would it serve to know the structure of the eye and the ear, if experience had not taught us their uses ? Would the most profound perspicacity ever have attributed the sense of smell to the pituitary membrane of the nose, and the sense of taste to the nervous papillæ of the tongue, when even to this day anatomists still dispute which nerve conveys the gustatory sensation ? The tendons and ligaments have been confounded with the nerves for ages ; and the organisation of the heart has had so little influence in leading anatomists to a knowledge of its functions, that, to the time of Harvey, the arteries were considered as conducting tubes of air. . . . Almost always has the knowledge of their functions preceded that of the parts. It was not necessary to know the structure of the eye, nor the mode of existence of the optic nerve, to know it was the organ of sight. For a long time it was not believed that the nerves were necessary to the functions of the senses, because it was thought that the blood-vessels carried the impressions to the heart, the supposed seat of the soul. . . . Whenever it has been attempted to advance the pretended knowledge of organisation before that of functions, it has been altogether conjectural, and worn the impress of the prejudices of the age. It is in this way that the heart has been constituted the seat of courage, love, sympathy, cruelty ; the liver was formerly the seat of anger and physical love ; it is thus that, even to this day, the moral and intellectual faculties are made to arise from a mixture of the humours of the temperaments ; and the dispositions and passions take their rise in the abdomen or from the solar plexus. If anatomy were a sure guide in establishing the uses of different parts, would Willis have said that the vital spirits, necessary for motion, were secreted in the cerebellum ? Would Galen have connected the organ of smell with the anterior cavities of the brain ? Would the soul, alternately dislodged from the pineal gland, the corpus callosum, the annular protuberance, etc., have been replaced by Sömmering in the vapour of the cavities of the hemispheres, and by Ackermann in the medullary substance which lines the interior of the same cavities !

" It is rather by observing physiological phenomena that we arrive at a more just idea of the brain. Accordingly, it has been requisite for me to collect a great number of **physiological and pathological facts,** before I could come to any rational induction respecting the laws of its organisation. I owe almost all my anatomical discoveries to my physiological and pathological observations ; and it is only from these that I have been able to convince myself of the perfect accordance of the moral and intellectual phenomena, with the material conditions of their manifestation."

Modern physiologists have tried to discover the mental functions of the brain by experimental excitation and destruction of different parts ; but all they have achieved is the production of physical phenomena, connected with either movement or sensation. Many of them were in consequence convinced more than ever that Gall was wrong ; but they might as well deny not merely the localisation of mental functions but the existence of mind or spirit itself, as a portion of man, because we cannot separate, with our scalpels, that ethereal essence from our grosser parts, and subject it to an examination, by one or all of our external senses. When we examine with the most scrupulous minuteness, the form, colour, and texture of the brain, no sentiment can be perceived slumbering in its fibres, nor half-formed ideas starting from its folds. It appears to the eye only as a mass of curiously convoluted matter ; and the understanding declares its incapacity to penetrate the purposes of its parts. In fact, we cannot, by merely dissecting any organ of the body whatever, discover its vital functions. As Gall has said, anatomists for many centuries dissected the nerves of motion and sensation, and saw nothing in their structure that indicated the difference of their functions ; and, at this moment, if the nerves of taste and of

hearing were presented together on the table, we might look at them for ages without discovering traces of separate functions in their structure. Simple dissection of the brain, therefore, could not lead to the discovery of the functions of its different parts.

GALL ON CRANIO-CEREBRAL RELATIONS

We have already stated that Gall examined brains wherever he could, but he generally started with the examination of the living head for the detection of variation from the normal or average, and verified his conclusions post-mortem when he could get the opportunity. His critics, however, denied that it was possible to learn anything from the living head, because, as they alleged, the skull and brain do not agree in conformation. This untruth has been fostered to the utmost for a whole century, and is still echoed by men unacquainted with the fact that Gall studied only extremes of skull types, and not average heads, and that all the different objections which they raise have been answered by him.

To estimate the size and shape of the brain from the size and shape of the skull has been compared to "telling the contents of a travelling trunk by passing the hands over it"; and by **OLIVER WENDELL HOLMES** (1809-1894) to "telling the number of a bank-note inside an iron safe by feeling at the knobs outside."

F. GOTCH (1853-1913), Professor of Physiology in the University of Liverpool, said: "It would be just as sensible for a safe-maker to examine the knob or handle of a safe, and then to profess to be able to tell what amount of wealth was contained in the safe in its various drawers and compartments."

Another writer said: "It is just as reasonable to determine a person's digestive capacity by looking at his waistcoat as it is to pretend to know the shape of the brain by looking at the skull."

Professor **M. ALLEN STARR** (*The Popular Science Monthly* 1889) said with reference to Gall's doctrine: "It is pretty well agreed among scientists, at present, that it has no actual basis of fact, and that elevations upon the skull do not indicate masses of brain beneath them. . . . It may be stated without hesitation that from the size and shape of the head no conclusion whatever can be made as to the extent of surface of the brain, and consequently no conclusion can be reached regarding the mental capacity." Yet, in the same paper, he stated that "in the middle (of the brain) lies the motor area, and it is interesting to know that on the left half of the brain, which guides the right hand, it is *larger in extent* than on the other side, which controls the left hand; because the majority of the fine movements are performed by the right hand, and have to be learned by the left brain. The reverse is true of left-handed people."

Professor **P. G. H. KLENCKE** (1813-1881), *Canstatt's Jahresberichte*, 1843, declared, "Gall's brain organs are nothing more than excrescences of the skull bones, caused partly by the insertion of the head muscles, partly by centres of ossification. There is no correspondence between brain and skull surfaces, and in later life the brain recedes altogether from the skull. The furrow we see marked on the inner surface is simply the markings of blood-vessels. Just as all the bones of the skeleton vary in different individuals, so does the cranium. The latter develops in accordance with the growth of the other skeleton bones *quite independently of the brain.*"

JOSEPH HYRTL (1811-1894), the celebrated Austrian anatomist ("Lehrbuch der Anatomie des Menschen"), also held that the skull develops independently of the brain, and that "early closure of the sutures, before the brain has reached its full growth, causes microcephaly, *i.e.*, is accompanied by innate idiocy."

KONRAD RIEGER (1855-), another well-known anatomist, held the same mistaken notion.

WILHELM WUNDT (1832-), the famous physiologist ("Gehirn und Seele," *Deutsche Rundschau*, 1880), said: "Skull and brain do not agree in conformation. No deduction can be drawn. If Gall's views were right, the gorilla should be distinguished for his enormous venerating capacity."

AUGUST FRORIEP (1849-1897), Professor of Anatomy, Tübingen ("Lagebeziehungen zwischen Grosshirn und Schädeldach," 1897) held there is no constant relation between the convolutions and the skull-covering.

HENRY CHARLTON BASTIAN (1837-1915), the well-known neurologist, complained that Gall located functions in centres of ossification ; ignorant of the fact that Flechsig located the musical sense in the parietal eminence.

LEONARD HILL ("Manual of Physiology," 1899), says : "The bumps on the head are in many places due to interspaces in the bone or thickening of the bone, and by no means represent swellings of the brain substance." He calls it "quackery and deceit" to determine the size of the brain by the size of the head.

Many of these critics produce diseased skulls from their museums to prove that the internal table does not correspond with the external. They might as well say that a healthy nose could not be of Roman shape, because another nose, in a state of disease, had a greater resemblance to a Dutch cauliflower. Gall dealt only with healthy skulls.

Other anatomists have expressed the opinion that it was "impossible to conceive such a tender and delicate substance as the brain forcing out such a hard and durable material as the skull," forgetting the distension of the head in hydrocephalous, and that an aneurism or new growth can wear away a solid bone.

If the brain and skull do not agree in conformation, one may well ask what is the good of anthropometry, craniology, anthropology, and all the other studies based on measurements of the head ? Is it an idle freak of nature that the skulls of the various nationalities differ, and that amongst the same race one man has a round head, another a square, another a cylindrical, and still another a sugar-loaf head ?

Many well-meaning objectors give elementary information on skull growth in a patronising tone, taking it for granted that Gall knew nothing of the subject. Thus **FREDERICK PETERSON,** Chief of the Clinic, Nervous Department, College of Physicians and Surgeons, New York ("American Medico-Surgical Bulletin," 1895), tells us plainly that Gall's doctrine "was an entirely empirical study of the exterior of the head, and *no careful anatomical investigations were ever made by him* of the brain or its convolutions, or of the thickness and structure of the skull and scalp."

Gall himself was the first to point out the formation and the irregularities of the skull. It is presumption, therefore, on the part of his antagonists to write as if he had been ignorant of elementary anatomy. Gall wrote :

"The circumstance that the two tables of the cranium are not parallel in their whole circumference, and at all periods of life, would certainly be of the greatest importance if I had ever pretended to judge of all the minute shades of difference that exist in the convolutions of the brain. On the contrary, I have endeavoured to acquaint my hearers and readers with all the circumstances in question. I have spoken of the frontal sinus, of the separation of the two tables in the cranium in men and in animals. I wrote upon it in my article 'Cranium' in the *Dictionary of Medical Sciences*. I was the first to mention that it was impossible for us to determine with exactness the development of certain convolutions by the inspection of the external surface of the cranium. I was the first to treat in detail the variations in the thickness of the cranium which happen in old age, in insanity, etc. I was the first to teach that in certain cases the external table of the cranium is not parallel to the internal one. I have called the attention of anatomists to all these circumstances. Is it fair, then, of these anatomists to turn these facts into weapons against craniology ? Why had they not the frankness to state by what means I have removed many of these difficulties, and to confess that I pursued my researches with candour, and considered it, in all its aspects, with impartiality ? A critic who, in order to combat his adversary, is obliged to attribute to him opinions contrary to those which he professes, betrays the weakness of his own arguments. . . . By what right do these anatomists suggest the idea that a man, who for a long

series of years has devoted himself to the study of the functions of the brain with an indefatigable zeal and a love of truth, overcoming all obstacles, has neglected to observe so necessary a condition ?

" It is true that, after the cranium is removed, the prominence of certain cerebral parts do not appear such as they are impressed on the cranium. But does it astonish anyone that the brain should sink and flatten down in some measure when the osseous box, which covers it and sustains and supports it on all sides, is removed ?

" In examining the internal surface of the cranium of a subject who has not died of a chronic cerebral disease, we observe that the great blood-vessels of the dura mater are very exactly impressed upon it ; we see also there the impressions of the so-called Pacchionian bodies, and the sinuses. The convolutions are found very distinctly impressed, especially on the orbital plate, the inferior anterior part of the frontal bone, and in the temporal bones. When from any cause the membranes of the brain become thinner than natural, we then distinguish the impression of the convolutions on the whole internal surface of the cranium.

" The head of a new-born child is from thirteen to fourteen inches in circumference ; those of adults are from twenty to twenty-one inches and a half. (The old French inches.) The cerebral cavity, and consequently the whole contour of the head, enlarges in the same proportion as the brain increases in size ; and this simultaneous enlargement continues so long as the head grows. The cranium yields constantly to the brain, as it augments in volume ; and, as the bones of the cranium are very thin until the age of puberty, it follows that the external outline of the cranium is precisely similar to the surface of the brain. Some physiologists have thought that the enlargement of the osseous box was caused by the pressure which the brain exercises on the internal surface of the cranium ; but there does not exist in living organisation any like mechanical action. There is continual absorption, secretion, nutrition, decomposition, and new formation. The osseous molecules are absorbed, and others are secreted in their place.

" The thickness of the cranium in adult age is from one to two lines. After the brain has completed its growth (at an age of thirty to forty), the cranium thickens by degrees, in the following manner. The bones of the cranium are composed of two solid osseous laminæ, one forming the outer, the other the internal surface ; the interval between the two laminæ is filled with a cellular substance—the diploe ; this substance is not of uniform thickness throughout, so that the two tables are more separated from each other at certain places than in others. Thus then, although the internal surface is exactly moulded on the surface of the brain, from the moment when the cranium has acquired a certain thickness, it cannot be asserted without qualification that its external surface exactly represents the convolutions of the brain. For if we take a cast both of the internal surface of the cranium and its external surface, we shall see that the first does not correspond exactly to the second ; hence the inference that is drawn from the external surface of the cranium, as determining the form of the brain, must be false, and consequently cranioscopy would be, at least in the mature age, a very precarious means for determining with exactness the degree of development of the cerebral organs.

" When, in consequence of a collection of fluid, which takes place in the ventricles of the hemispheres, the cerebral convolutions are unfolded and distended, the bones of the cranium are distended, whether they are yet united by their sutures or not."

The distance of the brain from the external frontal bone in certain animals is sometimes cited to cast discredit on Gall's claims ; but here too, as in so many other departments, he was a most exact and conscientious observer. He described the crania of animals and the relations of their brains to the crania, and showed that **in most animals it is only a part of the cranium which has any relation to the brain.**

" In some species of animals, we can determine the form of the brain from an examination of the external surface of the cranium ; in others, on the contrary, the external table of the cranium, either in its whole contour, or in some regions, is so

far from being parallel with the internal table, that the external form of the head and cranium in no way resembles the form of the brain. . . . Some species are without any frontal sinus ; in others, the cells between the osseous tables extend not only to the frontal sinus, but spread all over the skull and into the horns ; in others, there are only cells in one considerable part of the skull. . . . In night-birds the two tables of the skull are at a considerable distance apart, the interval being filled with very light cellular material. In certain species the tables are parallel, although at a considerable distance apart ; in others, again, their directions are quite different. In dogs we may observe, as regards the muscular masses, the frontal sinuses, and the crests or ridges, a great difference not only between one variety and another, but even between individuals of the same breed. Some dogs have no frontal sinus at all ; in others it is as big as in the wolf or in the hyæna. The cat, the marten, the squirrel, the horse, the ape, have no frontal sinuses ; the ox, the pig, the bear, the elephant, etc., have them."

Some German anatomists believe that the shape of the head is due to the **traction of the masticatory muscles** and the insertion of the **neck muscles** at the back of the head. Both **LANGE** and **J. ENGEL** (1816-1899) held that the shape of the cranium depends on the traction which the muscles exert. But **RIEGER** does not hold that opinion. He says :

" I have seen many skulls cut open, but I have never observed any special connection between a strongly arched temporal bone and powerful masticatory muscles or between a flat occiput and feeble nape-muscles. What is it, then, that shapes the skull ? Surely not," says Rieger, " individual parts of the brain ? " Why not ? " Because that would be acknowledging Gall's doctrine."

Here we have the stumbling-block to all the brain investigations of the last century. Truths cannot be truths if they favour a doctrine which we have dismissed long ago as untrue.

Various modern authors have expressed a similar view to Lange and Engel, quite unaware that Gall had also dealt with this problem. This is what he said :

" Some naturalists believe that the muscles, by the traction and pressure which they exercise upon the cranium, contribute greatly in determining the form of the head, and that consequently we may greatly deceive ourselves in estimating the shape of the brain from the appearance of the cranium. . . . The physiologists and naturalists who attach such significance to the action of the muscles upon the cranium may be divided into two sets, whose opinions contradict one another. Some believe the action of the muscles causes the protuberances on the skull ; the others hold that they tend to flatten the skull. Now, which set is right ? ' They are both wrong,' he says. ' **The form of the head is determined in utero.**'

" If the prominences of the cranium were owing to the action of the muscles, they ought to assume the contours of the attachment of these muscles ; but I have always found them to correspond to the underlying part of the brain. . . . If the muscles drew the bones of the cranium outwards, they ought necessarily to act with more force upon the external table, and separate it from the internal. But it is exactly there, where the strongest muscles act—in the temporal region and occiput—that the osseous plates are more closely in contact. . . . Negroes have stronger masticating muscles than Europeans, but have the temporal region flattened. . . . The muscles of the limbs are sometimes attached to prominences and sometimes to grooves, which proves that neither prominences nor depressions are formed by muscles. . . . In certain diseases the action of the muscles curves the spine of the back. In most of these cases the right shoulder rises above the left in consequence of this action ; here, say they, is a modification of bones produced by the muscles. The instance cited shows that when the action of certain muscles becomes predominant, their most feeble antagonists yield, but by no means proves that the form of the bone is modified by such action."

The following quotations from old and modern authors will show that Gall's view that the skull grows with the brain and conforms to its shape is shared by an overwhelming number of eminent observers.

GALEN (131-201), "De usu partium," vol. viii., long since said that the cranium is moulded on the brain, and not the brain on the cranium.

A. DE LAURENS (1550-1609), "Hist. Anat.," p. 139, and **J. van DIEMERBROEK** (1609-1674), "Anat. corp. human.," p. 534, taught the same thing in the XVIIth century.

J. B. FISCHER (1685-1772), anatomist, in 1743 wrote a treatise making the same observation.

J. F. BLUMENBACH (1752-1840) was equally convinced of it.

FRANÇOIS MAGENDIE (1783-1855) said: "The only way of estimating the volume of the brain in the living person is to measure the dimensions of the skull."

L. P. GRATIOLET (1815-1865), one of the greatest anatomists of the XIXth century, very accurately observed that the cranium surrounding the brain has the shape of that organ truly engraved, otherwise the original form would be lost when the brain is taken out, as it is only a soft mass, and collapses when the blood ceases to circulate in it. Fortunately this form, though lost in the brain, exists in the shape of the cranium.

The celebrated **CUVIER** (1769-1832) stated that: "The brain moulds itself in the cavity of the skull, which it fills exactly in such a manner that knowledge of the bony part gives us information at least of the form of the exterior of the brain."

The renowned **PAUL BROCA** (1824-1880) in "Mémoires de la Société d'Anthropologie," ser. ii., vol. i., p. 63, declared: "One can say, that in a general way, the capacity of the cranium increases or decreases with the volume of the brain, and that consequently a comparison of the capacity of crania corresponds pretty well with that of the brains themselves."

L. MANOUVRIER, the celebrated French anatomist, pointed out that the impressions of the convolutions on the inner surface of the skull are unshakable proofs, firstly, that the brain fits close to the skull, and secondly, that its position does not change, but it lies immovable. (Société d'Anthropologie de Paris, November 4th, 1885.)

G. SCHWALBE ("Ueber die Beziehungen zwischen Innen-Form und Aussen-Form des Schädels," *Deutsches Archiv für klinische Medizin*, 1902), traced the various convolutions and fissures on the outer surface of the skull, and his observations, as he says, open a large field of new and truly scientific investigation on the lines of Gall.

NIC. RUDINGER (1832-1896) also traced the vaulting of the skull to the growth of certain convolutions.

HERMANN WELCKER (1822-1897), who examined Schiller's skull, believed in the localisation of special capacities in the sense of Gall, only that Gall, in his opinion, was too impatient, and came to conclusions on insufficient material. He did not accept the details of Gall's theory.

RUDOLF VIRCHOW (1821-1902), "Ueber die Entwicklung des Schädelgrundes," Berlin, 1857, confirmed the harmony of conformation between brain and skull.

J. RANKE (1836-), in an address "On the Relations of Brain and Skull," stated that the differences in the form of the skull are entirely due to the differences in the development of the brain. (German Anthropological Congress, Danzig, 1891.)

EMIL ZUCKERKANDL (1848-1910), "Medizinische Jahrbücher," 1883, pt. iv., described the influence of the growth of the sutures and of the cranial shape in the direction of the convolutions, and agreed that "brain and skull develop together."

F. OBERNIER (1839-), "Allg. Zeitschrift f. Psychiatrie," 1865, wrote: "All processes which augment the brain-substance have also an influence on the development of the skull."

R. B. TODD (1809-1860), "Cyclopædia of Anatomy and Physiology": "A comparison of the external and internal surfaces of the cranium establishes the fact that there is a general correspondence of the two as far as regards those parts which are in contact with the periphery of the brain."

MORIZ BENEDIKT (1835-), the Vienna neurologist: "It has been objected that

there are in the skull very many accidental secondary prominences which have no counterpart in the brain. Fairly considered, however, this objection is not very material, inasmuch as it refers only to unimportant and changeable details and comparatively rare abnormities. No scientific man, even if he does not altogether agree with Gall, disputes the doctrine that the construction of the skull is remarkably proportionate to the whole anthropological organisation in brutes and in man ; and the whole craniology, as it is understood by anatomists and anthropologists, would have no meaning if this idea were not the leading one. . . . That types of skull are generally connected with types of character may be concluded with safety from the results of craniology in the animal classes and from the study of the skulls of different races."

Sir CHARLES BELL (1774-1842), in his " Anatomy " said : " The bones of the head are moulded to the brain, and the peculiar shape of the bones of the head is determined by the original peculiarity in the shape of the brain."

SAMUEL SOLLY (1805-1871), in his work, "The Human Brain," 1836, said: "The skull is moulded in its form and shape by the brain, though it is not uncommon to hear opponents ridicule the idea of a soft brain producing any impression on the hard skull."

Sir WILLIAM LAWRENCE (1783-1867), Professor of Anatomy and Surgery, St. Bartholomew's Hospital, in his " Lectures on Man " said : " The general capacity and particular form of the skull depend entirely on the size and partial development of the brain."

SAMUEL GEORGE MORTON (1799-1851), author of " Types of Mankind " and " Crania Americana " (1839) wrote : " The growth of the brain is consentaneous with that of the skull." According to his biographer, he saw nothing unreasonable in the doctrines of Gall, but much that was reasonable and worthy of being seriously maintained.

FREDERICK PETERSON, *American Journal of Insanity*, 1895, said : " It may be affirmed that every segment of the skull represents some particular part of the brain lying beneath it. This may be asserted without proclaiming one's self a proselyte of Gall."

Sir WILLIAM FLOWER (1831-1899), in his lectures at the College of Surgeons in 1879, said that " the skull is a fair index of the development of the brain in its different regions, and ought therefore to be studied " ; adding that " the longer he lived he saw fresh beauty and meaning in every line and configuration of the cranium, and that the fact that he could recognise particular skulls when presented to him as belonging to certain nations is a proof of there being certain fixed and uniform laws in regard to them."

ALEXANDER ECKER (1816-1887), the great authority on the Topography of the Convolutions, said : " The cranial vault fits like a tight glove on the surface of the enclosed cerebrum."

Sir GEORGE M. HUMPHRY (1820-1896), Professor of Anatomy, Cambridge University, said : " The skull is moulded upon the brain, and grows in accordance with it. The size and general shape of the brain may be estimated with tolerable accuracy by the size and general shape of the skull. The frontal sinuses and the projecting ridges, the inequalities on the surface of the skull, which have no correspondences in the interior, do not amount to much, and do not affect the principle that the skull is moulded upon and fitted to the brain, and that its exterior does, as a general rule, convey pretty accurate information respecting the size and shape of that organ."

Sir WILLIAM TURNER (1832-1916), Professor of Anatomy in Edinburgh University and a pioneer in cranio-cerebral topography, drew attention to the fact that in certain regions the outer surface of the skull possesses elevations and depressions which closely correspond to definite fissures and convolutions of the brain, and he adds (*West Riding Lunatic Asylum Medical Reports*, vol. iii.) that " single psychical functions, and probably all, are related to circumscribed centres of the cortex of the cerebrum."

Sir DAVID FERRIER (1843-), one of the greatest authorities on the brain, who also studied cranio-cerebral relations, made the following statements (*Harveian Oration*, 1902) :

1. The brain fills the cranial cavity like a hand in a glove and is closely appressed to the interior of the skull-cap.

2. Under normal conditions the amount of cerebro-spinal fluid is so small as to be practically a negligible quantity.

3. As a general rule, it is not till about the fortieth year that the cranial sutures (except at the base) become ankylosed, and the process is not completed till much later in life.

4. So long as the intersutural fibrous tissue is present, the cranium may increase.

5. Increase of the brain pressing from within can delay the closure of the sutures. During the development of the brain, the cranium expands according to the demands made upon it. The initiative lies with the brain.

Sir FREDERICK TREVES (1853-), in his "Surgical Anatomy," says: "The amount of fluid in the subdural space is only enough to prevent friction during the movements of the brain. The fluid which is in the subarachnoid space over the convexity of the brain is insignificant.

GEO. M. ROBERTSON, in the *Journal of Mental Science*, 1893, says the same as Treves.

Sir THOMAS LAUDER BRUNTON (1844-1916), Anthropological Institute, February 22nd, 1887, supported Gall's view.

D. J. CUNNINGHAM (1850-1909), Professor of Anatomy, at the British Association Meeting, Glasgow, 1901, said:

"The cranium is the outward expression of the contained brain, and the brain is the most characteristic organ of man; cranial peculiarities therefore must always, and should always, claim a leading place in the mind of the anthropologist. . . . During the development of the brain the cranium expands according to the demands made upon it by the growing brain. The initiative lies with the brain, and in normal conditions it is questionable if the envelope exercises more than a very subsidiary and limited influence upon the form assumed by the contents. The directions of growth are clearly defined by the sutural lines by which the cranial bones are knit together; but these are so arranged that they admit of the expansion of the cranial box in length, in breadth, and in height, and the freedom of growth in each of these different directions has in all probability been originally determined by the requirements of the several parts of the brain."

ALEXANDER MACALISTER (1844-1910), of Cambridge University, said: "The largest part of the skull is that which is at once the receptacle and the protector of the brain, a part which, when unmodified by external pressure, premature synostosis, or other adventitious conditions, owes its form to that of the cerebral hemispheres which it contains. . . . So far from the shape of the brain being seriously modified by the constraining influence of the surrounding embryonic skull, the form of the soft membranous brain-case is previously moulded upon the brain within it, whose shape it may however be, to some extent, a secondary agent in modifying in later growth. We have also learned that the cerebrum is not a single organ acting as a functional unit, but consists of parts, each of which has its specific province; that the increase in the number of cells in any area is correlated with an increase in the size and the complexity of pattern of the convolutions of that area; and that this in turn influences the shape of the inclosing shell of membrane and subsequently of bone." (British Association Meeting, Edinburgh, 1892.)

Professor SYMINGTON, of Belfast University, at the British Association Meeting, 1903, said:

"It is the brain growth that determines the form of the cranium, and not the skull that moulds the brain into shape. There can be no doubt that within certain limits the external form of the cranium serves as a reliable guide to the shape of the brain. Indeed, various observers have drawn attention to the fact that in certain regions the outer surface of the skull possesses elevations and depressions which closely correspond to definite fissures and convolutions of the brain."

It seems strange that such a simple problem should not have been settled long ago. The fact is, few trouble their heads about it, otherwise it could be solved every day in any dissecting-room. I have carefully observed many dissections, seeing the skull sawn through and the brain exposed, and I have never failed to observe

that when the skull-cap was lifted off the brain showed exactly the same elevations and depressions as the skull itself. But even if this were not completely the case, we must always remember that **we are looking for extremes of development and deficiencies, and are not trying to prove that every slight elevation or depression has its significance.** It might well be that a special extraordinary growth of the brain in a particular area caused the skull-covering to arch conformably, without it necessarily being true that an average brain in average activity has such a power over the cranial roof. Gall himself acknowledged that "every individual cannot become the object of useful craniological observations."

Let us remember also, that the skull cavity is so closely filled by the brain, that any development of it must exert pressure on its own substance—with serious consequences—unless that part of the skull becomes elevated. Does not the shell of the snail and the shield of the tortoise expand with the increase of the animal ? Why ? Because the hard covering is made for the protection of the animal, and not the animal for the covering. Likewise the cranium is made for the protection of the brain. The brain is more essential to the end of nature than its osseous envelope.

It is sufficient to say that **brain shape does in the main undoubtedly determine skull shape in human beings,** at least in normal cases. Any deviation between the two skull plates, when it exists, amounts usually only to one-tenth or two-tenths of an inch, except at the frontal sinus and occipital protuberance ; whereas the differences in the development of particular regions of the head amount to "entire inches." The general thickening of the skull often seen in the aged is in direct correlation with the shrinkage of the brain's bulk, the internal table gradually following the retreat of the cerebrum, so that, if the outer table does not likewise contract, either the two tables of the skull separate or the interspace is filled by fresh spongy ossification, making the skull as a whole thicker. This is conformable to the general physiological fact that the hard parts of the body are adapted to the size and form of the soft ones they enclose. In consumption, if one side of the lungs alone be affected, the ribs of that side sink down. If the eye be extirpated, the orbit becomes smaller ; and if, on the contrary, it grows carcinomatous, the orbit enlarges as the eyeball increases in size. Precisely so does the skull follow the brain in its size and general configuration. It must be remembered that the bones of the head, like all other bones of the body, are alive, and their life is animal life, they are permeated by blood-vessels and absorbents ; their materials are continuously in the course of removal and re-disposition.

That the skull-bones have the power to adapt themselves to abnormal conditions has been shown by **A. B. DROUSIK** ("On the Causes influencing the Shape of the Skull," St. Petersburg, 1883), who states as the result of his experiments on animals, firstly, that the skull bones increase in thickness in proportion to the diminution of pressure (reduced activity) on the part of the brain from the inner surface ; secondly, that an abnormal development of the brain as well as any changes in its form influence the configuration of the skull and indirectly of the face.

With reference to the **traction of muscles on the head,** let me point out that the muscles are softer than the cranium, that, notwithstanding the muscles, the head increases in size ; that the base of the brain is a solid structure which does not change much and is harder for the protection of the more vital organs at the base of the brain—not like the vault of the skull, where the almost immovable occipito-frontalis muscle is attached. *If the muscles really did determine the form of the skull, they ought, obviously, to act in the direction of their insertions ;* and the protuberances of the occiput and sides of the head ought then to be directed downwards, not backwards and to the sides. There ought also to be some proportion between the size of these protuberances and the strength of the muscles inserted between

them ; but it often happens that large protuberances correspond to weak muscles, and *vice versa.*

The brain is frequently described as lying upon a water-bed or as swimming in the cerebro-spinal fluid. The only portions which are really separated from the skull are the medulla oblongata and the pons Varolii, structures containing the centres controlling the action of the circulatory and respiratory organs and other vital functions, and may therefore be regarded as the most vital parts of the central nervous system, which need special protection. Otherwise, **the amount of fluid in the subdural space is only enough to prevent friction during the movements of the brain.**

Skulls vary in thickness, but since nature, in forming the bony frame of healthy people, has a uniform mode of working, *a healthy man may be judged to have a thick skull if the other bones of the body are also strong and thick.* On the other hand, we may infer from thin bones of the limbs a comparative thinness of skull under normal conditions.

Even if single convolutions do not impress themselves always perceptibly on the outer surface of the skull, **groups of convolutions do modify the shape of the cranium ;** indeed, there are no two skulls alike, as little as there are two faces alike. My experience of those who deny the fact is that they are mostly men unaccustomed to look at the appearances of skulls and the surface of brains, though they may be expert anatomists and histologists.

The difficulty with reference to the **frontal sinus** has also been much exaggerated. In children one may ignore it altogether. *The sinus does not generally appear before the age of twelve.* After puberty it is generally present, and increases with age. *In women the frontal sinus is smaller than in men,* and only slight allowance need be made. In men the bodily constitution will tell us what sized sinus to expect. Where all the bones are large, the sinus may be expected to be large, though not necessarily so. In old age, in chronic idiocy, and in dementia it may be of abnormal size. Finally, the frontal sinus, even when excessively developed, affects only the centre part of the lowest segment of the frontal lobes of the brain, but does not affect the width of that part of the forehead or its length from the ear forward.

All these difficulties exist only for those who look for protuberances on the head ; they do not affect the scientific man who looks first at the general configuration of the head, then at the development of the different bones which make up the skull, to judge of the size of the various lobes of the brain underneath, and who has a scientific system of measurement, not of one direction only, but including the length, breadth, and height of each region.

As has been pointed out already, **every child is born with a tendency to that form of head which it afterwards assumes.** To allow of this, the brain of the fœtus is surrounded not by an osseous substance, but by a transparent cartilaginous membrane, which becomes osseous simply for the protection of the brain. Centres of ossification start about the eighth week. Could any person go to the length of imagining that the size and shape of the body are determined by the state of the skin which surrounds and protects it ? Brain growth is the determining factor, and the skull grows upon, and accommodates itself to, the brain, whether the latter be large or small. Surgeons, like **O. M. LANNELONGUE** (1841-1911), who have removed strips of bone from the skulls of microcephalic idiots with the idea of affording more space and freedom for the growth of the brain, have evidently forgotten the fact ; hence their failure.

A microcephalic brain is not a more or less normal brain of very small size, the idiocy resulting from the smallness of the parts present, but is always an abnormal and undeveloped, and in a great many instances a diseased, brain. Large areas of it may never be developed, and the cells that are present are small and comparatively few in number. If a strip of bone be removed from the skull, new normal

cells will not be produced ; parts that are entirely absent cannot be created, and powers that do not exist cannot be called into being. The reported improvement after this operation is not due to the surgical procedure. Many cases have been reported at too early a date, and the improvement has not continued. When it has done so, it has been due to proper instruction and care, and not to the operation.

In old men, as a rule, the external appearance of the skull indicates what was *formerly* the shape of the brain, the internal table having receded to follow the shrinking brain. The skull will be spongy and lighter. In the chronic insane, on the other hand, the bones thicken, become more dense, compact, and heavier, approaching somewhat the texture of ivory. Most idiots also have a very thick cranium, when not suffering from hydrocephalus.

CHAPTER XIV

GALL'S CLASSIFICATION AND LOCALISATION OF MENTAL FUNCTIONS

GALL's localisations of the mental functions of the brain appear fantastic at first sight and give the impression of being the creation of his imagination. But we must remember that he made no attempt at a psychological analysis of mind and character —**he simply recorded his observations.** Yet the mental powers he located roughly agree with those of the modern psychological school, which has studied human and animal behaviour: Bain and Spencer began, William James, M'Dougall, Sutherland, Shand, Hyslop, Mercier, Coriat, Boris Sidis, Harry Campbell, Drever, Mott, Armstrong-Jones, etc., continued the inquiry. Gall emphasized:

"My views of the qualities and faculties of man are not the fruit of subtle reasonings. They bear not the impress of the age in which they originate, and they will not wear out with it. They are the result of numberless observations and will be immutable and eternal, like the facts that have been observed and the fundamental powers which these facts force us to admit. If the reasonings of metaphysicians are ever discarded, this philosophy of the human qualities and faculties will be the foundation of all philosophy in time to come. . . . Let man confine himself to the phenomena of nature, regardless of any of the dogmas of metaphysical subtlety; let him utterly abandon speculative suppositions for positive facts, and he will then be able to apprehend the mysteries of organisation."

But, it is said, granted even that he hit on the right elements of the intellect and emotion, or on some of them, his brain centres, provided that they can be localised at all, are mere guesses. The answer to this query can be only one: if they have been mere guesses, and not the result of careful observation, based in many cases on clinical and pathological facts, *they have been very shrewd guesses*, for some of them have been confirmed by more recent research. Other critics say that Gall's localisations have been rejected long ago and will bear no revival:

"It would be flogging a dead horse at the present day to offer arguments against the exploded doctrine of Gall, which has long been discredited by scientific men." So said one; and another: "We had imagined that Gall's doctrine had been judged and condemned long ago, and sank into an enormous grave where lie buried so many other huge and popular delusions. We must beg our friend not to prosecute this subject any further. People have all made up their minds about it."

These were the replies I received when I first attempted to revive Gall's doctrines. But it is not the question whether Gall's centres actually exist in the brain or not. I give them merely as a proof that **localisation of "mental" functions is possible,** and shall produce such evidence as will convince any one willing to listen that localisation is already a fact, as far as the principle is concerned, and that if we have until now failed in detail, it has been because of the insufficiency of our methods, and because we did not know what to look for. In my opinion, we have

now reached, after being for a century on wrong tracks, the right course, both psychologically and physiologically, for the unravelling of the relations between certain parts of the brain and the elements of mind and character.

Accept nothing without proof and re-examination ! But clear your mind from preconceived notions, which frequently are based not on personally examined evidence, but on the faith in authorities of long ago who did not know better, considering the state of science at the time !

Gall studied the form of the brain in connection with the capacities and actions of man. When he claims to have observed that musical geniuses have a certain part of the brain and head prominently developed, and that tone-deaf persons have this part deficient, he is making a definite statement of observation, which cannot be contradicted by mere words. The observation itself would have to be repeated. This has not been done, until nearly a century later, when by other methods of inquiry, *i.e.*, by vivisection, clinical and pathological evidence, the possibility of such localisation was established and a centre discovered, which we shall see presently corresponds very nearly with that of Gall. He observed other varieties of genius to have other parts of the brain prominently developed ; and men renowned for their crimes, or for their goodness and faith, or for their sensuality, still other parts. **He himself asked us not to accept these observations as established facts,** though he repeated them a thousand times. It is our duty to find out for ourselves.

The explanations may be wrong, the facts of observation will remain. As G. ANDRAL (1797-1876) said :

" The question is not whether Gall erred in the determination of the cerebral organs. Even if no one of these organs has been found, the basis of the science is still unaffected. The principles of it have been laid down by the aid of induction, in itself most valuable, and sooner or later the facts will be accumulated. Then the science will be definitely formed, and if the great majority of these facts favour the principle laid down, we must not be embarrassed by a few exceptions, for these will be only apparent."

Gall's psychology was arbitrary ; his system, like most other systems, inadequate ; but the principle, which he was the first to lay down—the localisation of function in definite parts of the brain—was true ; and to-day our cerebral physiology, as far as it exists at all, is but a refined and more cultured expansion of Gall's doctrine. For this service he should be remembered.

Gall first made his observations ; when he was reasonably certain in his own mind that his localisations were founded in nature, he noticed that they followed a certain plan, namely :

1. The most fundamental instincts, common to man and animals, and tending to the preservation of the individual—" self-protecting," as he calls them—were found to have their seats at or near the base of the brain ; as the instinct of propagation, love of offspring, instinct of self-defence, that of providing food, instinct of cunning, etc.

2. The social sentiments for the preservation of the species were placed in the posterior lobes.

3. Those intellectual faculties which man enjoy in common with animals were found to be at the base of the frontal lobes ; perception of size, form, distance, number, colour, etc.

4. The higher intellectual faculties, the ethical, æsthetical, and religious sentiments, which are peculiar to man, at least as regards their degree of intensity, were found to be in the coronal region, *i.e.*, at the posterior part of the frontal lobes.

5. Analogous qualities were found to be placed near each other ; for example, tone-centre and the centre for number.

In one respect Gall's general exposition of the functions of the brain differs

essentially and totally from the modern view. Gall did not assign to the thin stratum of grey matter of the convolutions and cerebral ganglia the whole of the functional energies of the brain, and to its vastly greater mass of white fibres the mere business of conduction ; he considered the **grey and white mass together** to be involved in the functions of an organ. Modern experimenters have tried to disprove his localisations by destroying certain areas of the cortex and noting the loss of function following. But if he is right, the mental function of any region of the brain can only be destroyed by the extirpation, destruction, or disorganisation of *not only the grey matter, but also of the white fibres* throughout their whole depth. Such disorganisation may possibly occur as a direct result of injury, or may follow subsequently as a consequence of atrophy where the nutritive function of the grey matter is suspended by the injury.

Gall did not personify the faculties and imprison them in circumscribed portions of the grey substance ; but he regarded the grey area as the centre where the stimulus enters the nervous system through the medullary fibres of sensation, rouses a psychical image or feeling, and terminates in other medullary fibres appropriated to movement. In his opinion, **the grey matter is destined for deliberation and repression.**

Gall did not pretend to have discovered the ultimate nature—the elementary function—of the mental powers :

" I have made it," said he, " an invariable rule to advance nothing which I could not strictly prove, or at least render very probable by very strong arguments ; for this reason, in regard to the qualities and faculties, the existence of which I maintain, I have always confined myself to the degree of activity in which I could discover them and observe their manifestation. I know it would have been more philosophical always to refer to their fundamental forces the qualities or faculties which I could detect in only their highest action : but **I preferred leaving something for those who came after me to do, rather than give them an opportunity to disprove what I had prematurely advanced.**"

There was no analysis of mind and character available in his time ; only now are we making attempts at it. What his contemporaries and the psychologists before him had described as fundamental powers—attention, memory, judgment, imagination—were in his view merely the general attributes of all the faculties.

" We see the poet, and the external mark of his talent ; but this degree of activity is evidently the result of an extraordinary development of one cerebral part. What is the function of this part in its primitive destination ? What is its radical fundamental function ? "

Gall did not know. He also pointed out to the future inquirer that " a modification of a mental power, and the result of the combined action of several mental powers, must not be mistaken for elementary qualities."

This shows that Gall conducted his inquiry in the right spirit.

Gall did not map out the whole brain or circumscribe the region of each centre ; neither did he pretend to have enumerated all the faculties of the mind. " Probably," says he, " those who follow me in the career which I have opened, will discover some fundamental forces and some organs which have escaped my researches." He was quite aware of the incompleteness of his discoveries. **All that he claimed was to open the way for further research.** As he said :

" I am far from believing that the edifice is finished. Neither the life, nor the fortune of one man, can be sufficient for this vast investigation. I have had to depend on my own resources. It will require many fortunes to bring this study to the perfection, which my unaided efforts could not alone effect." And again :

" I do not as yet know the functions of all the cerebral parts, consequently further discoveries have yet to be made. I have also more than once avowed, that *it is impossible for me to circumscribe exactly the extent of each centre*, and have urged this consideration with those who believed that in removing such and such parts of the brain they would be enabled to learn its functions."

Had Gall located only intellectual activities, there probably would not have been much difficulty in accepting his theory ; but that he should attempt to find the centres from which originate the feelings and propensities of man aroused the opposition of the old psychological school. But then Gall was a naturalist, not a psychologist. **He observed and analysed human behaviour, not the entities created by introspective meditation.**

" The inquiry into the contents and the operations of the mind must be conducted upon the same principles as a physical investigation—that is, on natural philosophy lines." So said Gall. Now, psychologists are only just starting to make this inquiry, and they have not got very far yet. WILLIAM JAMES in his " Principles of Psychology," 1890, admitted that both psychologists and physiologists very much neglected the emotional nature of man and dealt only with the perceptive and volitional parts of the mind. It is only since James that the subject has received attention. Some of the essays of this school of psychologists (p. 283) are almost identical with those published nearly a century ago by the despised phrenologists in the *Edinburgh Phrenological Journal* (see Chap. XVII).

Gall, as I have mentioned repeatedly, made no attempt to analyse the mental powers. He contented himself with naming those for which he could find brain centres, **in the terms of their highest activity and frequently of their abuse.** This terminology of the functions of the organs was atrocious—the hoarding instinct was the organ of " theft " ; the instinct for self-defence was the organ of " murder," and so on. True, he made his qualifications and explanations, and, later, modified his terminology altogether, giving his organs more reasonable appellations ; but these were disregarded, so great was the merriment and indignation, and sometimes contempt, with which his earlier conceptions were received. A degree of obloquy was brought upon his doctrine, from which it has never recovered. However, if we take his later terminology and read more deeply, and take note of his explanations, we shall find that his mental powers correspond in the main with those of the modern school before mentioned.

This is what Gall said :

" Whatever the fundamental disposition, it would have been impossible for me to discover such a quality or faculty, unless it had been manifested in the highest, or, at least, in a very marked degree of activity ; and I was under the necessity of giving it a name, derived from this high degree of activity. For example, the carnivora are forcibly impelled by an innate propensity to kill creatures necessary for their support ; but never, as some of my opponents, with equal assurance and folly, have sedulously endeavoured to make people believe, never, in speaking of the instinct of murder, did I mean, therefore, a propensity to homicide. My principle is, and I shall always adhere to it, that to designate a fundamental faculty or quality, common to man and the lower animals, we must choose a name that will be applicable to both. But, certainly, a propensity to murder impelling to homicide, would be totally inapplicable to the natural destiny of the carnivorous animals. Would it be just for nature to withhold from man the means of ridding himself of his enemies ? . . .

" All the faculties are good, and necessary to human nature, as it should be according to the laws of the Creator. But I am convinced that too energetic an activity of certain faculties produces vicious inclinations—causes the primitive destination of propagation to degenerate into libertinism, the sentiment of property into an inclination for theft, circumspection into irresolution and a tendency to suicide, self-love into insolence, disobedience, etc."

The analysis of the mental powers presents difficulties. No sharp line can be drawn between intellectual faculties, sentiments, emotions, and propensities, nor between animal and human faculties. **No faculty acts singly.**

"The moral qualities and intellectual faculties may be differently divided, if considered from a different point of view. We may divide them into sentiments, propensities, talents, and intellectual faculties. Pride and vanity, for instance, would be sentiments; the instinct of propagation and the love of offspring, propensities; music and mechanics, talents; and comparative sagacity, an intellectual faculty. It is often perplexing, however, to fix the precise limits of each division. The intellectual faculties and talents, when their organs are very active, are manifested in company with desires, propensities and passions; and the sentiments and propensities have also their judgment, taste, imagination, and memory.

"The more cautious observer would not venture to decide where the faculties of the brute end and those of man begin; hence it must be acknowledged that the division in animal and human would not prove satisfactory.

"The best division appears to me that of fundamental qualities and faculties, and that of the general attributes of these same qualities and faculties."

A mental quality is considered primitive by Gall:

1. When it exists in one species of animal and not in another.
2. When it varies, according to sex, in the same species;
3. When disproportioned to the other mental powers of the same individual.
4. When its appearance and disappearance is independent of the other mental powers;
5. When its action or repose is independent of the other mental powers;
6. When it is capable of being transmitted from parent to child;
7. When it is capable of preserving independently a degree of normality or abnormality.

Gall was the first to show us the **evolution of the mind of man**: First impelled by instincts, wants, or tendencies; next directed by sentiments, subordinating the selfish desires; and finally, the intellect springing up and growing in strength, subduing and modifying the impulses arising from the instinctive tendencies and sentiments.

Gall held that there are innate predispositions, but **no innate ideas**; these dispositions remain dormant if not stimulated by the senses; the propensities—to fight, construct, acquire, etc.—could only be developed by objects and would ever remain dormant without them. For example, in order to fight we must have an antagonist.

To most philosophers mind and intellect were synonymous. They viewed man as a rational creature, but Gall laid stress on the instinctive nature of man; **he was the first to treat of the propensities,** the appetites of man and animals. They over-estimated the reason of man. As a matter of fact, as I have already pointed out, the average man accepts the judgment of the herd and the persons whom he respects as authorities, but he does not formulate his own conclusions, in most of the matters concerning which he holds opinions. The intellect acts only in the service of the propensities as a means of attaining the ends to which they are directed. The impulses to action must come from the affective elements of our constitution. The intellect can only appreciate facts, not supply motives. Unless stimulated by the propensities, which present more or less definite aims, the intellectual powers might remain inactive, dormant, latent. As Gall said:

"The intellect is not the sovereign exercising despotic authority as the metaphysicians imagined it. The instincts produce certain wants, desires, propensities to action, and are most active in the ignorant, and therefore also in childhood; but also in later life, when the intellectual faculties are most active and cultivated, our actions are not invariably guided by what is called reason; hence the contradiction

we observe in human actions, the disorders of civilised society, and the obstacles placed to oppose progress.

"Man is said to be a reasonable being, and although the observation is just to a certain extent, yet are all his actions the result of reason ? Are not many of his actions such as reason cannot approve ? Is he not frequently influenced by feelings alone ? And feelings which are purely of an instinctive character ? Are there not such feelings as sexual desire and parental attachment ? But are *they* the result of reason ? Do we not find them in powerful operation in inferior animals ?

"When the superior qualities and faculties, proper to the human species, predominate greatly over the qualities and faculties of an inferior order, the man, properly so called, will subdue the animal in him. The contrary takes place with those in whom the organs of the animal qualities and faculties have reached a considerable development and activity, while the organs of the superior faculties are but little developed, and have little activity. In these individuals, everything is subject to sensuality and error. In those cases where the qualities and faculties common to animals, and, at the same time, those proper to man, are equally active the character will be alternately influenced by both classes of faculties. They will be stimulated, elevated, or degraded according to circumstances. Such may be great in vice or virtue. These are the individuals who experience, in the most sensible manner, the struggle of two beings at war within them. When one or several qualities or faculties, whether animal or human, possess extraordinary energy, while the others are only moderately developed, there will result a predominance in that direction, producing a particular talent, or a definit peropensity, good or bad, predominating over the rest. Where there is a deficiency in one particular organ, there is apathy or weakness in that direction. Lessing and Tischbein, for example, detested music ; Newton and Kant had a horror of women. Finally, there is the crowd of ordinary men ; but as in the brain the organs common to animals occupy by far the largest area, this class of men remain much under the influence of their animal qualities, their enjoyments are those of sense, and they never distinguish themselves in any remarkable degree."

GALL'S MENTAL FUNCTIONS AND THEIR LOCALISATION

Combativeness, Courage, Fighting Instinct, Aggressive Instinct, Tendency to Oppose.
Located in posterior part of inferior temporal convolution.

Carnivorous Instinct, Destructiveness, Propensity to Annihilate, Impulse of "Anger," Irascibility.
Located in the middle part of the inferior temporal convolution.

Hoarding Instinct, Sense of Property, Acquisitiveness, Propensity to make Provision.
Located at the superior anterior part of the temporal lobe, behind Constructiveness.

Cautiousness, Foresight, Circumspection, Emotion of Fear, Organ of Melancholy.
Located in supra-marginal convolution.

Constructiveness.
Located at anterior edge of temporal lobe, in front of Acquisitiveness.

Propensity of Propagation, Sexual Instinct.
Located in Cerebellum.

Love of Offspring, Parental Love.
Located in lower part of occipital lobe, near the middle line.

Attachment, Social Affection.
Located in occipital lobe, external to Parental Love.

Inhabitiveness, Attachment to Home and Country.
Located in occipital lobe, above Parental Love.

Pride, Love of Authority, Self-Esteem.
Located in superior parietal lobule, near the middle line.

Vanity, Love of Approbation, Love of Glory.
Located in superior parietal lobule, external to Self-Esteem.

Firmness, Perseverance, Obstinacy.
Located at the top of the posterior central convolution, behind the Fissure of Rolando.

Verbal Memory.
Located in Island of Reil.

Linguistic Faculty.
Located posterior part of orbital convolutions.

Memory of Objects, Educability.
Located at lower end of first frontal convolution.

Memory for Moving Things, Memory of Events.
Located above the former in first frontal convolution.

Memory of Persons. Perception of Form.
Located in anterior part of orbital convolutions, near middle line.

Memory of Spaces and Places. Relation of Objects in Space.
Located at lower end of second frontal convolution.

Colour Sense.
Located in orbital convolutions, central and anterior. He was the first to show that colour-blindness is an affection of the brain, and not of the eye.

Faculty of the Relation of Numbers, Memory for Numbers.
Located at the anterior outer part of the orbital convolutions.

Tone Sense, Music.
Located within the Fissure of Sylvius at anterior edge of temporal lobe.

Time Sense, recognised by him, but he admitted having failed to discover its centre.

Comparative Sagacity, Deductive Faculty, Perception of Similitude.
Located in the middle of the first frontal convolution, above Memory for Facts and Events.

Metaphysical Sagacity, Causality, Inductive Faculty, Aptitude for Drawing Conclusions.
Located middle part of second frontal convolution, at side of Comparison.

Wit, Humour, Perception of Dissimilitudes.
Located in outer margin of second frontal convolution. In centre, external to Causality.

Poetical Aptitude, Ideality, Creative Fancy.
Located upper part of third frontal convolution.

Sense of Fine Arts ; the Perfecting, Æsthetic Faculty ; Sense of Beauty.
Not located.

Imitation, Tendency to Copy, Mimicry.
Located in ascending frontal convolution, below Veneration.

Sympathy, Benevolence, Compassion, Good Nature.
Located most posterior part of first frontal convolution.

Religious Sense, Veneration.
Located at upper part of ascending frontal convolution.

Visionary Capacity, Wonder, Inspiration, Prominent in Fanatics.
Not located.

To these Spurzheim and Combe added :

Alimentiveness, Desire for Food.
Located at anterior edge of third temporal convolution. In exactly the same situation as Ferrier's gustatory centre.

Conscientiousness, Sense of Justice.
Located by the side of Love of Approbation.

Hope, Tendency to Aspire, Mental Elation.
Located in front of the former.

Perception of Size.
Located in orbital convolution, next to Form.

Perception of Weight.
Located in orbital convolution, next to Size.

Time Sense, Perception of Relation of Objects in Time.
Located external to Eventuality.

Order, Perception of Objects in Relation to Sequence.
Located in orbital convolution internal to Number.

Anyone looking at Gall's classification of mental activities and their localisation will, at a first glance, declare it as " absurd " and " without the slightest foundation," and undoubtedly it seems so. But let us remember, Gall had a clumsy way of expressing himself, partly due to writing in a language foreign to him, and partly due to the fact that he was more of a naturalist than a psychologist. Let us therefore have patience in examining his statements, and we may find more treasure in them than is apparent at first sight.

First of all, it will be noticed that all the intellectual powers are located by him in the frontal lobes. He was the first to show that the frontal brain, that area which is largest in man of all animals, and lies in front of an imaginary plane drawn midway between the two ears (and more particularly the pre-frontal brain—that is, the region corresponding to the forehead proper), is **the region for the higher intellectual operations** : of observation and reasoning capacity. This has been confirmed since his day by various neurologists—such as Meynert, Hitzig, Ferrier, Macdonald, Bolton, Sachs, Mills, Durante, Oppenheim, and many others.

Gall regarded the frontal lobes as an inhibitory apparatus against the lower and more instinctive natural impulses and the purely vegetative functions. If this inhibition becomes weakened or disordered, predominance of the natural instincts or impulses occurs. Th. MEYNERT (1833-1892) " Psychiatrie" (1859) confirmed this view, apparently unaware of what Gall had said before him.

Gall's system explained the causes of individual talent :

" Neither psychology nor physiology has up to the present explained what gives men that special bias towards certain pursuits. There is no uniform type or universal talent—for painting, poetry, mathematics, music, mechanics, philosophy, language, acting, etc., all in one. What makes for greatness is the pronounced talent for one pursuit together with the relative imperfection in others. There is no one model type of man, just as there is no single type of dog. The organisation of the greyhound is different from that of the bulldog. . . . We all admit with Horace, that 'a poet is born, not made'—*poeta nascitur, non fit* ; but if this maxim is just with regard to the poetic talent, it is equally just with regard to talent of every kind."

Gall placed a number of the special perceptive powers—for form, space, colour, number, etc.—**in the orbital convolutions** resting on the orbital plates at the roof of the eyes. This might be dismissed at once as contrary to anything we know ; but I shall produce some evidence for it in that part of this work where I present my own investigations, which will justify us in leaving it an open question.

Gall was the first to show that colour-blindness is not an affection of the eye, but

of the brain, and that it is not "a good ear" that gives capacity for music, but a well-developed brain-centre for the appreciation of tones.

Nearly a century later, in a paper on "Colour-blindness" contributed to vol. v., pt. ii., of the *Proceedings of the Bristol Naturalists' Society*, the celebrated chemist, Sir W. RAMSAY (1852-1916) suggested, as something quite new, that the particular defect which causes colour-blindness may lie in the brain, not in the eye. Certain persons, he points out, are incapable of judging which of two musical tones is the higher, even when they are more than an octave apart. Yet such persons hear either tone perfectly; the defect is not one of deafness. "It must be concluded," says Prof. Ramsay, "that in such a case the brain is the defaulter, and it may equally well be the case that the incapability to perceive certain colours is not due to a defect in the instrument of sight—the eye—but to the powers of interpreting the impressions conveyed to the brain by the optic nerve. If this is the case, the problem is no longer a physical one; it falls among those with which the mental physiologist has to deal."

Apparently he was wrong with his localisation of his colour centre, but **his location of the tone-centre, implying musical ability, coincides nearly with that of modern observers,** of which evidence will be given later. He located the tone-centre in the superior lateral part of the head, which gives width and roundness to the forehead towards the temples. His location is based on the examination of the heads of Kreibig, Mozart, Haydn, Beethoven, Rossini, and many other eminent musicians, casts of whose heads were in his collection. He also observed cases of insanity in which there was almost a complete derangement of faculties, yet music remained preserved. He mentioned, too, a number of cases of more or less complete idiocy with a remarkable talent for music, thus showing that there must be an independent brain-part for it, which did not suffer in the general arrest of brain-growth. Considering further a number of cases of musical and arithmetical prodigies, he came to the conclusion that the explanation can only be that there is a separate centre for the appreciation of tones, number, and the other fundamental capacities.

"Such prodigies are, ordinarily, in every other relation except in their peculiar talent, children like others; which proves that the faculty by which they distinguish themselves, as well as its organ, is independent of all the other faculties and all the other organs, and that we must recognise it as a peculiar power."

Gall had to defend himself against the charge of materialism and wrote in the Petition to the Austrian Emperor in 1802:

"I have long ago made the discovery that the tone-centre is quite distinct from the proper organ of hearing. I have established, by evidence, the existence of a brain organ for the faculty of number. Because I have demonstrated the situation of these brain organs, do I say that, therefore, material organs feel and judge of the relations of tones and numbers?"

Gall's location of the "speech-centre" will be dealt with later in a separate chapter (Chapter XIX.).

Gall further showed that **"memory" is not a single faculty** but that each faculty has its own memory, and he distinguished certain special memories, for words, places, events, etc.

Gall's "metaphysical faculty," located in that portion of brain underlying the frontal eminences, "enables us to form abstract conceptions of a kind the most remote from all practical application; to discuss the ultimate causes of things, the nature and qualities of matter, motion and force, of space and time, of cause and effect, of will and conscience." This localisation is followed from the observation of heads of the philosophers of his day; and how great was the general interest

aroused in his doctrine is shown by the fact that the death-mask of Kant was presented to him.

Another intellectual power distinguished by him was the "discriminating" capacity (located internally to his metaphysical faculty corresponding to the region between the two frontal eminences). Of this he said: "Without discrimination there is no knowledge. Knowing a thing is, in a sense, being able to distinguish it from other things. So, too, in a higher sense, discriminative power is the ability to analyse, to criticise, to classify. There can be no order without it, and therefore no clearness. The power of intellectual discrimination differs in the case of different persons."

Gall showed that the moral feeling is not an omnipresent, infallible guide to conduct, identical in all men, but that it varies in different people, and even fluctuates in the individual himself, according to the state of his mental and emotional poise. **He was the first to hold that the moral sentiments,** the highest acquisition of man, **are part of our brain organisation.** A defective brain organisation leads to moral imbecility.

HENRY MAUDSLEY (1835-1918) held a similar view: "Moral feeling may be impaired or destroyed by direct injury of the brain, by the disorganising action of disease, and by the chemical action of certain substances which, when taken in excess, are poisons to the nervous system. When we look sincerely at the facts, we cannot help perceiving that it is just as closely dependent upon organisation as is the meanest function of mind."

The moral head, according to Gall, is *above* an imaginary plane drawn between the frontal and parietal eminences. The "villainously low forehead," in spite of the affirmation of some theorists, will, to the majority of mankind, point to a villainous disposition; as the lofty forehead will to an elevated disposition—a rational sequence.

The organs which minister to the necessities of our animal life are according to Gall in the temporal lobes. If the temporal lobes are well developed, particularly in the lower region, the ears would appear set deep. In the typical murderer, as in carnivorous animals, the lower part of the temporal lobes predominates, when compared to the mild-natured man and frugivorous animal. The ears of the typical murderers are set very low and wide apart, thus giving more space to the inferior part of the temporal lobes. The murderer's head is therefore a wide and deep head; deep *below* an imaginary horizontal plane drawn between the frontal and parietal eminences. Gall asked us to compare as regards the breadth of head across the temporal lobes "the broad-headed lion with the narrow-headed horse; the ferocious, broad-headed bull-dog with the timid, narrow-headed English terrier."

These observations were confirmed by PAUL BROCA (1824-1880), "Revue d'Anthropologie," 1878, and MORIZ BENEDIKT (1835-1920), "Anatomische Studien an Verbrechergehirnen," Wien, 1879, and again in his article on "Der Raubtier Typus in menschlichen Gehirn," Centralblatt für Medizinische Wissenschaften, 1876.

RUDOLF WAGNER (1805-1864) *Untersuchungen über dei Funktionen des Gehirns* (1858-60), gave the following figures to show that the uneducated labourer is broad across the temporal bones. Taking the entire cortex as 100, he showed:

	Frontal.	Parietal.	Temporal.	Occipital.
Gauss	39·4	16·7	26·6	17·5
Fuchs	39·7	14·6	24·3	21·4
Labourer	35·9	16·5	29·6	18·0

Not only are the temporal lobes in the uneducated labourer larger absolutely, but still more so relatively, considering the small size of the frontal lobes.

REINHOLD HENSEL ("Kraniologische Studien," Halle, 1881) observed the wide arching of the brains in ferocious animals, as compared with the frugivorous, and the greater width of diameter in males.

Gall's localisation of the "sexual instinct" in the cerebellum, which is the only localisation of his that has ever been tested, and in consequence of the failure of which his whole system was discarded, will be stated, with all the evidence he submitted, in a future chapter (Chapter XXXII.).

The "domestic propensities" are placed by Gall at the back of the head above the occipital protuberance. This region, especially the area for maternal affection, is larger in female than in male animals. Gall gave several sections of male and female skulls and brains, human and animal, which showed this quite clearly. He also stated that the posterior lobes were feebly developed in twenty-five out of twenty-nine women who committed infanticide, and that this region was well marked in negresses, among whom infanticide very rarely occurs.

Many naturalists to this day assume, with **SIR RICHARD OWEN** (1804-1892), comparative anatomist, a pupil of Abernethy, that the occipital lobes are peculiar to man. Gall denied this. He said:

"It is not true that the posterior lobes are wanting in animals. Many animals, as the elephant, the dolphin, and apes, have the cerebellum as much covered by the posterior lobes as man. The error has arisen because of the difference in position of the head, being more or less horizontal or vertical; the covering of the cerebellum being connected with the upright position of man and monkeys."

We cannot be surprised that Gall's organology was not accepted, but that it should not have occurred to one scientist, whether physiologist, neurologist, or psychiater, to test the principle laid down by Gall and underlying his observations, however imperfect and faulty they may be, that **the fundamental qualities of the mind, whether intellectual capacities, emotional dispositions, or propensities, are located in more or less circumscribed parts of the cortex of the brain,** is an omission that cannot easily be pardoned. The neglect of Gall's main principle of localisation has been, in my opinion, disastrous to science, for, as a consequence of this neglect, our knowledge in this respect is to-day not much further advanced than it was a hundred years ago.

We see, then, that according to Gall, the brain is composed of various parts, to each of which a special function belongs, and his system embraces the topographical determination of each of these parts, organs, of centres. It has been objected that Gall thus destroyed the unity of mind; but he replied:

1. That philosophers have always admitted mental activities of a sort.
2. That it is no more unreasonable that the brain, though a unity, should have different subsidiary parts, than that the body, which in one sense is also a unity, should have very distinct and independent organs, which yet fit into the whole.
3. Unity of mind is already destroyed by the existence of the five senses—one for seeing, one for hearing, etc.

"The same soul which sees through the medium of the organ of sight, and smells by means of the organ of smell, learns by heart through the organ of Verbal Memory, and is stimulated to kindness through the organ of Sympathy. It is always one and the same spring; only with you it moves a few wheels, and according to my view, a greater number."

Gall wrote to Baron Retzer:

"Allow me to touch upon two important defects in my work. First, I should

have conformed more to the spirit of the age, and ought to have maintained that we could absolutely ascertain by the shape of the skull and the head *all* the dispositions without exception, and instead of investigating I ought to have made the whole a speculative study. People are not charmed by, or interested in, a science which is hard to acquire. The premature judgments which have been pronounced, the jokes and squibs which have been let off at my expense, even before my intention or my object became known, go to prove that men do not wait for research in order to draw their conclusions." Other or more centres may be discovered, but " if we reflect on the number of possible combinations which may result from the twenty-seven or thirty faculties or qualities, from the reciprocal action of as many organs, we shall not be surprised at the infinite number of shades of character among mankind. How many different combinations result from the ten cyphers, from the twenty-four letters ? How many different countenances result from the different combination of the small number of parts which compose the human face ? How many shades of colours and tones result from the small number of primitive colours and fundamental tones ? "

It has been objected that Gall's appropriation of particular functions to certain parts of the brain cannot be correct, because *insects* and *reptiles* exist which possess similar instincts, *without the corresponding cerebral organs ;* but insects and reptiles have the power of motion, though they lack that area of the brain which is called the motor area ; and they breathe and have their blood oxygenated, though they do not possess any lungs. As Gall said : " We might as well argue that the stomach cannot be intended for digestion because there are creatures, very low in the animal kingdom, which digest without stomachs."

Gall made it clear that **the various mental activities do not arise through the senses** ; and that the sense-organs in the brain (the visual, auditory, and other areas) are distinct from the location of the various capacities and talents. This harmonises with WUNDT'S view, some eighty years later, that the brain areas of " perception " are not the same as those of " apperception."

Gall said :

" We no longer regard the external senses as the origin of our faculties. It is the brain which receives their impressions and operates upon them. The various senses merely modify the impressions created by external bodies, in such a manner as to render them perceptible by the brain, but it is the latter organ alone which perceives. This is proved by the fact that when the brain is diseased, perception ceases, although the organs of sense remain perfectly sound.

" **The perceptive centres are perfectly distinct from the regions in which the perceptions themselves are placed** ; for the various talents for painting (colour centre), music (tone centre), etc., belong to regions of the brain which are quite distinct from those masses at the origin of the nerves which preside over perception properly so called. This is proved by the fact that a man's perceptions may be exceedingly clear and distinct, without his possessing the talents mentioned.

"People err when they believe that the eye sees, and the ear hears, and so forth. Every external organ of the senses is, by means of its nerves, in connection with the brain.

" The perception of bodies acting through the nerves is not the office of the brain taken in mass, but belongs to certain portions of the cortex destined for that purpose. This might be proved by showing that certain partial affections of the brain prevent the production of perceptions which should arrive from certain senses, while the perceptions excited by the other senses are uninterrupted."

Gall pointed to the fact that **the intellectual faculties are to a certain degree independent of some of the special senses,** inasmuch as persons born blind, deaf and dumb may be very intelligent. Have we not had examples of this since Gall, in Laura Bridgman and Helen Keller ?

Gall also held that **where the special brain capacity exists, opportunity alone is necessary to develop it.**

Whatever Gall's errors may be, it must be admitted that he proceeded scientifically. It is impossible to do him justice in all his reasoning within the compass of a work like this. All I want to do is to initiate an inquiry into his doctrines and discoveries. His works have never been read. If my effort to give the stimulus to the perusal of his writings should succeed, it will be a great accomplishment; for he has remained for a century not only a neglected but a despised philosopher.

Let me give only one example in detail to show that he did not select his fundamental powers, for which he sought localisation, rashly; and that introspection, while seated comfortably in an armchair, or the vivisection of animals in a laboratory, are by themselves methods insufficient to disclose what are the fundamental attributes of mind and what are the centres for their localisation in the brain. Both psychologists and physiologists have dealt unfairly with Gall. He knew a great deal more than most of his critics.

The subject I will choose for quotation is that of "Parental Love."

"Most insects, fishes, and amphibious animals, seeking to preserve their eggs from accidents, lay them in a place which facilitates the egress of the young, and where they are enabled to find food. Their solicitude for their young extends no further.

"In some of the species of these animals, the care that they take of their offspring even goes beyond this. Certain species of spiders carry their eggs in a little sack on their back, which they never part with except in the most pressing emergency, and which they immediately resume when the danger is passed. All those who have once in their lives destroyed an ant hillock must have seen with what earnestness the ants collect their eggs and larvæ, to replace them in safety. Wasps and bees, that at all other times permit us to observe them without manifesting anger, become dangerous to those who approach them in the season of their young. Who does not know with what indefatigable activity they nourish them, and with what courage they defend their young bees, with what anxiety they lick and caress them from the moment when they come out of the cells? We find also in birds this tender affection for their young. The more they are taught, by sad experience, the dangers that threaten their young, the greater pains do they take in building secure nests and in concealing and protecting them. After having with perseverance covered the eggs and hatched out the progeny, the parents nourish them with extreme tenderness; their watchful love foresees all the accidents which may happen to them, instantaneously gives them notice, and induces them to remain still and conceal themselves, or conducts them to a safe place. When the parents perceive that their brood is threatened, what anxiety, what alarms do they manifest! what stratagems do they put in operation to deceive the bird of prey, the serpent, the weasel, or man! and when we succeed in robbing them of their offspring, what painful cries, what stubborn resistance! Sometimes uttering plaintive accents, they follow the robber for considerable distances, to the very place where he deposits them, which they do not quit until they have lost all hope of recovering them; even hunger cannot make them quit in the moment of peril; often, even after long continued cold and humid seasons, we find the males and females dead, covering their young, victims also of the cold.

In the mammalia, also, the love of offspring is the most active and imperious of all the instincts. The mother observes with solicitude and anxiety everything which may become dangerous to her offspring. When the fox, the cat, the squirrel have the least indication that their habitation is discovered, they instantly abandon it, and conceal their young in another retreat. Animals of prey, however wild they previously had been, and with whatever caution they had concealed themselves in the vicinity, become rash when they have young to provide for; no danger stops them; they enter the gardens without caution, the poultry yard, the dove-cot, etc. When all the outlets of a burrow are furnished with snares, the foxes, when they have no young, keep shut up for fifteen days, until there only remains the alternative of dying of hunger or falling into the trap. But when they have offspring, the cruel hunter knows too well that the mother will not long resist their groans, and the

father also, after having exhausted all the means of safety, will soon become the victim of his tender love for his progeny. Cats nurse the young of which the mother is sick or dead. With what earnestness does the bitch implore the pity of her master who takes from her one of her young ? The hind and the female roebuck forget that they are unarmed, and rashly precipitate themselves on the enemy when they are compelled to save or defend their fawns. With what fury does the wild sow defend her young ! How formidable do animals of prey become when they seek food to appease the hunger of their offspring !

" Finally, who is there that forgets this admirable propensity in the human species ? From the most tender age, nature begins to teach the woman the part of the mother, and makes her pass through the different degrees of instruction to prepare her for her future destiny. Observe this little girl, so seriously occupied in playing with her doll. She dresses it, undresses it, decks it in fine clothes, feeds it, gives it drink, prepares its night linen, puts it to bed, takes it up often, caresses it, gives it its lessons, scolds it, threatens it, and tells it stories. In this way she spends the whole day, weeks, and even months, with her dear doll. It is with hearty goodwill also that she assumes the care of her younger brothers and sisters. She feels, more acutely than they, their pleasures and their sorrows. Hardly does a new desire arise in her heart ; nothing in the world has greater value or more charms in her eyes than babies. Where is the father, or the mother, who does not call to mind with rapture the time, when, being single, they hoped soon to be married ? And when the early indications attest that the union has not been sterile, what joy ! what mutual felicitations ! what plans for the future ! Some young women experience especially an inexpressible delight when they first perceive the movements of the living infant within them. The young wife becomes the object of the busy cares of the whole family ; all await the decisive moment with impatience, mingled with anxiety ! Is there any happiness purer than that which is depicted in the looks of a mother, watching with tenderness the wants of the infant that she presses to her bosom ? What duty is there more to be revered and more sacred than the cares which parents take of the precious pledge of their love ? If I had a city, there should arise in its centre an emblem of domestic happiness : a mother nursing her infant. Every time that a grandmother sees her grandchildren, or her great-grandchildren, the sentiment of maternity comes again to her heart, and this benevolent instinct acts still, when all the other propensities are almost entirely extinguished within her.

" Every sacrifice, the least action performed for the safety of a child, or to administer to its happiness, deeply affects us ; all which discloses the heart of a barbarous mother fills us with indignation and horror ; every injury inflicted on feeble infancy, or on a pregnant woman, or a nursing mother, revolts us. The interest, which infancy commands, influences even the judges in favour of criminals. Reflecting on all the circumstances that characterise the love of offspring, it is impossible to deny that it is an innate instinct, and intimately inherent in the organisation.

" In order to be convinced by the surest evidence that the love of offspring is an innate and particular instinct, let us follow it in its different manifestations in the different species of animals, in the two sexes, and in different individuals.

" In many species, the male have little or no love for the young ; such as the bull, horse, stag, wild boar, dog, cock, etc. In these species the love of offspring appears to belong exclusively to the females. It is very rare to see a dog bring food for his female companion with young. In other species, on the contrary, the male and female equally love their young, and take care of them in common. This particularly takes place in those where nature has established union durable as life ; for example, in the fox, wolf, marten, pole-cat ; in almost all birds, such as the stork, swan, swallow, blackbird, nightingale, sparrow, pigeon, etc. In these species, when the female dies, the male continues to cover the eggs and nourish the young. When both are alive, they generally cover the eggs alternately, and take care of the young in common. Still, even in these species, it is observed that the female is more powerfully influenced by this instinct than the male. In cases of imminent danger the father escapes rather than the mother.

" In each of these two classes again there exist differences between one

individual and another. There are cows, mares, bitches, which submit with indifference to the loss of their young; some females even abandon them entirely as soon as they are born. Generally, pigeons, the male as well as the female, cover their eggs carelessly. They often let them get cold; frequently they crush them; sometimes they abandon their nest for the slightest cause; and when their young are taken from them they do not manifest much sorrow. Le râle des genets, called the king of quails, acts with so much assiduity, that oftentimes the bird is beheaded by the sickle of the reaper. When the building in which there is a stork's nest takes fire, the parents precipitate themselves into the flames, rather than abandon their young. The females of the silver rabbit and hamster neglect their young, and sometimes devour them, even when they do not want food. Other females are inconsolable for the loss of their young, grow lean with sorrow, and utter lamentable cries. I have seen bitches seek their young for many months, with the most unwearied anxiety, attack with fury all those whom they suspect of having taken them away, and overwhelm with plaintive caresses those whom they believe are able to restore them; when they found all their hopes disappointed, they filled the air with their continued howls. Some mares have such a passion for colts, that they lead away those of other mares, and take care of them with jealous tenderness.

"In the different species, maternal love manifests itself still with different modifications. The female of the silver pheasant singularly loves her young; and on this account the nest and care of the young speckled hens are confided to her, in preference to the old hens. Some females have an affection only for their own young, and hate those of other females of the same species. The female partridge manifests the greatest tenderness for her own young, but destroys those of others. The common hen pheasant, on the contrary, shows much less affection for her own young, and abandons, with apparent indifference, those that have wandered away; but she receives with joy and takes under her protection young pheasants that are strangers to her.

"Some animals live a long time with their young, and constitute a family; others quit them as soon as they can do without assistance. There are numerous families of insects, of amphibious animals, and of fishes, the males and females of which do not trouble themselves about their young. Among birds, the cuckoo is entirely a stranger to the love of offspring. All her care for her posterity is confined to the preservation of her eggs, which she deposits in the nests of other birds, whose eggs she either eats or carries away. The masters of these nests, always smaller than the usurper, not only hatch out the eggs of the cuckoo, but still nourish, with indefatigable complacency, the voracious young cuckoo. When anyone takes him from the nest and places him in an aviary with other birds, or exposes him in a garden, all the birds around seem anxious to adopt him. I have frequently caused them to be raised by a wren; it was a pretty sight to see the adopted father mounting on the shoulders of the young cuckoo to introduce food into his mouth.

"Man constitutes a part of that class in which the male and the female love their young, and take care of them with common accord. Notwithstanding this, the woman very much exceeds the man in this respect. This instinct is manifested in infancy; the little girl reaches out her hand for the doll, as the boy for a drum or sword. When we wish a child taken care of, we call a servant girl and not a valet. Females who do not wish to marry, or those whose marriage is sterile, often adopt the children of others, in order to bestow upon them those cares which nature imposes upon the mother. The whole physical constitution of woman combines with her moral and intellectual character to prove to us that she is destined, more particularly than man, to take care of children.

"These striking differences in the manifestation of the love of offspring strongly prove that it is not a voluntary or factitious propensity, but an instinct resulting from organisation, varying like it, but always natural and innate.

"The manifestation of the love of offspring is a phenomenon of such daily observation that, on this very account, no one takes notice of it. Whenever, in my youth, I inquired the causes of similar manifestations, I was taken for a very singular man. It is *natural*, they replied to me, and my inquiry was terminated. But why is it natural? How has nature implanted this instinct in animals? Has she not been obliged to appropriate a part in the organisation, by means of which

this instinct not only becomes natural in man and animals, but becomes also in them a want and a passion, which, at the same time that it procures for them great pleasures, provides for the preservation and the education of their feeble offspring ?

" Others would endeavour to satisfy me by speaking of *instinct*. In general, it is by instinct, as we have so often seen, that everything in animals is pretended to be explained, as, in man, everything has been accounted for by will and intellect. But again, instincts also ought to derive their source from the organisation. They are very different among themselves, sometimes even opposed to each other ; they are developed at very different periods of life ; one instinct may exist, and not another, etc. All the instincts cannot, then, be collectively considered under the same denomination nor be derived from the same source. Naturalists only follow natural deduction when they endeavour to seek a particular cause for a particular effect.

" ' A mother,' they say, ' does not love her infant because she has a special brain development ; she loves her child because it makes, or has made, her happiness ; she loves it because it is a part of herself, because it is a part of the man who is or has been dear to her ; she loves it because it resembles her, or at least she thinks so ; she loves it because it is her work ; she loves it from the pride she has in being a mother ; she loves it from the dangers she has been exposed to on its account, from the pains it has caused her ; she loves it because it is feeble and requires her aid ; she loves it because she has felt it within her, and because she has heard proceed from its lips the sweet sound of mother ; she loves it, finally, from duty, from virtue, from habit if you will, when there have not been other reasons sufficiently powerful.' (" Dictionnaire des Sciences Médicales," vol. xxi., p. 210.)

" It certainly is not to such causes as these that the Creator has confided the life and the well-being of children and the young of animals. He has provided better for their safety. Let any one examine the hearts of tender parents, and let him read there whether their love for their children is determined by such artificial motives ; if they can possibly do otherwise than love them ? Do we not find examples of this tender love in the most degraded individuals, in the most savage nations—in a word, under circumstances where most of the motives above mentioned do not exist ? Finally, in all these assertions, we entirely forget the animal creation, which affords thousands of examples of this strong love of offspring. It is true that we may be sometimes tempted to doubt whether, in the human race, the love of children is an inherent propensity. With what repugnance do not certain women observe the first development of the fruit of their womb ! With what indifference do they not place in mercenary hands their new-born infant ! There are instances where, from the want of development of this particular brain organ, this propensity is hardly manifested, and where this kind of insensibility is a natural condition.

" The love of offspring, say some, neither merits recompense nor admiration. Immediately after confinement, the breasts and nipple are distended with milk, so much so as to give the mother pain ; nursing becomes a matter of necessity ; the child or the young animals, by sucking, give ease to the mother ; this is sufficient to cause the mother to love them. It is proved by constant observations that this immediate affection belongs essentially to the dispositions of the womb, or the interior of the organ secreting the nourishing fluid ; hence arises the necessity for nursing and the pleasure that attends it. How can we transport to a cerebral division the seat of such an affection ? " (Delpit, " Dictionnaire des Sciences Médicales," vol. xxxviii., p. 267.)

" How can any one be so ignorant of natural history, and especially of comparative physiology, so fruitful a means of enlightening the philosophical physician on the functions of our race ? Where are those constant observations which prove that the love of offspring belongs essentially to a disposition of the womb, or the interior of the secreting organ of the nourishing fluid, etc. ? As soon as the infant or the young animals have quitted their parent's womb, and a long while before the breasts are distended with milk, the mother warms, dries, and licks them with tenderness. If among them she finds one dead, she turns it every way with the expression of the most melancholy feeling, and often preserves it many days.

What need of nursing have birds, and the males of those mammalia where the two sexes divide the care of the young, as man, the fox, the marten ?

" ' Maternal love,' says Richerand (" New Elements of Physiology "), ' surely is not the result of any intellectual combination of cerebral action ; it is in the *bowels* that it derives its source ; it comes from them, and the greatest efforts of the imagination cannot produce it in those who have not enjoyed the happiness of being mothers.' No ! It certainly is not the result of any intellectual combination. But Richerand also would deny that the *sentiments* are an operation of the brain. The whole natural history of woman, from infancy to old age, refutes his gratuitous assertion. How often, I repeat it, do we see women who have never desired or never been able to become mothers adopt the children of others, and bestow upon them the most tender cares ? Animals prepare nests or breeding-places before they have brought forth young.

" If the love of offspring, say my adversaries, were the effect of a brain organ, it ought to be evident at all times, but we observe nothing of this in animals when they have no young. But I have shown, when speaking of other instincts and propensities, that the reason why they do not always manifest themselves, proves absolutely nothing against their innateness. The various instincts can be individually active or at rest ; that proves that they are independent powers and have separate organs. How happens it, notwithstanding this, that some women do not have equal love for all their children, that sometimes they hate some of them ? This is of little importance. Dogs and cats frequently love one of their breed in preference to the rest, and in human beings additional influences, such as the character of the child, its beauty, etc., are at work. All music does not please equally well every musical ear, and every woman does not inspire every man with desire and love."

CHAPTER XV

GALL ON INSANITY, IMBECILITY, AND CRIME, AND THEIR TREATMENT

A PICTURE OF THE PERIOD

GALL ON THE NATURE AND PATHOLOGY OF INSANITY

It is self-evident that the teachings of Gall were bound to have a revolutionary influence on the prevalent conception of insanity and the treatment of the insane.

Gall interpreted all *mental disturbance as a pathological manifestation*, and welded *psychiatry with general clinical medicine*. He held that in order that *psycho-pathology* may acquire real practical value, it is necessary for it *to go hand in hand with normal psychology*. But we must not look upon normal psychology as a purely introspective analysis, but must examine *normal psychical phenomena in relation to their anatomical and physiological conditions*, that is to say, study the organic brain processes which are their essential basis. Insanity is not primarily, nor always, a disorder of the intellect; that is to say, it does not always comprise delusion, or faulty observation or judgment; but the mind may be disordered in any of its departments, and frequently the feelings are deranged without disturbance of the intellect. There is also moral disorder, sometimes amounting to insanity, unaccompanied by any delusion. (See Chapter XI. on Prichard and Symonds.)

Insanity is not a mental *disease*, for the brain only—not the mind—can be diseased. Therefore insanity is only a *symptom* of a disease or of numerous diseases, and a symptom which can only be removed by taking away the pathological cause inducing it; or, in other words, by changing the state of the brain on which it depends. It is the prolonged departure, without an adequate external cause, from the state of feeling and modes of thinking usual to the individual when in health that is the true factor of a disordered mind. Disturbance of mental function is not a specific disease, but an effect of various and often opposite affections of the organ which performs that function. With these views of insanity, it follows that **Gall advocated an enlightened treatment of insanity** at a time when the insane were chained in dungeons and kept in order by the lash.

Let us see what Gall has to say on the subject. He wrote:

"The most important of my results is the entirely new doctrine of the different kinds of insanity and their means of cure, all supported by facts.

"Many physicians speak of diseases of the mind. Certainly the manifestations of the mind may be deranged; but I have no idea of any disease or of any derangement of an immaterial being itself, such as the mind or soul is. The soul cannot fall sick, any more than it can die.

"It is but a few years since the directors of insane asylums and all those who wrote on insanity considered mental alienations either as diseases of the mind, with which the body had no part; or they placed their immediate seat in the chest or viscera of the abdomen. This general belief not only diverted the attention from

the true seat of these diseases, but it deprived the physicians of madhouses of one of the most precious and most fruitful means of discovering the true fundamental qualities and faculties, the relation of their alterations with the changes of the brain, etc., and of exposing the erroneous doctrines of philosophy which are still professed in the universities.

"As in the prevailing philosophical opinions of the schools, the activity of the mind was looked for in the intellectual powers; as, according to an axiom, its whole activity began with sensation, so that there was nothing in the mind which did not come into it by the senses; it was very natural to think always of the intellectual powers, when derangements of the mind were spoken of.

"For a long time deranged judgment was considered the basis of insanity. It is true, so long as judgment exists and corrects erroneous perceptions, the morbid affections of the five senses are not considered as insanity. So long as we know the incorrectness of our perceptions, we are not insane; but a patient is styled insane if he believes in such perceptions from external impressions which have no existence. But the power of judging is not always deranged. *Many insane persons, if we grant their premises, reason with perfect consistency.*

"I soon perceived that my researches would throw great light on more than one point connected with mental disorders. . . . All the mental alienations, with their influences on so many other parts of the body, have their principal and immediate causes in derangement of the brain. What an indication consequently this is to the treatment of these sad maladies. . . . How great must be also the utility of the pathological study of the brain in other affections, besides insanity, such as cerebral fevers, apoplexy, inflammation of the brain, etc., which are frequently so deceptive and which by the tremor, spontaneous vomiting and depression of strength, simulate diseases of a totally opposite nature. . . . How could physicians, who had not the least idea of the functions of the brain in health, have just ideas of mental troubles? **I employed myself, therefore, with opening as many crania of insane persons as I could procure.**

"I know that anatomists and surgeons of celebrity relate that they could not find any morbid appearance in the brains of insane persons after death. . . . I was able to detect morbid appearances or organic alterations, either in the substance of the brain, or in the blood-vessels, or membranes, or even in the skull. . . . It is impossible to make accurate pathological observations upon an organ while we are ignorant of its structure and do not know its functions. The injury, new growth, etc., may not be in the cortex but in the fibrous part of the brain, or between the two hemispheres of the brain, or one hemisphere may have remained sound and assumed the function of the other;—in all these cases the mental functions might appear normal. The change in the brain is not always perceptible, the brain is not a lifeless machine, **the derangement may be purely functional.** This explains why, when a mental disorder has been of short duration, it frequently occurs that not the least trace of it can be found by a post-mortem examination; whilst, on the contrary, when the same kind of alienation has been of long continuance, the most marked changes are perceptible in the brain, the meninges, and the cranium. . . . Sometimes, indeed, considerable injuries of the brain do not disturb its functions so much as might have been expected, and at others the slightest injuries are followed by the severest effects. But the same thing occurs in other parts of the body. Moreover, very few philosophers have any correct ideas of the primitive faculties of the mind, and do not know what to inquire for. All the accounts of diseases or injuries of the brain, which do not, as is said, occasion derangement of the mental faculties, may be referred to this: the patient walked, ate, and talked; he did not lose his reason, that is he was not delirious, but retained his memory and judgment, and consequently had lost none of his mental faculties. A man had the anterior part of the os frontis fractured by the kick of a horse; although stunned, he answered slowly, and in an interrupted manner, the inquiries of the surgeons. Several hydatids were found in the brain of a camel, which had never ceased to eat or recognise its conductor. Therefore, in these cases, it is presumed that neither consciousness nor any of the intellectual faculties were affected. . . . The conclusion intended to be deduced from such facts would be true if consciousness, memory, recollection, and judgment constituted the whole of the intellectual and

moral powers of man and animals. Many of the lower animals evidently possess consciousness, memory, and recollection ; they often judge very correctly of what is passing around them ; but do they therefore enjoy all the moral and intellectual faculties of man ? If a man, by a defect or disease of the brain, were degraded to the state of a dog, or an ape, could it be said that he had lost none of his faculties ? . . . When a man whose character had been pacific became quarrelsome, after having received a blow on the head from a stone which laid open his skull, and another, whose previous inclinations had been honest, after having been wounded on the head, experienced an irresistible propensity to steal : can we say of these individuals, who certainly retained their consciousness, memory, judgment, etc., that their wounds had exerted no influence upon the manifestation of their moral and intellectual faculties ?

" I rejoice in having been the first who attacked these errors of our most respected authorities, and of having effected the most happy revolutions, not only for the study of the nature of mental disorders, but also for their treatment. If all my researches had only this one result, I should deem myself sufficiently rewarded for my labours. *If men of sense will not thank me, I ought, at least, to be sure of the thanks of fools.*"

In Gall's time, accidental symptoms of mental disease were taken for clinical entities, hence the frequency of " monomania " at that time. It was assumed that according to his doctrine all these monomanias and systematised delusions can each be localised in the brain. *He protested against this*, and explained that only the primitive power from which originated the special delusion has its seat in a particular area of the cortex. For example, there are endless delusions based on over-active suspicion. Suspicion is a primitive faculty and originates in some definite part of the brain, but not so the delusion or delusions based upon it.

Gall believed that the brain centre which is the most active in health is likely to influence the particular symptom of insanity ; thus over-conscientious and anxious persons are more liable to be melancholic when, from some cause, they become insane.

The importance of Gall's teaching becomes more apparent when we compare it with that of some of his contemporaries. Here is the most striking example.

J. C. A. HEINROTH (1773-1843)—whose text-book, " Lehrbuch der Störungen des Seelenlebens," Leipsic, 1818, is based on religion and metaphysics, and reads more like a mediæval treatise on theology—drew his psychology from the gospels and considered mental hygiene to consist in piety, the etiology of madness in sin, and repentance and a return to faith to be the means of cure.

" Whatever one may say," explained Heinroth, " there is no mental disease, except where there is complete defection from God. Where God is, there is strength, light, love and life ; where Satan is, weakness, darkness, hatred and destruction everywhere. An evil spirit abides, therefore, in the mentally deranged ; *they are the truly possessed.* It is no more absurd to hold that the insane are children of the devil than that the righteous are the children of God. In short, we find the essence of mental disease in the partnership of the human soul with the evil principle—and not merely in partnership, but rather in its entire subjection to the latter. This is the complete explanation of the lack of freedom or unreason in which all the mentally disturbed are involved."

The greatest change in the general views of insanity was brought about by Gall in Paris. As he himself says : " Let any one compare the articles on Insanity in the *Dictionnaire des Sciences Médicales* by M. PINEL with the new opinions of M. ESQUIROL and the excellent works of MM. GEORGET and FALRET." The two latter were disciples of Gall.

From the time of Gall's arrival in Paris, the brain became an object of particular attention. Post-mortem examinations increased in number and confirmed Gall's

observations. The reason why they did not always produce tangible results is pointed out by **J. E. GEORGET** (1795-1828), in his work on *Physiologie du Systeme Nerveux* vol. ii., p. 205 :

" On the one side," he said, " the delicate and imperfectly known organisation of the brain hardly allows us to appreciate all the changes that can occur ; on the other, in diseases of this organ, which, without being of themselves fatal, may endure for a great number of years, it is impossible, judging merely by an examination after death, to avoid confounding the cause of these diseases with the cause of death, and to avoid taking the latter for the former, the cause of death being generally much more evident than that of the cerebral affection. There is another consideration, which has always struck me, because it appeared to me highly important : it is, that we are seldom enabled to see a brain perfectly sound, since few patients die without being affected by fever and delirium, phenomena which depend upon irritation of this organ."

Gall was not the first to teach that insanity is due to disorder or disease of the brain ; but he certainly insisted more on the fact than any physiologist had ever done. His contemporary, the great French physician and reformer, **PHILIPPE PINEL** (1745-1826), held the same view, and even went so far as to measure the size of heads to determine whether or not a form of head existed from which a disposition to insanity can be adduced. Gall did not entertain the idea, for, he said :

" Mental disorders are simply a derangement of the functions of the brain, in the same manner as other diseases are merely a derangement of the functions of other parts of the body. An individual may be affected with alienation, whatever be the form of the brain, just as any one, with the best constitution, may become sick. However, **in such persons in whom a certain configuration indicates certain very active faculties,** it is possible that these form the subject of delusions, should the person have become insane ; and that is as far as we can go."

Gall had also much more definite and modern notions of insanity than Pinel. Indeed, much of the glory bestowed by posterity on the latter ought really to be conferred on the former, for Pinel (" Traité médico-philosophique sur l'Aliénation Mentale," Paris, 1801) seems really to have known little of insanity itself, making little distinction between mania, dementia, and imbecility. As Gall said :

" If anything vague is found in the opinions of Pinel, it arises principally from the fact that, in speaking of mental disorders, he does not sufficiently attend to the distinction between mania, dementia, and imbecility. Mania, dementia, and imbecility are mental diseases ; but neither dementia, nor imbecility, is mania ; nor is mania, dementia. . . . Dementia differs essentially from mania and melancholia. . . . Dementia must not be confounded with imbecility and idiocy. The imbecile has never had the faculties of the understanding sufficiently energetic, or sufficiently developed, to reason correctly. One who has fallen into dementia has lost a great part of those faculties.

" Mania and dementia, as I have already observed, have no connection with any particular conformation of the head, or with its volume. It is very different with congenital imbecility. . . . True, the extreme smallness of the cranium, and the manifest want of cerebral development, are *not the only reasons* why the intellectual faculties are so circumscribed ; for, we meet with those who are born imbecile, the exterior conformation of whose heads by no means indicates their mental condition ; yet where this want of development exists, there is always imbecility more or less complete. Pinel asserts, as we have seen above ' that there are certain malformations of the cranium, which are connected with a state of alienation, especially dementia, or congenital idiocy ' ; this is true of idiocy only."

Pinel (*ibidem*, p. 142) **located the seat of mania in the stomach,** not in the brain. He said :

" It appears generally, that the primitive seat of this alienation is in the region of the stomach, and that from this, as a centre, the disorder of the understanding propagates itself by a kind of radiation. . . . A prejudice most injurious to humanity, and which perhaps is the deplorable cause of the abandoned state in which the insane are almost everywhere left, is that of regarding their malady as incurable, and referring it to an organic injury of the brain. . . . I can affirm, that in the great number of cases which I have collected upon delirious mania, which became incurable, or terminated in some other fatal disorder, all the results of autopsy, compared with the previous symptoms, prove that this kind of alienation has generally a purely nervous character, and **is not the result of any organic unsoundness in the brain.**"

Gall criticised this passage as follows :

" Pinel lays it down as a principle that the character of mania is purely nervous, and therefore concludes that its seat cannot be in the brain ; but, when reasoning in this manner, he does not reflect that the brain itself is the most important part of the nervous system. . . . I cannot agree with Pinel when he affirms that in most cases he has been unable to find any visible trace of disease in the brain of those affected with incurable mania. . . . My own numerous researches contradict Pinel's assertions. If, in future, this learned man will bestow more attention upon the diminution of the cerebral mass, and the changes produced in the cranium, modifications which I shall point out when I treat of the influence of cerebral diseases upon the brain, he will find much more frequently than he has hitherto done in the encephalon, sensible traces of the effects of mania, at least as secondary consequences of the previous derangements, which the vital functions had experienced. I am persuaded, indeed, that **the cause of numerous mental diseases susceptible of cure is found in the abdomen,** but so far only as diseases of the abdominal viscera become remote causes of those maladies ; **the proximate cause of mania exists, and must exist, in the contents of the cranium.** . . . For this reason, physicians who undertake the treatment of mental disorders ought never to lose sight of the great influence which the brain exercises over the abdominal viscera. Every one knows how much the exertion of the mind too long continued enfeebles the digestive powers ; that grief often gives rise to disease of the liver, etc. In like manner, it is frequently very difficult to determine whether disorders existing in the abdomen have re-acted upon the brain and disturbed its functions, or whether the brain was the first cause of the disorder in the abdominal functions. It is certain that the observations of Pinel prove nothing against the doctrine that the brain is the seat of mania."

GEORGES CABANIS (1757-1808) held the same opinion as Pinel, and said with reference to changes in the brain after dementia :

" Pinel affirms that he has discovered nothing of the kind in the bodies that he has dissected ; and we may confidently rely upon the assertions of an observer so sagaciously and scrupulously accurate."

J. E. D. ESQUIROL (1772-1840), a pupil of Pinel, at first agreed with him, but on becoming acquainted with Gall's researches, he paid greater attention to the subject, and proved the existence of organic defects in the brains of deranged persons. (*Dictionnaire des Sciences Médicales*, vol. viii., p. 290.)

Still later, owing to the predominant influence of FLOURENS' investigations, which—as we shall see presently—seemed to prove that the brain was a single organ, Gall's doctrine was boycotted by all recognised scientific institutions ; and the effect of this boycott is obvious in a discussion which took place in 1845, when **M. BELHOMME** (1800-1880) stated before the Academy of Medicine in Paris that insanity is connected with disease of the brain, and **P. JOLLY** (1790-1879) replied that *we are not warranted in asserting that material lesions are necessary.*

" Children," he said, " are frequently attacked with inflammatory affections of the

brain, but are not insane. The lesions of the intellect do not require for their manifestation inflammation, softening, hardening, or any other *material* lesion. Hereditary predisposition, a bad education, moral commotions, alone suffice to give rise to them."

The reason for Jolly's view was that no changes were discovered in the brains of insane. Indeed, no changes were perceived until quite recent years. It was therefore supposed that the alteration in the ideas, emotions, and actions of the insane could not have a material basis. In this discussion, two physicians supported M. Belhomme, and three M. Jolly.

Those who belittle Gall ignore or know nothing of the history of insanity. Compare, for example, Gall's sound views of insanity as a disorder of the brain with the views held by the celebrated Dr. Prichard in England.

J. C. PRICHARD (1786-1848), as has been shown in Chapter XI., had said ("Treatise on Insanity," 1835, p. 30) that he is "acquainted with no fact, either in physiology or pathology, that these mental phenomena (the propensities and sentiments) take place through the instrumentality of any corporeal process whatever." The brain is for intellectual functions alone; the emotions of fear, anger, suspicion, etc., are not dependent on any bodily process. Now, since insanity generally starts with a derangement of the feelings, and the feelings, according to Prichard, are independent of a physical basis, insanity cannot be a bodily disease. Prichard went on to say:

"I believe most of the facts which appear to lead to this inference admit, when strictly examined, of a different explanation. Such apparent examples of disordered sentiments and affections are often, if not always, dependent on some hallucination. The insane mother, who neglects her offspring, only feels aversion for little imps or demons, which she imagines to have been substituted in the place of her own children, when they were cruelly torn from her."

Prichard did not realise what every modern physician experienced in the treatment of the insane knows, that many insane mothers hate their children, knowing them to be their own; and many irascible madmen furiously attack those who, they are at the time perfectly conscious, are full of kindness and sympathy towards them, and whom they esteem and admire.

Prichard continued: "The irascible madman is a victim of some vexatious disappointment or mortification, which is continually harassing him." Then, referring to Gall's account of a boy who displayed depraved impulses after an injury to the brain, an observation not at all uncommon at the present day, he remarked: "A relation of this kind proves nothing. That an individual at the age of this youth should begin to display the influence of powerful passions on his mind is nothing extraordinary. If stories of this kind gain credit, the College of Surgeons may expect one day to march in triumph and take possession of the vacant seats of the criminal judges, and we shall proceed forthwith to apply the trepan where now the halter and the gibbet are thought most applicable." We shall show in Chapters XXXI. and XXXII. that **many such operations have been successfully performed.** However, Prichard must have thought of that possibility, for at p. 41 he said: "I am sanguine enough to hope that the time will arrive when we may be enabled to ascertain the nature of the cerebral functions, and, perhaps, to understand thoroughly the whole of the process which is carried on in this part of our bodily fabric. At present, however, we must confess that we are not in possession of one fact that belongs to it."

We have seen that Prichard considered the primary emotions independent of the bodily organisation; but what is still more surprising is that he thought *the intellect*

had its seat in the cerebellum, not in the cerebrum. What was to be the use of the brain proper we are not informed by him. He explained this view, p. 474 :

" When we consider the great amplitude which the cerebellum attains in man in comparison with its size in the lower animals, we are obliged, if we really attach any importance to such a system of correspondence, to acknowledge some relation between this circumstance and the transcendent superiority of the human intellect, compared with the psychical power of brutes. Other paths of observation lead us to a similar conclusion. Cretins, in whom the cerebellum is very defective, display, in different degrees, idiotism or deficiency of intellect. Again, injuries of the posterior part of the head are observed to be followed by stupor and loss of memory, indicating the function of the cerebellum to be connected with the exercise of the mental faculties."

Injuries to the back of the head affecting the memory are explained now on the theory of contre-coup, the brain moving violently forward against the frontal bone ; and we know now that plenty of cretins have large cerebella and that their condition is due to insufficiency of thyroid secretion. Blows on the back of the head are more likely to affect the occipital lobes of the cerebrum than the cerebellum, which is situated below the level of the occipital protuberance.

With such views, progress in this department of research has necessarily been slow.

Prichard was a distinguished anthropologist. His works on the " Physical History of Man " (1813) and the " Natural History of Man " (1843) remained standard works for a long time.

When Dr. **JOHN EPPS** (1805-1869), one of the earliest advocates of Gall's doctrine in England, gave an address to the " Westminster Medical Society," April 5th, 1828, on " Insanity," Mr. **BENNETT**, the well-known surgeon, replied, " that he could not assent to the proposition of the author of the paper that mind comes from matter. He stated that there is no perceptible difference between the brain of man and of animals." (*Lancet*, April 19th, 1828.)

THE TREATMENT OF THE INSANE IN GALL'S TIME AND AFTER

In Gall's time, although the insane were no longer regarded as the peculiar property of the devil, it was thought that they had no claim upon the consideration of society. **So long as the madman was prevented from troubling his fellow-men the community felt that every duty had been discharged.** When all knowledge of mental action was gained by observation of self-consciousness, men naturally formed opinions from their own experience which they applied to the mental state of criminals and insane persons ; feeling that they themselves had a consciousness of right and wrong, and a power of will to do the right and forbear the wrong, they never doubted that madmen had a like clearness of consciousness and a like power of will ; that they could, if they would control their disorderly thoughts and acts. This was the epoch of dungeons and chains in the treatment of the insane, as we shall show presently.

Gall's doctrine supplied lunacy physicians with a practical doctrine of the mind in place of the visionary theories which had been hitherto maintained. Gall said :

" These metaphysical doctrines are fraught with the most dangerous consequences, as we see in the cruel neglect and imprisonment in infected cells of those unfortunate victims, who should merit our compassion, and often our esteem. We hardly dare to fix our attention on the establishments for the insane ; so defective are they in most countries, that they appear the shameful monuments of the most profound ignorance. . . . Villainous criminals who have disturbed the peace of society live in what might be described comparatively as palaces, well-aired, often with a play or exercise ground, and the whole building, even their place of worship,

warmed, hot and cold baths provided, and everything comfortable and clean ; while the poor insane, who want and deserve our pity, live on straw and dirt, exposed to all vicissitudes of season and weather, reduced to the mercy of the turnkey, and less attended to than a horse or wild beast."

DANIEL HACK TUKE (1827-1895), in his Prize Essay on the Management of the Insane, York Retreat, 1854, has described the condition of the insane in France, previous to the Revolution :

"Previous to the Revolution in France, the monk was the madman's physician, and the convent was his asylum. It is not to be doubted that, in some instances, he was humanely treated, but there is abundant evidence to show that the ordinary mode of treatment was to the last degree cruel and inhuman. Whether by these monks the insane were regarded as the subjects of demoniacal possession, and the idea was entertained of beating the evil spirit out of them, we will not determine ; but whatever was their theory as to the *modus operandi*, the fact is indubitable that in some establishments at least, the practice consisted in the daily administration of about a dozen lashes to each unfortunate patient ! . . . The practice of flogging has been mentioned ; the maniac was almost constantly chained, and frequently was in a state of entire nudity ; he was consequently filthy in the extreme. Often placed in a cage of iron, each revolving year still found him, crouching like a wild beast immured within his wire-bound cell, his limbs moulded to one position, and whatever of mind or feeling remained, crushed to its lowest pitch by changeless monotony, or maddened by intolerable despair. But whips and fetters were not deemed sufficiently ingenious. Chairs were employed, so constructed that all movement of the limbs was prevented, and others were devised to whirl round the patient at a furious speed in order to produce extreme vertigo and sickness ; 'muffling' was also a frequent practice, by which was meant covering the mouth and nose very closely with a cloth, in order to see if it would quiet them."

VINCENZO CHIARUGI (1759-1822) was the first medical man called upon to plan and construct an institution specially designed for the insane—St. Boniface in Florence. Here new methods were introduced, between the years 1774 and 1788, chains and fetters were abandoned, and patients were encouraged to work. But the chief impetus in the humanitarian movement is ascribed to his contemporary, Pinel, of whom we have already spoken.

In 1792 PINEL was appointed to the Bicêtre Hospital. The conditions which he had to face were graphically described by M. PARISET ETIÈNNE (1770-1847), Secretary of the Academy of Medicine and member of the Phrenological Society of Paris, in the eulogy pronounced in Pinel's honour before the Royal Academy in Paris, in 1828 :

"In spite of the reforms attempted under the most humane of all kings, the hospitals of the capital were still in a deplorable state of barbarity. The one which presented the most revolting aspect was the institution of Bicêtre. Vice, crime, misfortune, infirmity, diseases the most disgusting and the most unlike, were there confounded under one common service. The buildings were uninhabitable. Men covered with filth cowered in cells of stone, narrow, cold, damp, without air or light, and furnished solely with a straw-bed that was rarely renewed, and which soon became infectious ;—frightful dens where we should scruple to lodge the vilest animals. The insane thrown into these receptacles were at the mercy of their attendants, and these attendants were convicts from prison, and used the whip and other instruments of punishment to coerce the unhappy patients, who were loaded with chains and bound like galley-slaves. Thus delivered, defenceless, to the wickedness of their guardians, they served as the butts for insulting raillery, or as the subjects of a brutality so much the more blind as it was the more gratuitous. The injustice of such cruel treatment transported them with indignation ; whilst despair and rage, finishing the work with their troubled reason, tore from them by

day and night cries and howlings that rendered yet more frightful the clanking of their irons. Some among them, more patient or more crafty than the rest, showed themselves insensible to so many outrages ; but they concealed their resentment, only to gratify it the more fully. They watched narrowly the movements of their tormentors, and surprising them in an embarrassing attitude, they dealt them blows with their chains upon the head or their stomach and felled them dead at their feet. Thus was there ferocity on the one hand, murder on the other."

These were the conditions Pinel had to face. In 1793, he made his appeal for abolishing the chains—at a moment when France, crushed under the Reign of Terror, was left to the mercy of a few men who were more eager to destroy their own species than to aid the diseased, infirm, and insane. "Are you yourself become mad," asked George Couthon (1755-1794), "that you would unchain these animals ? " "I am convinced," replied Pinel, "that these patients would be less intractable, were they not deprived of air and liberty." He unchained about fifty of his patients, having prepared previously a strait-jacket, which could be tied behind the back if necessary. The first patient liberated was an English captain who had been in chains for forty years. He was very weak, but succeeded in time in approaching the door of his dark cell, when his first look was at the sky, and he exclaimed, "How beautiful ! " This patient remained two years longer at the Bicêtre, and during that time rendered himself useful by exercising supervision over other patients.

While thus liberating the lunatic from his iron fetters, it must not be supposed Pinel instantly realised to the full extent the degree to which the insane may be allowed liberty of action. Mechanical restraint he judged necessary in a considerable number of cases where it would now be considered reprehensible to employ it. Pinel still bound and confined them. Nor could he change the prison-like aspect of their abode.

In two years Bicêtre was transformed, and Pinel was sent to the Salpêtrière, where he found the same abuses and where he undertook the same reforms.

Seventeen years after Pinel had knocked the chains off the lunatics at Bicêtre, the progress of his ideas had not advanced one step. Then **J. E. D. ESQUIROL** (1772-1840), his pupil, intervened. Having been ordered to make an inquiry into the condition of the insane and their establishments, he wrote these grievous words :

"These unfortunate people are treated worse than criminals, and are reduced to a condition worse than that of animals. I have seen them naked, covered with rags, and having only straw to protect themselves against the cold moisture and the hard stones they lie upon ; deprived of air, of water to quench their thirst, and of all the necessaries of life ; given up to mere gaolers, and left to their brutal surveillance. I have seen them in their narrow and filthy cells, without light and air, fastened with chains in these dens, in which one could not keep wild beasts. . . . This I have seen in France, and the insane are everywhere in Europe treated the same way."

When Esquirol succeeded Pinel at the Salpêtrière (1810), he made great reforms in housing and regimen ; but he still used seclusion and the strait-jacket. He was the first to establish a clinic for mental diseases and to lecture on psychiatry, in 1817. He wrote "Des Maladies Mentales," Paris (1838). He professed to be an opponent of Gall, but he was not an active one, and certainly had imbibed his principles. **ANDREW COMBE** (1797-1847), who was one of his students, put it on record that he "talked Gall" in his lectures, so that many mistook him for a disciple of his. Most of his pupils were active followers of Gall, members of the Phrenological Society of Paris. There were VOISIN, FALRET, FOVILLE, DELAYE, ROSTAN,

the celebrated GEORGET, and many others, who were all placed at the head of asylums (see Chapter XVI.).

J. E. GEORGET (1795-1828), who lived for years in the midst of lunacy at the Salpêtrière, became like others **an avowed advocate of Gall's doctrines,** and by his writings on insanity did much to diffuse sounder views of its nature and treatment, which effected much good in later years. In his work "De la Folie," published in 1820, he lay down the following principles of treatment:

"1. Never to exercise the mind of the insane on their delusions.

"2. Never to attack openly or roughly the affections and the exalted ideas of the deranged.

"3. To create by diverse impressions new ideas, affections, moral emotions, and thus to restore the inactive faculties.

"Thus we achieve the object:

"1. To occupy the mind of the patient in another direction, and to make him forget his insane notions. We shall produce these effects by working upon the intellectual faculties, by manual employment, recreation, etc.

"2. To counterbalance and finally to destroy by opposition their dominant ideas.

"3. To give some motives in order to combat vicious ideas.

"4. To excite the cerebral action of those who are stupid, etc., in order to break the chain of thought.

"These are the means, then, which we propose to employ in the treatment of the insane. They consist briefly in conversations, the advice and counsel of the physician, the society of the convalescent, manual employment, agriculture, objects of recreation, etc."

It was **G. M. A. FERRUS** (1784-1861), another **adherent of Gall** and member of the Phrenological Society of Paris, who first gave employment to the insane at the Bicêtre asylum and open-air work at St. Anne's Farm.

Several works on Gall's lines were now published by members of the Phrenological Society. Among them was "Physiologie de l'Homme," by N. P. ADELON (1782-1862), who also wrote "Analyse d'un Cours du Dr. Gall"; "Sur la Folie," by F. J.V. BROUSSAIS (1772-1838): "De l'Hypochondrie et du Suicide" and "Folie Circulaire," by J. P. FALRET (1794-1870); "Nouveaux Elements d'Hygiène" and "Gymnastique Médicale," by CHARLES LONDE (1795-1862); and "Des Causes des Maladies Mentales," by the celebrated FÉLIX VOISIN (1794-1872), the favourite pupil of Esquirol and successor of Georget.

TREATMENT OF INSANE IN ENGLAND

Pinel's remarkable experiment was unknown in England for many years. The state of affairs in England at this period was no better than Pinel had found it in France. The asylum at York and Bethlem Hospital in London, unenviably immortalised by the great pictorial satirist Hogarth, and the records of Evelyn, were the homes of injustice, cruelty, and flagrant abuses, no less revolting than those described at Bicêtre.

The unsuccessful treatment of George III., first by WILLIS, the ecclesiastic, who founded a private asylum at a small village called Greatford, and later by SIR EVERARD HOME, physician, aroused in England an interest in insanity and a general feeling in regard to the miserable management of the housing of the insane. Burke described the "dreadful mansions where those unfortunate beings were confined"; and Pitt, Fox, and other statesmen sat upon a Committee of the House of Commons, in 1763, to inquire into the state of private madhouses, but no action was taken.

In 1751, St. Luke's Hospital was founded in London, and several similar institutions in other parts of the kingdom. There seems also to have sprung up about this time a very considerable number of private establishments for the safe custody of lunatics. But these, as well as the public institutions, seem to have been dens of misery and cruelty, where " chains, whips, darkness, and solitude " characterised the treatment. Up to the year 1770 the patients were exhibited to the public like wild beasts in cages, on payment of a penny ; and they are said to have afforded much sport to the visitors, who flocked to see them, in numbers estimated at no less than 48,000 annually. Dr. Wm. PARGETER, in his " Observations on Maniacal Disorders," published in 1792, records that beating was a common practice, and that chains and cords were employed, such cords he witnessed to be tied so tightly that they lacerated the tendons and caused gangrene.

The abuses existing in the miserably conducted old York Asylum led to the projection by **WILLIAM TUKE** (1732-1822), a Quaker, in 1792 of the York Retreat, which was opened in 1796, where neither chains nor any instrument of punishment were allowed. This reform was initiated therefore about the same time in which Pinel's appointment at Bicêtre took effect.

Elsewhere the treatment of the insane was still by flagellation, torture, confinement in dark rooms, and acute suffering, often until death released them. It was a treatment of the greatest cruelty, inhumanity, and barbarity. The insane were no longer tied to crosses, to pillars in churches, flogged at " trees of truth," or burnt as sorcerers at the stake, but they were still chained in dungeons, and the milder cases sent to common prisons.

The scandal was such that a Committee on Madhouses was appointed in 1815. The York Asylum, which was the worst, was burned down a few days later, and with reference to Bethlem the Report says :

" In the men's wing six patients in the side-room were chained close to the wall, five were handcuffed, and one was locked to the wall by the right arm as well as by the right leg. Except the blanket-gown these men had no clothing ; the room had the appearance of a dog-kennel. Chains were universally substituted for the strait-waistcoat. Those who were not cleanly, and all who were disinclined to get up, were allowed to lie in bed ; in what state may be imagined. One man had a stout iron ring riveted round his neck, from which a stout chain passed to a ring made to slide upwards or downwards on an upright massive bar, more than six feet high, inserted into the wall. Round his body a strong iron bar about two inches wide was riveted ; on each side of the bar was a circular projection which, being fastened to and enclosing each of his arms, pinioned them close to his sides. The effect of this apparatus was, that the patient could indeed raise himself up so as to stand against the wall, but could not stir one foot from it, could not walk one step, and could not even lie down except on his back ; and in this thraldom he had lived for twelve years. During much of that time he is reported to have been rational in his conversation. It is painful to have to add that this long-continued cruelty had the recorded approbation of the committee of management, the medical officers, and of all the authorities of the hospital."

The condition of the female patients is described as follows : " One of the side-rooms contained about ten patients, each chained by one arm or leg to the wall, the chain allowing them merely to stand up by the bench or form fixed to the wall or to sit down upon it. The nakedness of each patient was covered by a blanket-gown only, with nothing to fasten it in front ; this constituted the whole covering."

The Report goes on to say that the overcrowding was terrible ; the stench was intolerable ; the cold, too, in the winter months must have caused severe hardship ; there were no facilities for heating ; yet many of the poor creatures were more or less naked ; no glass in the small windows of the damp and dark cells, and the unglazed windows placed so high that no one could see out of them. Another of the horrors of those days brought out in this Report was the vice or immorality

which was rendered possible, and often actual, by the fact that the sexes were by no means rigidly separated, and specific instances are given of male keepers being in charge of female lunatics, and abusing that charge.

At this time, insanity, if no longer considered due to demoniacal possession, had chiefly a psychological interest, *sui generis*, and was certainly not considered to be a manifestation of a diseased nervous system. It is true that **SPURZHEIM** (see Chapter XVII.), the pupil of Gall, had published his "Observations on Insanity" in English, in 1816; and **ANDREW COMBE,** another able disciple of Gall, his "Observations on Mental Derangement" in 1831, when things were still not much better; but the official boycott of Gall's doctrine by the medical profession, of which the next chapter will give information, prevented progress from being made. Indeed, we shall see that even eminent men of that day denied any relation between mind and brain.

In 1839, the new resident physician of the Hanwell Asylum (opened in 1831), Dr. **JOHN CONOLLY** (1794-1866), a follower of Gall's doctrine (see Chapter XVII.), reported the entire abolition of mechanical restraint: "No form of strait-waistcoat, no hand-straps, no leg-locks, nor any contrivances confining the trunk or limbs or any of the muscles are now in use."

But previously, in the year 1836, the first experiment was made in not restraining the insane at the Lincoln Asylum by Dr. **GARDINER HILL** (1811-1878), and to the great surprise of the medical and general public he was able to say:

"Three successive months have now elapsed without the occurrence of a single instance of restraint in my establishment."

In 1838, the new treatment being still successful, he expressed the hope that his asylum might be an example to others, and that "undivided personal attention towards the patients shall be altogether substituted for the use of instruments of restraint." Dr. Hill further stated:

"Within the walls of the asylum I had the whole staff of attendants against me, for restraining a patient was a pretext for them to be idle and nothing more. . . . Outside the asylum I had the whole medical world against me. The superintendents of several of our largest asylums opened a regular battery against me. I was assailed right and left. The system was denounced as 'utopian,' 'a gross absurdity'; some fulminated against it as 'the wild scheme of a philanthropic visionary, unscientific and impossible,' it was 'an unnecessary exposure of the lives of the attendants—in fact, a practical breaking of the sixth commandment.' Dr. James Johnstone said, 'it indicated insanity on the part of its supporters, it was a mania which, like others, would have its day.'"

It was this experiment, described subsequently in 1838 by Dr. Hill at a lecture, that induced Conolly to embrace the new doctrine, and it was he who was successful in getting rid of all material impediments, hobbles and chains, handcuffs and muffs, when he became installed as superintendent of Hanwell Asylum. Both Pinel and Conolly possessed the rare gift of moral courage. They were reformers. But even after the system of non-restraint was proved to be successful, the superintendents of other asylums were still unbelievers. Thus Conolly, recording his success, said:

"Our asylum is now almost daily visited by the officers of other institutions, who are curious to know what method of restraint we *do resort to*, for they can scarcely believe that we rely wholly on constant superintendence, constant kindness, and firmness when required."

In 1844, he wrote: "After five years' experience I have no hesitation in recording my opinion that, with a well-constituted governing body, animated by philanthropy,

directed by intelligence, and acting by means of proper officers entrusted with a due degree of authority over attendants properly selected and capable of exercising an efficient superintendence over the patients, there is no asylum in the world in which mechanical restraint may not be abolished, not only with safety, but with incalculable advantages."

Thenceforward progress was made. In 1840 the British "Medico-Psychological Association" of Asylum Medical Officers was founded. After 1864 began in place of the old prison-like institutions the building of asylums which attained more and more perfection. Instead of the dark cells of half a century ago, asylums were then built in England of almost palatial luxury, at least in outward appearance, eclipsing other institutions, such as prisons, workhouses, hospitals, and even the great public schools.

Previously to 1870 no real progress was made in the study of psychiatry because of the common belief that no pathological changes could be discovered in the brains of men who had died insane. Since 1890, the asylum staff, both doctors and attendants, have had to be specially trained, pathological laboratories have been established, and, of late, even psychiatric clinics in the centre of great cities, which—it is hoped—will assist materially the prevention of insanity.

THE STATE OF THE INSANE IN OTHER COUNTRIES

In Germany the great cities at the end of the XVIIIth century had hospitals for the insane; but **JOHANN CHRISTIAN REIL** (1759-1813), a defender of "vital force" who applied psycho-therapeutics in the treatment of the insane (see Chapter XI.), wrote of them in his "Rhapsodich über die Anwendung der psychischen Kurmethode auf Geisteszerrüttung," Halle (1803).

"These unfortunate creatures, like State criminals, are thrown into low dens which the eye of humanity never pierces. We leave them there to waste away in their own excrements, under the weight of the chains which bruise their limbs. . . . They are exposed as a sight for public curiosity, and greedy keepers make a show of them like wild beasts. . . . Whips, chains, and dungeons are the only means of persuasion employed by their masters, who are as barbarous as they are ignorant. . . . The bellowing of the maniacs and the rattling of the chains resound day and night in the streets; cage strikes against cage in these dens, and deprives each newcomer speedily of what little reason may have been left him."

Reil proposed that all asylums should become public hospitals, with a psychologist as well as a physician at the head. He started a journal for psychotherapy, "Magazin für die psychische Heilkunde." German psychiatrical literature of that period was based largely on metaphysics and consequently laid stress on psychotherapy in its widest sense. When the influence of Gall began to be felt, the *somatic* school arose, which took the view of insanity being a purely bodily disorder. **C. F. NASSE** (1778-1851), **J. B. FRIEDREICH** (1796-1862), an avowed follower of Gall, and **MAXIMILIAN JACOBI** (1775-1858), were the chief representatives of that school.

JOHANN GOTTFRIED LANGERMANN (1768-1832), a reformer of psychiatry in Germany, was the first, in 1810, to place the curable and incurable in different institutions, and he divided disorders of the mind into idiopathic and symptomatic. His reform seems not to have had many followers, if any, for **J. J. S. SCHNEIDER** (1777-1855), in his book on the Treatment of Mental Disorders ("Heilmittellehre gegen psychische Krankheiten," Tübingen, 1824) contains still illustrations of instruments of torture being employed and such severe measures as "cold douches on a shaved head," "violent emetics and purgatives," etc.

It was a nephew and namesake of Spurzheim, the pupil of Gall, Dr. **KARL S.**

SPURZHEIM (1809-1872), who introduced the non-restraint system in the treatment of the insane in Vienna. Both in Germany and Austria the old accommodation for the insane was only gradually improved about the middle of the last century.

WILHELM GRIESINGER (1817-1868) was a **pioneer in the development of medical psychology.** The appearance of his work, "Die Pathologie und Therapie der Psychischen Krankheiten," 1845, made a startling contrast to the work of Heinroth. Griesinger, basing his science upon the psychology of Herbart, brought together, as had never been done before, careful clinical observation, psychological analysis, and the study of physiological and pathological changes. This was the first book on mental disorders on modern lines. Many writers on derangements of the mind, before him, insisted that insanity was not due to brain disease at all, since they could find in their post-mortem investigations of insane cases no brain lesions. Griesinger replied—almost in the words of Gall:

"Pathology proves as clearly as physiology that the brain alone can be the seat of normal and abnormal action; that the normal state of mental processes depends upon the integrity of this organ; and that both together are influenced by the state of the other organs in disease." The physiological and pathological facts of deranged mental functions prove unmistakably that the brain is the organ involved; "we, therefore, primarily and in every case of mental disease, recognise a morbid action of that organ. . . . Insanity being a disease, and that disease being an affection of the brain, it can therefore only be studied in a proper manner, from the medical point of view. The anatomy, physiology and pathology of the nervous system, and the whole range of special pathology and therapeutics, constitute preliminary knowledge most essential to the medical psychologist." And again he declared with italicised emphasis, "*that the most important and most constant changes in the brains of the insane consist in diffuse diseases of the external layers of the cortical substance—that is, of the surface of the brain—and of the membranes enclosing them.*"

During the last year of his life, Griesinger outlined the idea of **psychiatric clinics in connection with general hospitals,** and such were established at all the German and Austrian universities soon afterwards.

F. A. H. VOPPEL (1813-1885) founded, 1867, the first agricultural insane colony.

In Holland, **J. L. C. SCHRÖDER VAN DER KOLK** (1797-1862), who in his work, "The Pathology and Therapy of Mental Disorders" (1852), confirmed some of Gall's localisations, caused, in 1837, a model asylum to be built by the Dutch authorities, near Haarlem.

Miss **DOROTHEA DIX** (1802-1887) helped to ameliorate the condition of the insane in America about eighty years ago, and was instrumental in founding no less than thirty-two asylums; and since the sweeping attacks by DANIEL HACK TUKE (1885), and WEIR MITCHELL (1894), facilities for the scientific study of insanity have greatly increased.

No name in connection with reforms in the condition of the insane in the United States is worthy of more honour and veneration than that of Dorothea Dix. Early in the field, never disheartened by the difficulties which beset her path, this resolute woman succeeded not only in exposing the once revolting condition and shameful neglect of the insane, but in inducing the State Legislatures to erect suitable retreats for them. More than this, she encouraged efficient medical men to come forward to superintend these institutions, and exercised her influence in obtaining their appointment. Furthermore, she watched over the hospitals for the insane after their establishment, and promoted their successful working by all the means within her power.

PLINY EARLE (1809-1892), a celebrated American alienist, in 1867, emphasised the importance of **suitable employment of the insane,** of the inclusion of psychiatry in the medical curriculum, and the establishment of psychopathic "hospitals."

Reviewing the history we have given, and after reading the reference to insanity in Chapter XVII., who can deny that it was due to Gall and his medical followers that a broader conception of mental disorders arose ? Treatment was bound to improve with the recognition of insanity as a brain disease. In this respect Christian countries were behind the Mohammedan, for, as JOHN HOWARD (1726-1790) found in the XVIIIth century, the Arabs and Turks made a large and merciful provision for lunatics " as was not to be seen in Christian lands."

GALL ON IDIOCY

Gall made also some original observations on idiocy, more especially on microcephalic idiocy. He said :

" Their heads, measured immediately above the superior arch of the orbit and the most prominent part of the occiput, were from eleven to thirteen inches in circumference ; and from the origin of the nose to the posterior part of the occiput from eight to nine inches. They consequently contained as much brain as the head of a new-born child, that is, a fourth, fifth, or sixth of the cerebral mass of an adult in the full enjoyment of his faculties. The perfect exercise of the mental powers is absolutely incompatible with so small a brain, and there always exists in such cases idiocy more or less complete ; to this rule no exception has been or ever will be found. . . . When the circumference of the head varies from fourteen to seventeen inches, and the arc between the origin of the nose and the occipital foramen nearly twelve, these dimensions are accompanied with a greater or less degree of stupidity or fatuity—more or less complete inability of fixing the attention on a determinate object ; vague sentiments, indeterminate and transitory affections and passions, an irregular train of ideas, speech consisting of broken phrases, or merely of substantives or verbs, blind and irregular instincts, or an almost entire absence of them.

" The orang-outang has not quite the same quantity of brain as the imbeciles of whom we have been speaking ; and this refutes Buffon, who maintains that the orang-outang has as great a cerebral mass as man ; from which this author thinks the conclusion legitimate, that the brain is not essential to the exercise of the moral qualities and intellectual faculties.

" Children from two to twelve years old generally have the periphery of their heads from eighteen to nineteen inches in circumference, and the arc, from the origin of the nose to the occipital foramen, twelve or thirteen inches.

" Heads eighteen, or eighteen and a half inches in circumference, are small, though not incompatible with the regular exercise of the intellectual faculties ; they indicate a pitiful mediocrity, a slavish spirit of imitation, credulity, that species of sensibility which is easily raised to joy or tears, a very fallible judgment, an extreme difficulty in discerning the relation of cause and effect, a want of self-control, and frequently, which is a happy circumstance, but few desires. With this degree of development, however, there may exist one faculty or other highly developed.

" Still **imbecility is not always the result of a defective brain organisation** ; the functions of the cerebrum may be impeded by other causes ; for frequently we see idiocy with an apparently perfect organisation from birth."

Gall found in the brain of idiots the convolutions fewer in number, individually less complex, broader and smoother than in the apes ; this condition resulting neither from atrophy nor mere arrest of growth, but consisting essentially in an imperfect evolution of the cerebral hemispheres or their parts, dependent on an arrest of development. With the animal type of brain in idiocy sometimes appear animal traits and instincts.

G. L. BUFFON (1707-1788) maintained that no difference could be found between the brain of an imbecile and that of one in the enjoyment of all his intellectual faculties, and, consequently, that it is impossible to admit the dependence of intellectual excellence on the perfection of the brain. This was because the cortex

of the brain, considered of much importance by Gall, was still neglected, and all the structures in the middle and lower parts of the brain could be seen in both. For the same reason, many anatomists denied any difference existing between the brains of the higher apes and man.

The criticism of Buffon by Gall was mild compared to the bitter fight some fifty years later, between OWEN (1804-1892) and HUXLEY (1825-1895), the two great anatomists and naturalists, at the British Association Meeting in 1860, continued in the columns of the *Athenæum* in 1861, Owen declaring that there was a marked difference in the brains of man and the monkey, and that the higher and the lower monkeys stood in that respect nearer to each other than the highest monkeys to man. Huxley declared the opposite.

To **JEAN ITARD** (1775-1838), of the Bicêtre, belongs the honour of having been the first to recognise the condition of the imbecile and to take steps for its amelioration. The first idiot to be scientifically treated was the so-called "Savage of Aveyron," in 1801. But it was not until 1839 that the first "special school" for idiots was opened by **E. S. SEGUIN** (1812-1880), who in 1841 published "The Theory and Practice of the Education of Idiots."

The first *school for cretins* was founded by **GUGGENMOOS**, in Salzburg, 1816, and in 1839 **J. GUGGENBÜHL** (1816-1863), in Switzerland, began to study cretinism, and opened a school on the Abendberg in 1842. In the same year, **SAEGERT** opened the first hospital and educational establishment for idiots in Berlin. In 1846 **HERMANN KERN** (1823-1891) established a similar school at Leipsic.

The Earlswood Asylum for the care and training of the feeble-minded, a model private philanthropic institution in England, was founded in 1847, partly through the efforts of Sir **JOHN FORBES** (1787-1861), afterwards a member of the Board, an active advocate of Gall's doctrines.

And yet another active follower of Gall founded the first school for teaching and training idiotic and feeble-minded youths, namely Dr. **SAMUEL HOWE** (1801-1876), of Massachusetts, in 1848.

We shall have occasion to refer to some of these disciples of Gall in a succeeding chapter.

GALL ON CRIME AND CRIMINALS

Gall regarded the moral sense as innate, and if innate, he argued, it can be lost the same as any other sense, and from a variety of causes.

He was the first to point out that moral defects are frequently caused by affections of the brain, and was the first to describe moral idiocy, imbecility, and moral insanity. By moral idiocy and imbecility, he meant the congenital absence or deficiency of the moral faculties. Moral insanity assumes the loss of pre-existing moral qualities. In all these cases there is a lack of moral judgment and ethical ideas—a moral insensibility. Such persons may mechanically know the laws of morality, but if such laws enter their consciousness, such persons do not experience any real appreciation or regard for them.

Gall gave an enlightened account of moral responsibility, which might have been written by any modern authority. He said :

"Legislators and moralists feeling that they themselves had a consciousness of right and wrong, and a power of will to do the right and forbear the wrong, they never doubted that all men had a like clearness of consciousness and a like power of will. If an individual showed bad dispositions, it was because he willed them. Offences and crimes have been considered without regard to the mental organisation of the man who committed them. In the prisons, of which we have visited a very large number, we have satisfied ourselves that the greatest number of the criminals were born in districts and in conditions of life in which instruction and education, moral as well as civil, are the most neglected. To alter the will of malefactors, it

has been thought sufficient to inflict penalties. Hence, criminal laws have been made, which have only determined what acts are to be considered culpable, and fixed for each a proportionate punishment without considering the different circumstances of the individuals offending.

"It has been argued that if man's evil propensities are innate, there is no longer any culpability in vice and crime; no one can avoid doing evil, and a criminal need only say that he has such or such a propensity to excuse all his actions and secure himself from punishment.

"But man possesses motives which urge him to do good and to avoid evil, and if through neglect the higher faculties are not sufficiently developed to restrain the lower ones, this only shows that not all men are equally morally free, are not equally guilty, although the positive acts they committed may be the same.

"There can be no question of culpability or justice in the severe sense; **the question is of the necessity of society preventing crime.** The measure of culpability and the measure of punishment cannot be determined by a study of the illegal act, but only by a study of the individual committing it.

"It is the nature of the act which determines the nature of the punishment without regard to the person committing it; undoubtedly we shall find too many difficulties in proceeding otherwise, and this is believed to be the only means of obtaining perfect equality and impartiality in the administration of justice. But it is evident that it is exactly in this manner that we render ourselves guilty of the most crying injustice, and, while we almost always fail in obtaining a just estimate of the crime, we fail equally in the proportionate application of punishment.

"Crimes and misdemeanours are not to be considered as abstract existences, but the result of the actions of individuals; they can only be estimated according to the nature and situation of the individual.

"Men have always regarded violent affections and passions as extenuating motives, such as anger, jealousy, etc., when, under the influence of these feelings, they were hurried into a criminal action. But are promptitude and impetuosity the only characteristics of violent affections and passions? It often happens that, although the storm rages in the mind, external circumstances may retard the explosion; it is not always the strongest sensations that burst out the most suddenly. He who is moved by fierce anger, often succeeds in restraining it, but the mind and body are more strongly agitated than if it were allowed its free course. The deeper a painful sentiment, and the longer it gnaws upon the mind, the more it weakens the powers and violently agitates the soul. An atrocious resolution adopted in this state should be regarded, under many circumstances, as the effect of the strongest emotion and perverted judgment."

How to deal with criminals is a problem which we have not yet solved satisfactorily, and it was a much more serious problem a century ago. Here, too, Gall showed himself to be an advanced humanitarian reformer, and no magistrate, judge, or legislator should fail to read his suggestions.

"We have seen that the want of instruction, the ignorance of moral and religious precepts, the laws and duties toward men and God, are the principal sources of the criminal aberrations of men. We must then endeavour to supply the deficiencies resulting from the organisation and education of these individuals. In the first place, **prisons must become houses of correction.** Criminals should not be herded together to recount to one another their adventures and boast of their deeds, and thus to lose all shame and horror of crime; they should not be branded (as they were in Gall's day) so as to be an object of public disgrace, and they should be provided with the necessary means to earn an honest livelihood, as otherwise they are forced to devote themselves to crime to avoid starvation. Imprisonment is not always the kind of punishment best adapted to the character of criminals and their peculiar propensities. The society they enjoy renders their lives less miserable. If they are ill-fed, they are at least secured from all the wants common to this class of men; they are clothed and preserved from the inclemencies of the weather. On the other hand, the punishments are often severer than the law prescribes, especially when the buildings are insanitary, or placed in a damp soil, or when the walls are

damp—when glandular affections, pneumonia, dysentery, etc., are common. When the punishment of a criminal is limited to a detention for a stated period, it would be in accordance with the spirit of the sentence to inflict the punishment in a manner not destructive of the individual's health.

" Prisoners who are accustomed by the regulations to inaction or are made to do useless work, when restored to liberty often are deprived of the means of earning their living for a long time. It is not surprising, therefore, that we find prisons filled with persons who have returned over and over again.

" Prisoners should be instructed in reading, writing, arithmetic, morals, and religion ; and should be taught some occupation which would be of use to them when restored to liberty, instead of being made to pass their time in idleness or being forced to a labour which is no good to them."

In connection therewith, we must not forget that, in England at all events, **JOHN HOWARD** (1726-1790) began to direct public attention to the abuses in the administration of prisons some little time before Gall, in 1774.

The prisons of that period were vile beyond belief. Men were confined in dungeons rarely, if ever, disinfected after the death of previous occupants, and with their corridors connecting directly with the foulest sewers. There was no proper disinfection, ventilation, or drainage ; and in most of the large prisons for criminals or debtors the jail fever was supreme, and from these centres it frequently spread through the adjacent towns. About 1750 began the work of John Howard, who visited the prisons in England, made known their condition to the world, and never rested until they were greatly improved. Though not a physician, he was the first to take notes on sanitary questions. His essays presented to Parliament demonstrated the awful neglect which obtained in lazarettos and prisons both at home and abroad. He showed that typhus arose from lack of hygiene, and in the course of his post-chaise travels and investigations in the South of Russia, he at length contracted this disease and fell a victim to it. As Sir SAMUEL ROMILLY (1757-1818) said of his travels : " What a singular journey ! Not to admire the wonders of art and nature, not to visit courts and ape their manners, but to dive into dungeons, to compare the misery of man in different climates, to study the arts of mitigating the torments of mankind. What a contrast might be drawn between the painful labour of this man, and the ostentatious sensibility which turns aside from scenes of misery, and, with the mockery of a few barren tears, leaves it to seek comfort in its own distress."

It was Sir **SAMUEL ROMILLY** who, in 1808, brought in his Bill to abolish the death penalty in cases of small gravity.

Prisons improved after the great work at Newgate of Mrs. **ELIZABETH FRY** (1780-1845). Transportation was abolished in 1857, and public executions in 1868.

Within recent years we have come to recognise that offenders must be taken in hand when found. One method of dealing with them is the " Borstal System," started by Sir **EVELYN RUGGLES-BRISE.**

Do criminals repent ? Gall's answer to this question is :

" It is commonly imagined that malefactors, who are condemned only to imprisonment of greater or less duration, repent, and ultimately resolve to renounce their evil habits and return to good behaviour. Nay, more ; the hope is cherished that those condemned to perpetual imprisonment, to hard labour for life, to the punishment of death, will make a sincere confession of all their crimes and all their accomplices ; and in their effort to obtain pardon, at least in the other world, will be tormented by the stings of conscience, and will feel sincere repentance. But experience in this respect shows a very different result. I do not deny that some criminals do sincerely repent : those who have been drawn into crime by imprudence, an unfortunate fit of passion, poverty, seduction, or other very pressing external circumstances. When the fatal concurrence of circumstances has passed, the milder internal feelings will become active. A total contradiction is manifested

between the natural sentiments and the act committed ; and this contradiction is what constitutes repentance, or the natural conscience.

" But he who is drawn into crime by an innate propensity will rarely experience natural repentance. In such a man the natural inclinations which lead to evil are predominant ; if the expression may be used, they compose his proper character. Consequently, all his acts are in harmony with his whole being, and his tranquillity is rarely disturbed by them.

" This view of man's depravity may naturally displease those persons who dream only of the dignity of the human species. But observe closely the usurer, the libertine, the villain, and you will see that each of them is happy only in proportion as his desires are satisfied. Go into prisons ; place yourself in the midst of the prisoners, avoiding the appearance of a public functionary, which would incite deception, and inspire these men with frankness and confidence : with what internal satisfaction, with what joy and vanity they will recount to you their crimes, without forgetting the most insignificant details ! Calculate how many of them have been recommitted, and you will be easily convinced how few have repented. An abandoned criminal is rarely accessible to remorse and repentance, but I have seen many, who, being convinced of the abominable character of their habits, have begged that they should be restrained from having it in their power to indulge in them. We should do the utmost to strengthen and multiply contrary motives, and where this fails, and we cannot reform the criminal, to proportion the punishment to protect society from the attempts of those who are more or less incorrigible."

This was written a hundred years ago. Now let me quote the most recent utterance of an expert of the present day—Sir **BRYAN DONKIN,** Medical Adviser to the Prison Commission, Director of Convict Prisons, who in the *Journal of Mental Science*, 1917, says practically the same thing :

" Here it may be said that most practical observers and students in the field of mental pathology, however they may differ on this matter, do undoubtedly recognise the frequent occurrence, in many kinds of convicted prisoners, of this defect (feeble-mindedness or moral imbecility). It is marked by aberrant conduct which points to plainly inferior function, not only in the intellectual sphere, but also in the other so-called ' faculties ' of the mind ; and the defects indicated may be manifested in different proportions. These cases are certainly more common among convicts than in the general population ; and whatever their nature be deemed to be, there is a general concensus of opinion that **the characters manifested point to imperfect cerebral development** as the predominant element in their causation. It is this prominent manifestation of defect which demands notice as carrying with it a claim for its subject to be credited with at least attenuated responsibility, or a modified liability to punishment, and, therefore, to be specially treated. . . . This mentally defective class which I have described includes criminals of many kinds. Their defect is manifest apart from their criminal acts. They are apparently unable to acquire the complex characters that are essential to social life, and are actually possessed by the large majority of men. These, according to their individual surroundings and the multiform influence acting on them, as on all men, tend to follow the path of least resistance, which is, more often than not, the path of anti-social action."

Classic moralists asked themselves whether a man with a brain organisation for murder is responsible for his crime, whether he is a free agent, whether he is so guilty as he is held to be when he yields to the cruel instincts with which nature, in his case a wicked mother, has endowed him. Is it just to be pitiless towards a man who has only obeyed his physical conformation, almost as a madman obeys the impulse of his diseased mind ? But the same reasoning could be applied to virtuous deeds. Is much commendation due to the man who fulfils his duties, if his wise and respectable conduct be simply obedience to the good impulses communicated to him by his physical organisation ? If there is barbarity on the part of society which

punishes the guilty, there is absence of merit in the well-behaved man. These results of Gall's doctrine were very embarrassing and almost immoral. They were difficult and painful to admit, so the world got out of the difficulty by rejecting Gall and his teaching.

Gall is the pioneer of modern criminology, a science which, while it was overdone by some of its followers, nevertheless contains many truths that are of practical value to humanity.

HAVELOCK ELLIS (*The Criminal*, London, 1890) said :

" Gall thrust aside for ever the credulous fancies of the physiognomists ; and he has been described, not altogether without reason, as the founder of the modern science of criminal anthropology. He was certainly its most brilliant pioneer. . . . Gall studied the brain, sought to differentiate the functions of its various parts, and the effects of its varying development on the skull.

" For Gall the varying development of the brain was the cause of the divergent mental and moral qualities of the individual ; he was firmly convinced that all the facts of psychical life are rooted in the physical organisation ; he wished to write the natural history of every primitive moral and intellectual force, in health as well as in disease. To the best of his ability he carried out his programme in detail, by an unceasing study of all the varieties of the brain and of the living head that he could find ; he pursued his studies throughout Europe, in lunatic asylums and in prisons, as well as among the ordinary population, and he foresaw the extent of the applications of the science he was opening up to medicine and to law, to morality and to education. While his work extended far beyond the borders of what we should now call criminal anthropology, he devoted much attention to the problem of the criminal organisation, and even to its varieties, many of his observations according well with the results of recent investigations. More than this, he clearly advocated a method of dealing with the criminal which is now widely regarded as the only right and reasonable method."

Gall regarded all men as potential law-breakers. Few men are so fortified that they are not liable to make a slip from rectitude, more or less unconsciously, when placed in trying circumstances and seduced by temptation. Excluding such accidental offences, Gall recognised two factors which lead to crime, namely, ignorance and lack of moral sensibility. Both these factors diminish the human check on the instinctive tendencies, so that the propensities, *i.e.*, the animal qualities, govern the whole being.

Now, an animal type of character will be shown by an animal type of brain, which according to Gall is indicated by prominent temporal lobes, giving breadth of the head between the temples ; and deficient frontal lobes, giving a narrow low forehead ; and frequently by deficiency in the occipital lobes, giving a short head from front to back.

Gall's criminal type is the same as described in later years by MORIZ BENEDIKT (1835-1920), who like Gall called it a reversion to the carnivorous type, by HANOT and C. BOUCHARD, CORRE and ROUSSEL, TAMBURINI (1848-1919), PAUL NÄCKE (1851-1913), and HENRY MAUDSLEY (1835-1918), late Professor of Medical Jurisprudence in University College, whom we propose to quote herewith :

" All broad-headed people," he wrote, " are very selfish ; that is to say, all who have the head broad in proportion to its length. An undue preponderance of the breadth of the head indicates with certainty an animal self-love, which can scarcely be trusted at all times to adopt only fair means for its gratification. Undue preponderance, be it observed, for it is justifiable to expect a favourable result, even with a rather broad head which has a proportionately good length, and which has, so to speak, the power of its length placed in the anterior half thereof. And why ? Simply because there is in the front the greatest natural power, the force of intellect, which, by exercise and development, is able to control the objectionable propensities

indicated in the animal broadness of skull." He described a brutal head as follows: "The bad features of a badly formed head would include a narrowness and lowness of the forehead, a flatness of the upper part of the head, a bulging of the sides towards the base, and a great development of the lower and posterior part; with these grievous characters might be associated a wideness of the zygomatic arch, as in the carnivorous animal, and massive jaws. A man so formed might be expected, with some confidence, to be given over hopelessly to his brutal instincts."

Gall considered it **a mistake to think that every criminal bears these marks**; not even the head of the worst kind of criminal need necessarily have that conformation. There are various causes that lead to crime, and criminals vary in character and therefore also in brain organisation. But given an individual at the meridian of life with this type of head, a bad inheritance, and a bad education, there is little or no chance of his reformation.

A murderer need not necessarily have a low head. For example, it was objected that John Thurtell, who was executed for murder, had actually a high head in the frontal region, as we find in benefactors. As a matter of fact, Thurtell, like many other notorious criminals, was noted for his benevolence. If applied to in behalf of a friend in distress, he drew out of his pocket his last remaining half-sovereign, with the remark, "He wants it more than I do." He would shed tears over a quarrel he caused innocently. His kindness to friends and his affection toward all his family were extreme. When naval lieutenant, he was a dashing, thoughtless, good-hearted officer. Yet, from his early youth, he was irascible, and what was called a murderous shot; a very dare-devil, a kind of prize-fighter, a notorious liar, a dupe of all his gambling associates, and he became a premeditating, cold-blooded murderer.

That types of skull and brain-conformation are generally connected with types of character (due to habitual states of mind) may be concluded from the results of craniology of animals. A criminal type of head may be found in men outside prisons, but is far more common inside these institutions. All Gall wanted to convey was that, given the psychological characteristics of a typical criminal, there will be a particular cranial conformation. Of course, not all men in prisons have the same mental dispositions. All are there because of their anti-social tendencies; but while some are anti-social from mental weakness, others possess considerable intellectual capacity which they employed for criminal ends. The swindler, forger, pickpocket, require special skill; the burglar audacity, and so forth. Gall also admitted the modifying effect of the environment on the inborn characteristics, especially in childhood; but it may also render the inherited tendencies over-active.

Critics of Gall are fond of quoting OLIVER WENDELL HOLMES' (1809-1894) sarcastic remarks in "The Autocrat at the Breakfast Table," but they omit to mention that Holmes has said ("Elsie Venner," p. 174):

"The limitations of human responsibility have never been properly studied," except by Gall. Though Gall's system is not a branch of positive knowledge, but only a pseudo-science, "for all that, we owe it an immense debt. It has melted the world's conscience in its crucible and has cast it in a new mould, with features less like those of Moloch, and more like those of humanity. If it has failed to demonstrate its system of special correspondence, it has proved that there are fixed relations between organisation and mind and character. **It has brought out that great doctrine of moral insanity,** which has done more to make men charitable, and soften legal and theological barbarism, than any one doctrine I can think of since the message of 'peace and good-will toward men.'"

HISTORY OF CRIMINAL ANTHROPOLOGY

Altogether, that department of anthropology which concerns itself with the study

of the physical and mental constitution of typical criminals—so-called criminal anthropology—has contributed many facts of interest and value to the psychologist and criminologist. **H. L. LAUVERGNE** (1797-1859) in France, in 1841, and **ATTOMYR** (1842) in Germany, had applied the theories of Gall to the examination of convicts; and their works, in spite of certain exaggerations of phrenology, are still a valuable treasury of observations in anthropology. Later **PAUL BROCA** (1824-1880) gave attention to this science by noting the peculiarities of skulls of habitual criminals. Then followed **A. B. MOREL** (1809-1872), Director of the Asylum at Rouen, with his doctrine of degeneration (1857). According to this doctrine the somatic factor in mental disorders assumes a high importance, whereas hitherto psychic causes were made to account for it. Organic causes, above all of an infective or toxic nature, lower the tone of the organism, injure its most vital organs, and disturb the most delicate mechanism of procreation. The offspring degenerates; the individuals carry in their person the stigmata of degeneration from birth, and evidence of this degeneration is seen in external morphological aberrations, lesions of internal organs, and, above all, in departures from the normal in the nervous system.

This doctrine was modified later by **J. J. MOREAU DE TOURS** (1804-1884) and attained a high development with the work of **CESARE LOMBROSO** (1835-1909), and grew under the influence of the study of biological heredity. It received an absurd extension by some, who explained all extraordinary gifts of men of genius as the outcome of degeneration, and proceeded to describe the stigmata, real or imaginary, of all the great men who have contributed to the happiness of the world by their productions in literature, music, and fine arts.

PROSPER DESPINE (1812-1892), in "Psychologie Naturelle," 1868, leaving aside the physical nature of criminals, made an exhaustive study of the capacities and character of "instinctive" criminals, in whom he found absence of human checks on the lower propensities. He pointed out the unforeseeing imprudence, the entire lack of moral sensibility and of remorse, which characterises this class of criminals, whom he considered "morally" insane, and therefore irresponsible.

He was followed by **RICHARD v. KRAFFT-EBING** (1840-1902), whose work on the "Grundzüge der Verbrecher Psychologie," 1872, made criminal anthropology popular in Germany.

But the real home of criminal anthropology was in Italy, where CESARE LOMBROSO, Professor of Psychiatry in Turin, made a close study of the physical and mental organisation of criminals. His work, *L'uomo delinquente*, 1876, has been translated into most languages. Lombroso founded the anthropological school which held that criminals are racial degenerates, or biological reversions to the savage state, that criminality is hereditary, innate, or constitutional; and that criminals must, as a class, be regarded as generally irresponsible and incapable of reform. Lombroso assigned to atavism a position of prominence in the etiology of crime; crime is a return to primitive and barbarous ancestral conditions, the criminal being practically a savage, born out of due time. This refers, of course, only to the habitual criminal. Prominent among the stigmata, pointed out by Lombroso, are: want of symmetry of the cranium, receding forehead, deformities of the jaw-bones, and abnormal shape of the ears. On the mental side he found the prime deficiency in criminals to be a want of mental power and an inability to resist temptation, which renders them unfit to earn their livelihood in the competition of honest industry.

The interest aroused by this now somewhat discredited teaching inspired many different attempts to establish the study of crime and punishment so far as possible on a foundation of observed and accredited fact. Lombroso was followed by PAOLO MANTEGAZZA (1831-1910), ENRICO FERRI (Sociologia Criminale, 1891), ANTONIO MARRO, GAROFALO, etc.

CHARLES FÉRÉ (Dégenerance et Criminalité) thought that the type reversion would have to be complete for the establishment of atavism. Anything short of this he classed as degeneracy. Atavism must not be distorted to mean degeneracy, simply because of its frequent association with that condition in the human subject.

We have already quoted Gall's views on crime and punishment. **MORIZ BENEDIKT,** who examined Gall's collection of criminal skulls at Baden, found that they showed a reversion to the carnivorous type, as evidenced by great temporal breadth and a defective development of the frontal and occipital regions. **CORRE** and **ROUSSEL** ("Revue d'Anthropologie," Paris, 1883) found flattening of the frontal and the posterior part of the head.

J. WILSON read a paper before the British Association (Exeter) on "The Moral Imbecility of Habitual Criminals as exemplified by Cranial Measurements." He had measured 464 heads of criminals and found that habitual thieves presented well-marked signs of insufficient cranial development, specially *anteriorly.*

LOMBROSO, too, had noticed brachycephaly and confirmed Gall's observation that female criminals, even where sexual passion is exaggerated, have no love for their offspring.

TAMBURINI ("Archivio di Psichiatria e Scienze Penali," 1889) described the case of a man who killed his parents and brother, in whom the temporal arches were prominently developed and close to the sagittal line, thus giving excessive width to the head.

F. PACINI (Ibidem, 1882) had found 14 skulls out of 25 of female murderers mesocephalic.

BORDIER, of Paris, published a study of a series of criminals, and drew the following conclusion (*Anthropological Review*) : "The murderer's skull is developed at the sides mainly, or in the lower part of the parietal and in the temporal lobes." According to Gall, the sides of the head are the seat of the impulses, and the murderer is a creature of impulse. His lack of frontal development shows lack of reflective power. He takes no thought of to-morrow.

Of course, if the distorted skulls observed by criminal anthropologists mean anything in criminology, they imply correspondingly aberrant development of the brain beneath, with resultant perversions of the intellectual and moral faculties. Such persons cannot be held entirely responsible. A good argument to this effect was introduced by **HENRY MAUDSLEY** (1835-1918). He said :

"Take a quite young child, which is causing its parents alarm and distress by the precocious display of vicious desires and tendencies of all sorts, that are quite out of keeping with its tender years, and by the utter failure of either precept, or example, or punishment, to imbue it with good feeling and with the desire to do right. It may not be notably deficient in intelligence ; on the contrary, it may be capable of learning quickly when it likes, and extremely cunning in lying, in stealing, in gratifying other perverse inclinations ; and it cannot be said not to know right from wrong, since it invariably eschews the right and chooses the wrong, showing an amazing acuteness in escaping detection and the punishment which follows detection. It is, in truth, congenitally conscienceless, by nature destitute of moral sense and actively imbued with an immoral sense. Everybody who has to do with this unfortunate creature feels that it is not responsible for its vicious conduct, perceives that punishment does not and cannot in the least reform it, and is persuaded that there is some native defect of mind which renders it a proper case for medical advice. **If bad organisation be admitted in such a child, why not in the adult ?"**

The latest work on the subject is "The English Convict—a Statistical Study," by Prof **KARL PEARSON** and Dr. **CHARLES GORING** (1870-1919), which appeared as an official publication in 1913, and has already been referred to. The authors hold that criminality is to be explained by the facts of its heredity alone. "The criminal

diathesis is inherited and crime is only to a trifling extent, if to any, the product of the environment or the force of circumstances."

They conclude that there is no such thing as a physical or "anthropological" type of criminal man. Yet they admit mental deficiency. Those convicted of crime are differentiated by inferior stature and defective intelligence from the non-criminal population. The most defective convicts as regards intelligence are those who commit murder, arson, theft, or burglary, and these form the large majority of offenders (if they had the brains they would more carefully plan their crime so as not to be caught; moreover, they would be able to earn their living in an honest way); less defective are those who commit crimes of violence other than murder; receivers of stolen goods and coiners are more intelligent than thieves; and forgers, embezzlers, and fraudulent persons generally are practically absent from the records of "mental defect."

The mental defects of a certain class of criminals is not the causation of crime, for non-criminals have these defects, but they contribute to the detection and conviction of crime. "The thief, speaking of course generally, who is caught thieving has a smaller head and narrower forehead than the man who arrests him." According to these authors, the criminal possesses "anti-social proclivities," which amounts to the same thing as the inborn criminal propensities of other authors.

Sir **BRYAN DONKIN** says:

"Most of the human concrete characters that we choose to study, or that can be studied, are referable for their origin both to an inborn capacity for developing them, and to some external stimulus appropriate for their development, and that many inborn capacities may never be developed for want of such stimulus."

Criminal anthropology has described certain data which of course do not apply to all criminals, but are confined only to a certain number of congenital, incorrigible, and habitual criminals. In regard to two types—murderers and thieves—an incontestable inferiority has been noted in the shape of the head, by comparison with normal men, together with a frequency of hereditary and pathological departures from the normal type. Similarly an examination of the brains of criminals, whilst it reveals in them an inferiority of form and histological type, reveals also, in a great number of cases, indications of arrested development and disease, undetected frequently during life.

The size of the criminal head is about the same as that of ordinary people. Thieves more frequently have small heads; the large broad heads are usually found among murderers. In the worst kind of criminals the recognised tendency is towards the pointed or sugar-loaf skull. The low, flat crown and receding brow are also quite common, and have always been looked upon as evidence of low mental and moral organisation. Prognathism is another mark of degeneration. It is most frequently met with in those who are guilty of crimes of violence. It denotes a strong animal nature.

It cannot be denied that there are creatures with crime written on their faces. If so many malefactors were mixed up with a large number of honest men, a detective would pick out most of them at once merely by scrutinising their bearing and physiognomy; but then he would lay more stress upon certain traits acquired by vicious life than on the anatomical peculiarities described by anthropologists. Moreover, all the children of criminals have not these fixed peculiarities, and not infrequently the children of criminals turn out well in after-life.

SECTION II

THE RECEPTION OF GALL'S DOCTRINE

CHAPTER XVI

GALL'S BIOGRAPHY AND EMINENT FRENCH DISCIPLES

FRANCIS JOSEPH GALL was born on March 7th, 1758, in the village of Tiefenbrunn, in the Duchy of Baden, in Germany. It is said that his family came from Italy and the name was originally Gallo. Gall's parents were Roman Catholics and had intended him for the Church, but as his natural tendency was to study plant and animal life in the fields and woods, he chose the healing art as his profession. **Vienna** being at that time more noted for its medical school than any other of the German-speaking cities, he decided to pursue his medical studies there, and in 1781 went to that city from the University of Strassburg, completing his studies in 1785, and afterwards settling there. He carried on investigations into the structure and functions of the nervous system for a long series of years, dissecting brains both at the hospital and at the asylum for the insane, and examining, at the same time, all the brains and skulls of celebrities he could obtain, and studying the same organ in the different species of animals in connection with their mental characteristics. He had a wonderful collection of considerable value, of which a fragment only is preserved. In 1796 he made his first announcement of his discoveries in a letter to his friend, Baron RETZER, Imperial Censor of Vienna, which was published in *Der Deutsche Merkur*, in December, 1798. In this letter he gave an outline of that big work which he started to publish only twelve years later.

The discovery of the law of gravitation is attributed to Newton seeing an apple fall from a tree to the ground ; so Gall's doctrine is supposed to have originated in his observation when a lad that those fellow-pupils who were cleverest in committing recitations to memory had prominent eyes ; this peculiarity of appearance, as he discovered in later life, being due to a prominent development of a certain part of the brain—the centre for verbal memory—pushing the eye downwards and outwards.

Gall, in Vienna, was the friend of two eminent clinical teachers : of ANTON VON STÖRCK (1731-1803), successor to Van Swieten and physician to Maria Theresa, the Emperor Joseph II., and also to Francis I., at the commencement of his reign ; and of MAXIMILIAN STOLL (1742-1787), the successor of De Haën. When Störck died, Gall was to have been appointed his successor as **body-physician to the Emperor,** but disliking the restraints of Court life, he declined the honour and recommended another man, ADOLF VON STIFFT (1760-1836), who in course of time became so powerful that he was styled " His Medical Majesty." Gall's fame soon spread. His lectures became the talk of Vienna. Hearers came from all parts of the Continent. This notoriety made the authorities suspicious, and his former protégé, Dr. Stifft, not being too honourable and rather jealous, had no

difficulty in getting the Austrian clergy to use their influence with the Government and the Emperor **to prohibit Gall's lectures on account of their materialistic tendency.** Consequently, the Austrian Government, on January 9th, 1802, issued an edict, in the form of a general regulation, prohibiting all private lectures unless a special permission was obtained from the public authorities. Gall knew that this edict was pointed at him, and wrote a Petition and Remonstrance to the Emperor (reproduced in Dr. Walther's "Gall'sche Gehirn und Schädellehre," Munich, 1804), a lengthy but highly interesting document, wherein it is stated, among other things, that **he had already spent 32,000 florins of his own on investigations,** made in hospitals, asylums, and prisons, and had brought together a magnificent collection of material. His petition not being granted, Gall struggled on more or less privately for another three years, encouraged by numerous friends; but finally, having received invitations from a number of German universities for lectures and demonstrations, he left Vienna on March 6th, 1805.

Gall's first scientific visit was to **Berlin,** which he entered on April 3rd, 1805. There he pursued his investigations in the prisons and hospitals, and repeated his anatomical demonstrations before the medical professors, the King and Queen, and other distinguished auditors. Outlines of his lectures were published by Professor ERNST BISCHOFF (1781-1861): "Darstellung der Gall'schen Gehirn und Schädellehre, nebst Bemerkungen uber diese Lehre von C. W. v. HUFELAND," Berlin, 1805. A translation of this book appeared in London in 1807. The royal favour bestowed upon Gall excited the envy of some of his colleagues, who began to attack him. On the other hand, the King's physician, the famous Dr. Hufeland, became his friend, and had a medal struck in honour of his visit and discoveries.

The *Medical and Surgical Journal*, Edinburgh, vol. xv., March, 1806, contains an account of Gall's visit to Berlin, as follows:

"The craniology of Dr. Gall was the favourite topic of the German literati during the summer of 1805 at almost every university and capital of the Northern Provinces of Germany. . . . In the beginning of last spring the doctor set out for Berlin, and lodged in the house of his intimate friend, Mr. Kotzebue. He there met with universal acceptance. The King, the Queen, princes and princesses, interested themselves so much in his discoveries that he obtained an invitation to go through a course of lectures in presence of the Royal Family, during which the Queen inspected the dissection of a human brain, while the doctor demonstrated the whole series of his astonishing discoveries. . . . A rancorous attack was now commenced against his theory by Dr. WALTER, leading anatomist in Berlin, but it failed of the intended effect, every person being convinced that it was dictated by envy. On the opposite side, the justly renowned Dr. HUFELAND, first physician to the King, almost all the faculty, as well as others professed their full assent, and several interesting tracts were published, in which ample justice was done to the theory. . . . Dr. Gall visited the houses of correction and prisons in Berlin and Spandau, and gave the most convincing proofs of his ability to discover, at first sight, such malefactors, thieves, and men of particular talents as were amongst the convicts and prisoners. At Torgau, where he also visited a house of correction, Professor BOTTIGER accompanied him, who afterwards published Gall's observations, an abstract of which is given in this article."

The visit referred to by the above correspondent was that to *the prisons of Berlin and Spandau.* The former was visited by Gall on April 17th, 1805, in the presence of the chief of the establishment, of the heads of the criminal department, and various counsellors selected by the Prussian Government. It was the first official test of the truth of his doctrines and their application to the detection of criminal and other dispositions. Gall saw two hundred prisoners, and described not only the nature of the crime, whether murder, theft, fraud, etc., for which each one was detained, but in many of them the special natural characteristics for which they were known to the authorities and their companions. On April 20th he went to Spandau, accompanied by C. W. v. HUFELAND (1762-1836), one of the most

celebrated philosopher-physicians of his time, like Abernethy in England. Four hundred and seventy heads were submitted to inspection. These visits by Gall to the prisons of Berlin and Spandau attracted much notice throughout Germany.

In a brochure entitled "Etwas über Herrn Dr. Gall's Hirnschädellehre," Berlin, 1805, Geheimrat Professor **JOHANN GOTTLIEB WALTER** (1734-1818), Lecturer on Anatomy in the University, referred to the visit by Gall to the Berlin prison, where 600 inmates were brought before him, mostly thieves, and said:

"**With great ease Gall differentiated the more distinguished thieves from those less dangerous, and in every case gave a description which tallied with the record of the trial of the prisoner.** The disposition to thieving was most marked in the prisoner Columbus, and amongst the youths in the head of little H——, with reference to whom Gall advised that he should be kept in prison for life, as he will never be anything else than a 'good-for-nothing.' In both cases the acts of the trial showed an abnormally active disposition to thieving."

Now, Prof. Walter does not question the validity of the test to which Gall was submitted; he does not question the accuracy of the diagnosis, and that Gall had really proved that it was possible to recognise an incorrigible thief by the shape of the head. It is not the truth of the doctrine he challenges, but its tendency. He says:

"What man of feeling for morality and religion will be able to read this without amazement? A fanatic advises the perpetual internment of a child, which has stolen once and is supposed to have an imaginary organ of thieving. Mankind must revolt when it hears that a preacher of fatalistic theories promulgates teaching which would be abhorred even by the most savage people without morals and religion. And shall nations accept them who believe in Christ and revere His preaching of charity? And we fill the pockets of such a man and engrave medals in his honour! It is lucky for Berlin that Dr. Gall held his Fatalism Sermon in the presence of intelligent and just judges; in any other place it might have had dangerous consequences."

Gall, as will be seen from other quotations, pointed out the *difficulties* and *errors* to which those are liable who judge even abnormal heads; but with reference to criminal types of heads, he points out that:

"In a prison, on the contrary, errors are less likely to occur. I can, from seeing a greatly developed organ, the abuse of which might lead to crime, pronounce with sufficient confidence on the nature of an offence. First, it is on account of crime that the individual is imprisoned; next, we know that man, excited by energetic propensities, if not restrained by powerful motives, ordinarily abandons himself to his natural inclination. There is, then, good reason to suppose that the offence for which he is punished is that for which we find in him a marked disposition. We may, indeed, be mistaken; fortuitous circumstances may sometimes, for the time, urge a man to acts for which he feels in himself no very strong propensity. We often meet robbers and assassins in whom the organs for theft and murder have not acquired an extraordinary development. But, in these cases, the malefactor has been drawn in by seduction, misery, or unruly passions, such as jealousy, resentment, quarrelling, or some other unfortunate circumstance. We are rarely deceived when the question relates to incorrigible malefactors, or persons who from their childhood have manifested evil dispositions or criminal propensities; in these, the development of the organ is evident. If the features, gestures, mien, or language betray want of education, or of exercise of the intellectual faculties; if the organisation of the brain is not favourable, it will almost always happen that the actions will accord with the unfortunate organisation."

In this connection, I should also like to mention that I have visited many prisons

in England and other countries, and have frequently been told by the governors of these establishments that they can tell which prisoner is likely to return.

In reply to Walter the reader is referred to Gall's defence of free-will and his views on crime (Chapter XV.). What mental specialist and criminologist has not come across hopeless cases of evil-doers, and has had to advise permanent control? Has not the infliction of increased sentences the same effect, and are we not already trying to segregate the feeble-minded criminal? Walter was simply giving way to his wrath, for he was incensed at Gall's grand reception in Berlin. His anger is shown by his statement that "**Dr. Gall is completely ignorant of anatomy**; that much was promised and very little performed; that he saw no such parts as were pretended to be shown," and so on. (Report in *Medical and Surgical Journal*, July, 1806.)

The remarks by **C. W. von HUFELAND** (1762-1836), Physician to the King of Prussia, are very different in their tone and temper from those of his colleague, Professor Walter. He says no one could have been more prepossessed against Gall's doctrine than he was himself, before he became acquainted with the author; and only by attending the lectures and demonstrations, and being convinced from what he saw, did he become a partisan. He goes on:

"It is only necessary to have eyes, and to open them, to be convinced of what Gall demonstrated concerning the dissection of the nerves, the crossing of the pyramids, etc. In order to see the structure, the brain must be dissected after Gall's method, following the parts from below upwards through all their ramifications." Curiously, with regard to the very quickly acknowledged discovery of there being two distinct sorts of nerves, one going to the circumference of the brain, and the other returning, and these two sets being always found together (nerves of sensation and motion), Hufeland expresses his want of faith. He continues: "It is with great pleasure and much interest that I have heard this estimable man himself expound his new doctrine. **I am fully convinced that he ought to be regarded as one of the most remarkable phenomena of the eighteenth century,** and that his doctrine should be considered as forming one of the boldest and most important steps in the study of the kingdom of nature. One must see and hear him to learn to appreciate a man completely exempt from prejudice, from charlatanism, from deception, and from metaphysical reveries. Gifted with a rare spirit of observation, with great penetration, and a sound judgment—identified, as it were, with nature—becoming her confidant from a constant intercourse with her—he has collected, in the kingdom of organised beings, a multitude of signs and phenomena which nobody had remarked till now, or which had been only superficially observed. He has combined them in an ingenious manner, has discovered the relations which establish analogy between them, has learned their signification, has drawn consequences and established truths, which are so much the more valuable that, being based on experience, they emanate from nature herself. He ascribes his discoveries solely to the circumstance of his having given himself up ingenuously and without reserve to the study of nature—following her in all the gradations, from the simplest result of her productive power to the most perfect. **It is an error, therefore, to give this doctrine the name of a system, and to judge of it as such.** True naturalists are not men to form systems. Their observations would not be sufficiently accurate if they were prompted by a systematic theory, and realities would not square with the various limits of their notions. Hence, the doctrine of Gall is not, and cannot be, anything except a combination of instructive natural phenomena, of which a part consists at present only of fragments, and of which he makes known the immediate consequences."

From Berlin Gall went to Leipsic, Dresden, and Halle. At **Halle,** his lectures and demonstrations were attended by the very **REIL** (1759-1813) by whom he was afterwards charged with pillaging the self-same discoveries in the structure of the brain, which, on that occasion, Gall taught him; which Reil acknowledged: "I

have seen more in the anatomical demonstrations of the brain by Gall than I conceived a man could discover in the course of a long life."

In the same year Gall went to **Weimar,** where he met **GOETHE** (1749-1832) at the Ducal Court. The great poet, who, as is well known, was a scientist as well, was already acquainted with his teachings, and showed his appreciation, of which various records have been left. He took a very profound view of the doctrine of Gall. Some years after the meeting he wrote :

" The brain remains the foundation and chief object, since it is not required to adapt itself to the skull, but the skull must conform to it. . . . **In every way Gall's demonstration of the brain was superior to that of the schools,** where the organ was cut into horizontal and vertical sections and a view given of certain parts following one after another, to which names were assigned, as if this were all that was necessary. Even the base of the brain, the origin of the nerves, remained known as mere localities, from which I, interested as I was, could gain nothing further."

From Weimar, Gall went to Jena, Göttingen, Brunswick, Hamburg, Kiel, and Copenhagen. In 1806, he visited Bremen, Amsterdam, Leyden, Frankfort, Heidelberg, Stuttgart, and Freiburg. In 1807, he visited Marburg, Würzburg, Munich, Augsburg, Zürich, and Bâle ; **everywhere giving demonstrations of brain dissections.** Outlines of his lectures were published by Dr. KNOBLAUCH (1781-1819), of Leipsic, Dr. C. A. BLÖDE (-1820), of Dresden, Prof. BISCHOFF (1781-1861), of Berlin, and H. G. C. SELPERT. The earliest accounts had been by Dr. F. H. MARTENS (1778-1805), of Jena, published at Leipsic in 1801 ; Prof. F. L. v. FRORIEP (1779-1847), of Weimar, in 1802 ; Dr. P. F. v. WALTHER (1781-1849), of Munich, in 1804 ; and by Prof. J. ARNOLD, the anatomist, at Erfurt in 1805. Dr. JOHN MEYER, of Naples, published an " Exposition of Gall's Doctrine of the Brain and Skull " in 1808.

While Gall was lecturing at **Heidelberg** (where he was opposed by Prof. ACKERMANN), a French physician, Dr. DÉMANGEON (1764-), attended his courses, and on his return to Paris published, in 1806, *La Physiologie Intellectuelle, ou Développement de la Doctrine du Docteur Gall,* a work which enjoyed great popularity and went through a great many editions.

In the course of 1807, Gall arrived in **Paris,** where he repeated his demonstrations before various learned societies. He made converts of the great CUVIER, the celebrated FLOURENS, and GEOFFROY ST. HILAIRE, whose testimonies we have already quoted (Chapter XI.). The following year **he presented a Memoir to the Institute of France,** which was referred for report to a committee of five, Cuvier presiding. At first the committee appeared favourably disposed towards the claims of the German doctor ; but when the matter came to the ears of BUONAPARTE, he reprimanded the Institute severely for submitting to be taught chemistry by an Englishman (Sir Humphry Davy) and anatomy by a German quack. On Napoleon's displeasure becoming known, the natural characteristic to pander to Royalty, combined with the anti-foreign feeling so prevalent in France at that time, caused the committee of the Institute to change their attitude and to issue an unfavourable report. (Quoted Chapter XI.)

J. P. FLOURENS (1794-1867), professor of physiology, who had expressed himself previously so favourably, **was commissioned to make an experimental investigation** into the functions of the brain. Flourens took a live pigeon, and sliced its brain in successive stages, and as the poor animal seemed to suffer little or no effect by the destruction of its brain, it gave him the opportunity of denying the alleged discoveries made by Gall. (We shall deal with Flourens in detail in Chapter XVIII.) For the moment we need only mention that the law which was laid down by Flourens in consequence of the result of this experiment was accepted by scientific men for fifty years ; it was that " the brain is a single organ, that no individual part acts

by itself, and that by slicing off the brain its functions are preserved." His report was gladly accepted by the Academy and was used to strike a fatal blow at Gall's position, and thenceforward Gall's doctrines were declared "absurdities" and "charlatanism" and the newspapers were used as instruments to ridicule them, so that some physicians would not go in consultation with him.

Cuvier, who had previously upheld Gall, now abstained from doing so, in public at least, though he remained on friendly terms with him, as is shown by the fact that he sent a skull to Gall in confirmation of his doctrine, but Gall, who then was already on his death-bed, returned the same with a message of thanks, and explained that "my collection wants only one more proof, and that is my own cranium, which will soon be placed there." It can still be seen preserved in a glass case in the Natural History Museum of Paris in the midst of what remains of his own collection.

GEORGES CUVIER (1769-1832) is the real founder of comparative anatomy through his profound work, "Leçons sur l'Anatomie Comparée" (1803), wherein he formulated for the first time definite laws as to the whole of the animal creation. In vol. ii. of that work he states that he found, in the different magnitude of the corpora quadrigemina of the frugivorous and carnivorous tribes, an explanation of the two instincts, by which the former are led to feed upon plants and the latter upon animals. But he changed his opinion upon becoming acquainted with Gall's work. ("Rapport historique sur les progrès des sciences naturelles depuis 1789 et sur leur état actuel," p. 193.) In this "Historical Report" he wrote: "It appears even that certain parts of the brain contain in all classes of animals a development proportioned to the peculiar properties of these animals, and we may hope that in following up these researches we may at length acquire some notions respecting the peculiar uses of each part of the brain."

Baron Cuvier undoubtedly was favourably disposed towards Gall's doctrine, but he was docile to Napoleon, if not expecting favours from him; and Napoleon being hostile, Cuvier, like a skilful courtier, "dodged the question."

The renowned **F. J. V. BROUSSAIS** (1772-1838), who became an ardent disciple of Gall, wrote of the effect of Napoleon's pronouncement against Gall (*Lancet*, July 23rd, 1836):

"Before that event Gall's lectures were attended by generals, senators, privy counsellors, and all the learned frequenters of the Court. As soon as the Emperor's opinion was declared, the persons who had received the doctrine of Gall with favour changed their tone, and either became his open enemies or sought excuses for their desertion of a cause which they had so recently espoused. But this was not all. Ridicule was employed, the journalists were let loose, and for several years Gall and his opinions were attacked in the most virulent and embittered manner."

The no less renowned **JEAN B. BOUILLAUD** (1796-1881), says of the treatment of Gall by Napoleon and Cuvier:

"The opposition of these two great men, backed as it was by the power of ridicule so terrible in all countries, but particularly in France, arrested, so to speak, the course of the new star which had just appeared above the scientific horizon. Forthwith the journals, schools, and academies formed a sort of holy alliance against the system of Gall; and all would have been over with that system long ere now, were it possible for the triumph of any holy alliance over truth to continue for ever."

Napoleon, while in Germany, had become acquainted with Gall's doctrine through a *metaphysician* who had told him that the workings of the soul were too mysterious to leave any external mark. Gall knew this, and had this fact in view when he wrote to the Institute of France in his reply to their Report on his doctrines:

"And, the metaphysician can no longer say, in order to preserve his right of losing himself in a sea of speculation, that the operations of the mind are too carefully concealed to admit of any possibility of discovering their material conditions or organs."

Napoleon's first body-physician was **J. N. CORVISART** (1755-1821), a great authority on heart disease, who popularised the method of percussion, first introduced by J. L. AUENBRUGGER (1722-1809), of Vienna. Corvisart, like Baron **LARREY** (1766-1842), Napoleon's great army surgeon, was a great friend and supporter of Gall and defended him against his Imperial master; but when **FRANCESCO ANTOMMARCHI** (1780-1838) became body-physician, he, like Dr. Stifft of Vienna, did his best to ruin Gall. (Antommarchi published a text-book on Anatomy, merely writing a text to Mascagni's drawings, which he used without acknowledgment or permission, thereby causing considerable scandal.) In his Memoirs "On the Last Moments of Napoleon," vol. ii., p. 29, Napoleon is reported to have said:

"Corvisart was a great partisan of Gall; he praised him, protected him, and left no stone unturned to push him on to me, but there was no sympathy between us. Lavater, Cagliostro, Mesmer have never been to my mind; I felt, I cannot tell how much aversion for them, and I took care not to admit any one who kept them among us. All these gentlemen are adroit, speak well, excite that fondness for the marvellous which the vulgar experience, and give an appearance of truth to theories the most false and unfounded. **Nature does not reveal herself by external forms. She hides and does not expose her secrets.** To pretend to seize and to penetrate human character by so slight an index is the part of a dupe or an impostor; and what else is that crowd with marvellous inspirations which pullulates in the bosom of all great capitals? The only way of knowing our fellow-creatures is to see them, to associate with them frequently, and to submit them to proof. We must study them long, if we wish not to be mistaken; we must judge them by their actions; and even this rule is not infallible, and must be restricted to the moment when they act; for we almost never obey our own character; we yield to transports, we are carried away by passion; such are our vices and virtues, our perversity and our heroism. This is my opinion, and this has long been my guide. It is not that I pretend to exclude the influence of natural dispositions and education; I think, on the contrary, that it is immense; but, beyond that, all is nonsense."

From the above quotation it is evident that Napoleon saw no more in Gall's doctrine than a system of character-reading from the protuberances of the head; just as nearly all the other opponents have done since. Of Gall's real work he and the others were ignorant.

Antommarchi, successor to Corvisart as Napoleon's body-physician, seems also to have known no more of Gall's doctrine than can be learnt from a phrenological plaster bust, with which Gall had nothing whatever to do, as will be proved in the next chapter.

In the *Mémorial de Saint Hélène*, by COUNT E. A. D. DE LAS CASES (1766-1842), Napoleon is reported to have said:

"**I have greatly contributed to put down Gall**; Corvisart was his great follower; he and his fellows had a strong leaning to materialism; it would increase their science and their domain. But nature is not so poor; if she was rude enough to announce her meaning by external forms, we should soon attain our ends, and we should be more learned. Her secrets are finer, more delicate, and more fugitive; hitherto they have escaped every one. A little hunchback is a great genius; a tall and handsome man is often a great ninny; a large head with a big brain sometimes has not an idea, while a little brain is often in possession of vast intelligence. And yet, think of the imbecility of Gall; he attributes to certain bumps dispositions and crimes which are not in nature, and which take their rise from the conventional

arrangements of society. What would become of thieving if there was no property ? of the bump of drunkenness, if no fermented liquors existed ? of that of ambition, if man did not live in society ? "

Gall has very correctly replied to this :

" In regard to my doctrines, the ideas and prejudices of Napoleon differ in no respects from those of the vulgar. ' What would become of the bump of thieving, if there was no property ? of that of ambition, if there was no society ? ' What would become of the eye, if there was no light ?—but light exists. What would become of taste and smell, if there were no odorous particles, and no savoury qualities ?—but these particles and qualities exist. What would become of the propensity of propagation, if there were not two sexes ?—but two sexes exist. . . . If Napoleon wished to destroy the tendency to materialism in the way he understood it, he ought to have begun by prohibiting the study, not only of the anatomy and physiology of the brain, but also that of natural history."

In 1809, Gall commenced publishing his great work, entitled **" The Anatomy and Physiology of the Nervous System in General, and of the Brain in Particular.** Four vols., folio, with an Atlas of 100 Plates." The work was not finished until 1819. The first two volumes bear the name of his prosector Spurzheim as well. The price of the work was **1,000 francs per copy,** so that only libraries could afford to buy it. This is one of the reasons why it remained unread and unknown.

Gall concluded his folio work with the following reflections :

" Here terminates this big work, which for fifteen years the public has been impatiently expecting. I should have wished to defer it still longer to bring the fruits of my researches to greater maturity ; but the final hour draws near, and I must be content with leaving this first effort on the physiology of the brain far less perfect than it will be fifty years hence. Neither the life nor the fortune of one man can be sufficient for this vast investigation. I have had to depend on my own resources. It will require many fortunes to bring this study to perfection, which my unaided efforts could not alone effect. **If I had been a man to be gratified with a little temporary éclat, I should have yielded more than twenty years ago to the desire of publishing the first views of a physiology of the brain ;** but I am prouder of the discovery of the slightest truth than of the invention of the most brilliant system.

" If any one will convince me of the falsity of my discoveries, I shall be the first to announce it to the public. Truth is my object. I place it above all personal considerations. May all my adversaries follow my example !

" Conforming to the spirit of the age, I ought to have maintained that one could absolutely ascertain by my method **all** the mental powers, without exception. I ought to have given single instances, instead of experiments a hundred times repeated ; I ought to have made of the whole one speculative study, and not have submitted my doctrine, as I have done, to so many investigations and comparisons ; I ought not to have expected of the world so much preparatory knowledge and perseverance ; I ought to have mounted Parnassus upon Pegasus, and not upon a tortoise. For where is the charm and interest of a science, so hard to acquire ? The premature judgments which have been pronounced, the jokes and squibs which have been let off at my expense, even before my intention or my object was known, prove that men do not wait for the results of research in order to draw their conclusions.

" I dare not flatter myself that my undertaking will ever be continued in its details, or that my exertions will be appreciated. Whoever is not impelled by an innate instinct of observation ; whoever finds it hard to sacrifice opinions and views which he has derived from his earlier studies ; whoever thinks more of making his fortune than of exploring the treasures of nature ; whoever is not fortified by inexhaustible patience against the interpretation of envy, jealousy, hypocrisy, ignorance, apathy, and indifference ; whoever thinks too highly of the force and correctness of his reasoning to submit it to the test of experience, a thousand times repeated, will never do much towards perfecting the physiology of the brain. Yet

these are the only means by which my discoveries can be verified, corrected, or refuted."

Gall is still denounced by some writers as a quack and charlatan; but let me ask: Is that the strain in which a quack would write?

Gall, in Paris, was physician to ten ambassadors and had a large practice; but **he kept himself poor by spending upon his scientific pursuits all he gained.**

His skill as a physician may be inferred from the fact that in 1810 a medal was presented to him, executed by BARRE, an eminent artist of Paris, by order of Count Potosky, a rich Polish nobleman, who took this method of expressing his deep gratitude to Dr. Gall, who had cured him of an old and dangerous malady, for which he had in vain consulted the best medical men in Paris.

The famous **PRINCE METTERNICH** (1773-1859) was a pupil of Gall. He was then Count Clement, and not yet powerful. The Prince renewed his acquaintance with Gall in Paris, and when he resided there as ambassador to Napoleon, he did friendly services for him, such as guaranteeing the expenses of the publication of his big work.

Prince Metternich, in one of the numerous conversations he had with R. R. NOEL in the winter of 1835 on Gall and his doctrines, made the following remark: "Gall was the greatest observer and thinker that I have ever known, a most indefatigable investigator, and possessed a truly philosophic mind." On another occasion he styled him: "A man of facts and a lover of truth—a hater of all theories."

Metternich induced EMPEROR FRANCIS (1768-1835), in 1814, to invite Gall to return to Vienna; but Gall declined to do so, assigning as his reason that he was now established in Paris, and would be forced to begin the world anew if he removed to Vienna.

In 1823, Gall was invited to **London,** where much was promised, but he returned two months later disappointed.

In March, 1828, at the conclusion of one of his lectures, Gall was seized with an attack of apoplexy, from which he never fully recovered, and of which he ultimately died on August 22nd, 1828, at his country house at Montrouge, near Paris, in the seventy-first year of his age. A public monument was erected to his memory over his grave in the cemetery at Père la Chaise in 1836.

Gall was excommunicated by Pius VII. in 1817. No wonder he refused spiritual aid on his deathbed; but, he declared, he had no objection to a religious service over his coffin. He was religious by nature (according to the statement of his widow he had faith in God), but objected to ignorant credulity. He defended himself against the attacks of the Church by saying: **"In studying the works of God, I do not think that I have done any wrong."**

JOSEPH VIMONT (1795-1857), one of his disciples, performed the post-mortem examination and prepared his skull for the Natural History Museum, where it was placed in the midst of his own collection. His brain weighed 2lb. 11½oz. The circumference of his skull was 22″ 2‴ over the widest area, and it measured from glabella to occiput 14′ 9‴.

Gall was very independent, indifferent to praise and blame. Few men were ever more ridiculed; few men pursued their aims more determinedly, despite its effects. He—as we shall show presently—effected more change in mental and moral philosophy and cerebral physiology than any predecessor, except Hippocrates, Plato, Aristotle, and Galen, and it is with these men that he should be classed. ELLIOTSON (see Chapter XVII.) wanted him to write a "popular"

work on his theories, but he declined on the ground that his work was for scientists and not for the multitude, and if unappreciated in his time, it might yet appeal to posterity. Gall did not believe in hypnotism or homeopathy; he took no part in politics, and was unmusical. He took neither tea, coffee, nor spirits. He gave his friendship to few men, was circumspect and somewhat suspicious. He was hardly ever punctual, lacked order and system in his personal habits, and was negligent in his style of writing. This may be the reason why he left the arrangement and details of his great work to his prosector SPURZHEIM (see Chapter XVII.), and out of kindness and honourable feeling permitted his name to be printed as joint-author.

Gall was naturalised in France in 1819. He was married twice and had no children. He married his first wife, CATHERINE LEISSLER (daughter of a surgeon-major in the French army), after having nursed him during a serious attack of typhus while a student at Strassburg; but she rendered his life unhappy by jealousy and an ungovernable temper, for which reason he separated from her in Vienna, making her an adequate allowance. She died in 1825, when he married again—MARIE ANNE BARBE, of Nancy (born 1795). This lady re-married, in 1831, Dr. Imbert, of Lyons, a lawyer, who died in 1852. All the belongings, including the manuscripts of the two husbands, were sold by her to the new tenant; and Gall's most valuable papers have not been seen or heard of since.

✓ In Gall we have a man who devoted all his energies and means to his scientific investigations for the benefit of humanity, refusing even the honours which might have brought him glory, so as to remain undisturbed in his pursuits; publishing nothing until he was sure of his facts, which were accumulating to such an extent that his work came before the world, unfortunately, **too late,** when he was already a judged man; judged not by his own writings, but by the résumés of others, and by those who had never heard him speak at all. He was a century in advance of his time. Probably also the constant wars, invasions, and occupations of Germany, and the political events in France, helped in diminishing the interest in Gall and his works.

In some of the obituary notices Gall was charged with a lack of generosity; but the writer has found that their wording is identical, so that we may presume they were copied one from the other. A man who devotes himself to scientific research and spends what money he makes on the pursuit of it, who holds no official position and no endowed lectureship, cannot rightly be accused of lack of generosity, even though he charges duly for his services and exacts payment for what is due to him. Gall must have had cause for complaint, for he said, one day, to his friend FOSSATI: "Do you see how these wealthy people treat us and other physicians? They spend a hundred times more for their pleasures than the health we give them, and expend enormous sums on balls and dinners, while they leave their physicians unpaid. Indeed, while they largely remunerate the lawyer who gains their cause, they give nothing to the physician who saves their lives."

Gall published as a young man in Vienna one volume of a work he never completed, entitled, "Philosophisch-medizinische Untersuchungen über Natur und Kunst im gesunden und kranken Zustande des Menschen," 1791. His others, the physiological works, were published in French. There is the folio work already mentioned, and a smaller edition of the same—in six octavo volumes, which appeared between 1822-1826, the sixth volume consisting entirely of replies to his critics. The extracts I have quoted in this book are taken from the smaller work, where not otherwise stated, as already mentioned. He is also the author of various articles, including one on "Cerveau" and another on "Crâne" in the *Dictionnaire des Sciences Médicales* (1812-1822), a stupendous illustrated encyclopædia of sixty volumes, which was to carry the evidence of the greatness of French medicine to the most remote corners of Europe.

In 1824 or 1825 Gall presented to **Dr. ANTON ROLLETT** (1778-1842), of Baden, near Vienna, that part of his collection of skulls and casts which he had left in Vienna. This collection was treasured highly by the son, HERMANN ROLLETT, the Austrian poet, and is still in existence in the Rollett Museum at Baden; some objects, however, the writer was told, went into possession of another son, ALEXANDER ROLLETT (1834-1903), Professor of Physiology in the University of Graz.

Gall's Paris collection was handed over to the Government on the death of Gall by his widow, who received in return a life annuity of Frs. 1200.—It contained 354 brains, skulls, and casts of heads of men distinguished in some particular direction, besides 250 other anatomical preparations, and is preserved in the Natural History Museum of that city. Some of the most interesting specimens—for example, the casts of the heads of Goethe, Emperor Joseph II., Mozart, Liszt, Burdach, etc., from nature, and the original skull of Blumauer, the German satirical poet—seem to have disappeared.

Besides the famous Prince Metternich, Gall had another warm partisan in Prince LOUIS of Bavaria. Another fact that deserves mention is that Gall made converts of the two greatest sculptors of his day, who appreciated the value of his doctrine in the application to the modelling of the head. One was the great Italian sculptor CANOVA (1757-1822), and the other the great Danish sculptor THORWALDSEN (1770-1844).

The attention of German scientists has been drawn to Gall by **P. J. MÖBIUS** (1853-1907), a Leipsic physician, through a work on "Franz Joseph Gall," 1905, and other books and papers, and it has been assumed that he was the first in the field. A personal explanation here may therefore be not out of place.

My first publication on Gall's doctrine dates from the year 1886. In 1889 and 1890 I lectured before the British Association, the Anthropological Institute and other societies, when I had such distinguished men as Sir WILLIAM TURNER, F.R.S., and Dr. JOHN BEDDOES, F.R.S. (1826-1911), as chairmen, and practically all the leaders of brain research, as FERRIER, HORSLEY, and others, among my audience. I sent my papers to Dr. Möbius at the time, he being editor of an international medical journal. In 1899 I published a small brochure in German, entitled "Die psychischen Thätigkeiten des Gehirns" (Berlin, Hirschwald), which created a sensation, and was reviewed in "Pflüger's Archiv," besides other medical journals; but Möbius took no notice of it. A year later he commenced writing articles on Gall in his journal, the same which were afterwards published in book-form. In 1901 I published my big work on "The Mental Functions of the Brain" in London, a copy of which I sent to Möbius, who replied by letter expressing his indignation that I had omitted to mention his work, as bearing upon Gall. Subsequently, when his articles came out in book-form, I found that he had added a notice mentioning our "simultaneous" work on this subject, and dismissing my big book on "The Mental Functions of the Brain" with a few words as of no importance.

Möbius made no acknowledgment of my priority, but, all the same, I will give him credit that he wrote well and fought hard to convince his unwilling colleagues in Germany of the genius of Gall.

That my book on "The Mental Functions of the Brain" was of more importance than Möbius pretended is shown by its having been reviewed in the "Encyclopædia Britannica" by **ALEXANDER MacALISTER** (1844-1910), M.A., D.D., D.Sc., LL.D., F.R.S., Member of Senate of Royal University of Ireland, Lecturer on Anatomy in Cambridge University, and has thus been put on permanent record. Prof. MacAlister, in an article of over two columns in length, says:

"Gall's great work contains a very considerable number of clinical and pathological observations, and an attempt has lately been made to show that his doctrines are confirmed by modern physiological and pathological facts concerning cerebral

localisation. This attempt to advance Gall's doctrine to the level of the natural sciences may be studied in the volume published in 1901, by Dr. Bernard Hollander, entitled 'The Mental Functions of the Brain.' . . . Dr. Hollander's purpose is to bring Gall's clinical and pathological instances into line with modern observations. He honours Gall, with justice, as an admirable and dexterous anatomist; he calls attention to many carefully recorded clinical and pathological facts in Gall's writings . . . and endeavours by this method to establish an unbroken connection between his doctrine and our present knowledge of cerebral localisation. . . . These collections of recorded cases, taken from a vast mass of clinical and pathological literature, accumulated during the past century, have been arranged by Dr. Hollander with great industry; and they clearly express his purpose to extend the limits of the study of cerebral localisation, and to advance it from the observation of the motor areas and the special sense-centres to the observation of the higher acts and states of consciousness. This, we may be sure, is the tendency of all modern researches into the working of the central nervous system: to seek a higher level of interpretation, and a statement of the departmental life of the brain in terms of ever-increasing complexity. . . . Physiology is beginning to feel its way forward from the localisation of muscular movements and special sense-centres to the localisation of the simpler faculties and instincts."

Professor **G. v. BUNGE** (1844-), Lecturer on Physiology in the University of Bâsle, wrote about my efforts to restore Gall:

"I am gratified to see the attempts that are being made to overcome the prejudice which keeps physiologists and psychiatrists from taking up the investigations of Gall, whose immortal work is a mine of valuable information even for our own generation."

Professor **R. v. KRAFFT-EBING** (1840-1904), Director of the Clinic for Mental and Nervous Disorders in the University of Vienna, wrote, a few days before his death, a review of my work, in which he said:

"Hollander's sound scientific treatise in defence of Gall should be read by all who love truth and justice."

The late Professor **LEONARD LANDOIS** (1837-1902), whose text-book on Physiology is so well known, wrote to the same effect.

That Möbius ignored my work may be regarded of little consequence; but that he ignored Prof. MAX NEUBURGER'S work on the History and Development of Experimental Physiology of the Brain and Spinal Cord ("Entwicklung der exper. Gehirn u. Rückenmarks Physiologie," Stuttgart, 1897) is deplorable. Neuburger, the celebrated historian of medicine in Vienna University, in that work pleads eloquently for Gall and his scientific achievements.

THE HISTORY OF GALL'S DOCTRINE IN FRANCE

In France Gall's doctrine never died out. In January, 1831, three years after the death of Gall, a society was formed, unfortunately under the title of "Phrenological Society," which kept much more strictly to Gall's teachings than his followers and similar societies in England have done, as we shall see presently. The Paris society was a **scientific** society in the strict sense of the word, not a phrenological society for character-reading by the protuberances on the head; and that is probably the reason why **it counted among its members men of the highest renown in medicine, philosophy, and the law.** At the time of its formation it consisted of 110 members, of whom 61 were physicians, most of them of distinction and still remembered for their work in other departments.

We mention:

N. P. ADELON (1782-1862), Professor of Physiology (Text-book, 1823), who published "Analyse d'un Cours du Gall" (1818).

GABRIEL ANDRAL (1797-1876), Professor of Medicine, Paris; President of the Medical Academy and the Phrenological Society (1835); the most distinguished pathologist of his time; wrote a work showing the application of Gall's doctrine to insanity (reviewed in *Lancet*, 1833).

B. N. M. APPERT (1797-1847), criminologist, Editor of the *Journal des Prisons*.

PIERRE H. AZAIS, M.D. (1766-1845), author of "De la Phrénologie" (Paris, 1839), "Cours de "Philosophie Générale," and other works.

P. H. BÉRARD (1797-1858), Professor of Physiology, College of Medicine.

CLAUDE BERNARD (1813-1878), the celebrated physiologist.

H. M. DUCROTAY de BLAINVILLE (1777-1850), zoologist, Professor of Comparative Anatomy.

J. B. BLONDEAU (1784-1854), Dean of the Faculty of Law, University of Paris.

JEAN B. BOUILLAUD (1796-1881), Professor of Clinical Medicine; Chief Physician La Charité; Author of "Traité de l'Encéphale" (1825); President of the Phrenological Society and Editor of the *Phrenological Journal*.

ALEXANDER BRIERRE DE BOISMONT (1798-1881), the well-known alienist.

CASIMIR BROUSSAIS (1803-1847), Professor at Vâl-de-Grace; wrote a reply to the objections against Gall's doctrine by Flourens and Leuret (Transactions of Phrenological Society, 1841-2).

F. J. V. BROUSSAIS (1772-1838), the former's father, Professor in the Faculty of Medicine, Paris, and Chief Physician of Vâl-de-Grace.

JULES CLOQUET (1796-1883), the distinguished Anatomist and Professor of Surgery, Paris, who, in his folio work "Anatomie de l'Homme," copied every one of the plates of the human brain from Gall's great work.

AUGUSTE COMTE (1798-1857), the celebrated philosopher, Professor at the Athenæum. See Chapter XXII.

J. P. FALRET (1794-1870), the celebrated alienist, Physician to the Salpètriere, who described "Circular Insanity" (1853).

G. M. A. FERRUS (1784-1861), Professor of Diseases of the Nervous System; Physician to the Asylum of Bicêtre.

P. FOISSAC (1801-1886) the pathologist, who read a paper to the Phrenological Society on the post mortem examination of the brain Cuvier of (1832).

J. A. L. FOSSATI (1786-1874), Professor of Clinical Medicine; personal friend of Gall.

ACHILLE FOVILLE (1799-1878), Physician to the Mental Hospital at Rouen and later at Toulouse, who, in his "Traité du Système Nerveux" (1840), adopted Gall's doctrines.

IMBARD, Surgeon-in-Chief, Charité Hospital, Lyons.

PAUL JOLLY (1790-1879), the well-known hygienist.

C. J. J. LE GALLOIS (1770-1814), Professor of Physiology; located the respiratory centre in a circumscribed portion of the medulla oblongata.

P. M. LENOBLE (1772-1824), Head of the Department of Public Instruction.

M. A. LENOIR (1762-1839), archæologist, Director of the Athenæum.

CHARLES LONDE (1795-1862), author of "Gymnastique Médicale," Paris (1820), and "Nouveaux Élements d'Hygiène."

LUCAS, Inspector-General of the Houses of Detention in France.

C. C. H. MARC (1771-1841), renowned alienist; wrote "Insanity Forensically Considered," Paris (1840).

Duke of MONTEBELLO (1769-1809).

MOREAU, Inspector of Prisons.

ETIÉNNE PARISET (1770-1847), alienist; Secretary to the Academy of Medicine, Paris.

PINEL GRANDCHAMP, Surgeon at the Salpetrière.

PONCELET, Professor in the Faculty of Law, Paris.

LÉON ROSTAN (1790-1866), Physician to the Salpetrière; Professor of Clinical Medicine in the University of Paris; author of "Ramolissement du Cerveau" (1820); great authority on localisation of brain functions.

GEOFFREY ST. HILAIRE (1772-1844), Professor of Natural History; Member of the Institute.

L. J. SANSON (1790-1841), Professor of Clinical Surgery; successor to Baron Dupuytren at Hôtel-Dieu.

J. B. SARLANDIÈRE (1787-1838), collaborator and friend of Magendie; wrote "Examen critique de la Classification des facultés cérébrales, adoptés par Gall," Paris (1833), and many articles in *Phrenological Journal*; he practised electrical treatment of nervous diseases.

FÉLIX VOISIN (1794-1872), Chief Physician, Mental Hospital of Bicêtre.

At one of the meetings of the society, Dr. VOISIN gave an account of a visit which he made to the **Prison Galleries of Toulon,** under the authority of the Minister of the Marine. The number of prisoners confined amounted to 372, and he had to find amongst them the 22 individuals who had been condemned for the crime of rape. He selected 22 persons, and among them were 13 who had been condemned for rape, and the other nine were marked on their information sheet as requiring surveillance in regard to their morals.

At the same meeting there was a discussion on the characteristics of Dr. Antommarchi's MASK OF NAPOLEON, which had been taken immediately after his death. This mask gives only the fore part of the head, so that at best it is only an indication of the intellectual abilities, but not of the character of the man; and not even that accurately, for Antommarchi marked the position of the ear by guess, so that we do not know the length of the base of the frontal lobes.

In 1836, there was a discussion on Gall's doctrine by the "Royal Academy of Medicine of Paris," which occupied four sittings. The Academy decided that the subject could not at present be adopted, and deferred its decision "till the system was established upon more solid bases."

F. J. V. BROUSSAIS (1772-1838)

It was in the same year (1836) that one of the highest medical authorities of his day in France delivered *a course of lectures on Gall's doctrine* at the University of Paris, which were attended by nearly 2,000 persons. They were reported fully in the *Lancet* (London) of that year. He commenced by saying:

"I assure you that it has not been from rashness, nor without reflection and numerous observations, that I have ventured to take up this subject. I have multiplied observations, so far as it has been possible for me to do, ere entering the list of its defenders."

Previously, in 1828, Broussais had published a work, "Sur l'Irritation et la Folie," in which he applied Gall's doctrines to mental diseases.

Broussais was a pupil of Bichât and the founder of a theory of physiological medicine. Life, according to him, depends upon external irritation, especially that of heat. The latter excites in the body peculiar chemical processes, which in turn

maintain regeneration and assimilation as well as contractility and sensibility. When these functions supported by heat cease, death at once ensues. Health depends upon the moderate action of the external irritants; disease upon their weakness, or more frequently upon their extraordinary strength. Disease is in no degree or respect ontological. He thought gastro-enteritis the "basis of all pathology." Nature had no healing power and it was necessary to abort disease by active measures. To this end, he adopted a powerful antiphlogistic or weakening régime, the main features of which were to deprive the patient of his proper food and to leech him all over his body.

Broussais and his pupil and successor, BOUILLAUD (1796-1881), were furious blood-letters. Broussais' professional rivals asserted that he was responsible for as much bloodshed as Napoleon I.

In the XVIIth century bleeding was the universal remedy. No matter what the disease, bleeding was resorted to. Dr. PATIN, a contemporary of Molière, mentions that he himself bled seven times for a common cold, and he cites with approval the practice of a colleague who bled a patient sixty-four times for rheumatism. Of a physician who died without allowing himself to be bled, he says that "the devil will bleed him in the other world, as a scoundrel, an atheist, deserves." This bloodshed continued far into the XIXth century. Often patients were actually bled to death, yet those who did it were so blinded that they ascribed the death to the illness and not to the bleeding. If he had done nothing else, MARSHALL HALL (1790-1857) would have proved his genius by pointing this out, as he did in his "Researches Principally Relative to the Morbid and Curative Effects of Loss of Blood" (see Chapter XXIV.).

JOSEPH VIMONT (1795-1857)

In 1818, the Royal Institute of France offered a prize to the author of the best memoir on the anatomy of the brain in the four classes of the vertebrate animals. Attracted by this, Dr. Vimont, of Caen, commenced researches, without reference to Gall's doctrines; indeed, he had not read Gall, and had heard of him only as a charlatan. However, as Gall had written upon the subject of his researches, he thought it incumbent upon him to read his work among others.

"Hardly," says he, "had I begun to read it, when I found that I had to do with one of those extraordinary men whom dark envy endeavours to exclude from the rank to which their genius calls them, and against whom it employs the arms of the coward and the hypocrite. High cerebral capacity, profound penetration, good sense, varied information, were the qualities which struck me as distinguishing Gall. The indifference which I first felt for his writings soon gave way to the most profound veneration."

Vimont commenced investigations into the brain structure of animals, and continued them with extraordinary perseverance. In 1827 he presented to the Institute a memoir containing a fragment of the researches on which he had spent so many years, together with 2,500 skulls of animals of various classes, order, genera, and species. Among these, 1,500 had belonged to beasts with whose habits he had been well acquainted before they died or were killed. He presented to the Institute also 400 wax preparations of the brain, modelled after nature. He spent more than 12,000 francs in procuring specimens. His work was entitled *Traité de Phrénologie humaine et comparée* (1836), but was opposed to Spurzheim's phrenology. It contained 120 plates and 600 figures.

Of **AUGUSTE COMTE,** the greatest of Gall's philosophical followers, we shall speak later. (See Chapter XXII.)

GALL'S FOLLOWERS IN ITALY

In Italy, Gall had several distinguished disciples, and all the early ones fared badly.

PHILIPPO UCELLI (-1832), Professor of Medicine in the University of Pisa and Lecturer in the Academy of Fine Arts, wrote an important work on the doctrine of Gall, a perfectly mild and philosophical treatise, entitled, *Compendio di Anatomia-Fisiologico Comparata ad uso della scuola di medicina* (Florence, 1825-6), supported by observations of his own. How innocent the work was may be seen from his statement :

"I am no convert to the doctrine of the twenty-seven compartments or boxes of organs, each separate and distinct ; but I honour the man who carries on the duty of investigation in a frank and fearless temper, and am sure mankind will be greatly served by the result, be it what it may."

However, the work was regarded by the authorities as dangerous to the popular religious views and it was suppressed. Its author, in 1826, was deprived of his chair in the University by the reigning Grand Duke, and persecuted in every possible way. At his death, in 1832, the censor prohibited the publication of biographical accounts of him, and suppressed even the notice that his former students had accompanied his body to the grave. The young men intended to have a funeral service, but even this was not granted.

The Professors **ORICELLI** and **GIACOMO TOMMASINI** (1768-1846), of Bologna, having adopted Gall's doctrine, and being consequently suspected like Ucelli of heresy, received a message from Cardinal Opizoni in the following terms : "I beg to apologise for the trouble I am giving, but as all mankind are not so enlightened as you, you will be so good as not to scandalise them by preaching **the dangerous and immoral doctrines of Gall.**" But they persisted in their offence, and having continued to teach what seemed to them the truth, measures were taken to depose them also.

Dr. **LUIGI FERRARESE,** alienist, of Naples, who wrote a work on Gall's doctrine (1838), in 1840 was called before the Holy Tribunal and was imprisoned for twenty-eight days. It is on record that "he was suspended from the office of physician to the Royal Lunatic Asylum at Aversa, and crushed to the earth by every engine of persecution which bigotry and tyranny combined could employ against him."

Other eminent Italian followers of Gall were Dr. **PIETRO MOLOSSI**, of Milan ("Studii Phrenologici," 1840), **RIGONI,** Professor of Physiology in Pavia, and **ZARLENGA,** alienist, of Naples.

Other followers of Gall, in Italy and other countries, will be dealt with in the course of this volume.

GALL'S FOLLOWERS IN DENMARK

were numerous. His doctrine had many adherents among physicians and surgeons. J. J. v. BERZELIUS (1779-1848), one of the greatest chemists of his time, was a follower of Gall.

Prof. MAX NEUBURGER, the celebrated historian of medicine of the University of Vienna, has gone very closely into the history of Gall and published many important biographical details in the *Archiv für Geschichte der Medizin.*

CHAPTER XVII

THE NEGLECT OF GALL'S ORIGINAL WORK BY ENGLISH DISCIPLES

JOHN CASPAR SPURZHEIM (1776-1832)

JOHN CASPAR SPURZHEIM was born on December 31st, 1776, at Longwich, near Treves, on the Moselle. He studied divinity and philosophy, and when the French armies seized upon Treves he went to Vienna, where he became tutor to the sons of Count Splangen. He appears to have commenced his medical studies in 1800, at the same time as he became acquainted with Gall's doctrine ; and when Gall was in need of a student to do the dissections for him at his public and private demonstrations, Spurzheim joined him for that purpose in 1804, and went with him on his tour round the German universities—as **prosector, secretary,** and **general assistant.** In all the reports of that journey the name of Spurzheim is not mentioned, and, with the exception of Great Britain and the United States, it has remained practically unknown. Gall, in his letters to Dr. R. Meier, of Bremen, in 1805, speaks of " my attendant and assistant Spurzheim," who addressed a letter wrongly. (Mentioned by Blumenbach, *Edinburgh Phrenological Journal,* 1846.)

During the first five years in Paris, however, Gall seems to have relied so much on Spurzheim as regards the arrangement of his discoveries for publication, that he allowed Spurzheim's name to be associated with his in the memoir presented to the Institute and as joint author in the first two volumes of his big work, **though Spurzheim at that time had not yet qualified as a physician.**

It was in 1814 that Spurzheim took his degree of doctor in Vienna, after which he came back to Paris and tried unsuccessfully some lectures of his own. He then decided to go to England, the previously subordinate Spurzheim then feeling sufficiently qualified and confident to pursue his own path towards the temple of fame. He therefore took " French leave " of his master. English medical men have always been rigid disciplinarians of their own fellows, but encouraging to " outsiders." Spurzheim hoped, therefore, to reap a harvest for himself by an unprincipled misapplication of his master's researches and discoveries, and a diplomatic utilisation of name and fame attaching to them. When Gall offered to go too, Spurzheim insisted on going alone, and admitted having learned English for six months in secret for that purpose. This led to a **break of the relations** between them.

The procedure and practice of his quondam pupil and associate were vigorously protested against and unsparingly denounced by Gall ; and it is to the renegade Spurzheim and his disciple George Combe that humanity at large became indebted for the illiterate reader of character from the " bumps " of the head, who has flourished ever since.

Spurzheim in England claimed a share in Gall's discoveries of the structure and functions of the brain, and to have rendered " systematic and philosophical what had been in Gall's hands merely rude and detached facts." According to FOSSATI, Spurzheim was with Gall from 1805 to 1813, and before he joined Gall, Gall had

already discovered the decussation of the pyramidal bodies, their passage through the pons, the different layers in the pons, the continuation of the optic nerve to the anterior pair of the quadrigeminal bodies, the divergence of the pyramidal fibres from the crura through the corpora striata to the cortex of the brain, etc. Spurzheim's claims to the anatomical discoveries of Gall were therefore unwarranted, and he admits in his work on the "Anatomy of the Brain," London, 1826, p. xi., that Gall had already made and promulgated his discoveries before he became Gall's prosector. Yet on the same page he says: "Modern anatomists before Gall **and myself** were divided in opinion on the subject of the decussation of the fibres in the pyramids." Again: "Before Gall **and I** began our researches, all other anatomists were in the habit of cutting down the brain by slices." As regards the physiological and philosophical theories of Gall, it must be admitted that he did remodel them and form them into a system under the name of "phrenology"—a name suggested in 1815 by Dr. THOMAS FORSTER (1789-1860), a naturalist, in a "Sketch of the New Anatomy of the Brain, with its Relation to Insanity" (1813)—but this systematisation, before the scientific foundation was laid, only inflicted fatal injury on Gall's doctrine.

Spurzheim undoubtedly succeeded in one respect, namely, in popularising Gall's doctrine; but the popularisation of science has its great dangers. No ideas lend themselves to such easy, and likewise to such shallow, generalisations as those of science. Once let out of the hand which uses them, in the strict and cautious manner by which alone they lead to valuable results, they are apt to work mischief.

Gall absolutely refused to have any more to do with him and declined even to look at his books, so disgusted was he. In vol. iii. of his big work, **he warned his readers of the hasty conclusions and premature systematisation,** and the introduction of "phrenology" by his pupil. Gall never undertook the construction of a system—in fact, he expressly disclaimed the pretension of doing so. He discovered one brain organ after another, just as it might happen. It was Spurzheim who had a more metaphysical mind, who divided the faculties, tried to improve upon their terminology, and added eight new organs. Gall disliked artificial systematic division and subdivision. He saw nothing satisfactory in Spurzheim's classification:

"The most natural and philosophic order," says Gall, "must be that which nature has observed in the successive arrangement of the faculties of the mind. But M. Spurzheim begins by establishing new divisions of the mind. . . . The philosophical spirit of M. Spurzheim shines in divisions, sub-divisions, sub-subdivisions, etc.; and this is what he calls infusing more philosophy into the physiology of the brain than I had the ambition of introducing. He is forced to jump from one region to another . . . a perfect monstrosity, which one would believe to be invented with the design of rendering the study impossible. The propensities and sentiments, and often the intellectual faculties, are so confounded together, that it is hardly possible to discover the characteristic signs which distinguish one from the other. . . . With what propriety does he exclude imitation, circumspection, secretiveness, constructiveness, from the intellectual faculties? . . . The division into qualities and faculties common to man and brutes, and qualities and faculties peculiar to man, is, I confess, of great value from a philosophic point of view; but, when the most careful observer dares not decide where the faculties of the brute cease and those of man begin, the division cannot be considered satisfactory. He has changed the names, but treated the organs according to my principles; yet in so hasty and feeble a manner, that this part of my doctrine would be deplorable, if it were not established on a better foundation."

There is also **independent evidence** of the relations between Gall and Spurzheim. The MARQUIS MOSQUATI wrote:

"From 1804-1807 Spurzheim was nothing else but the secretary and assistant to Gall. In 1806 I attended at Heidelberg the lectures of Gall, and I was witness as Spurzheim handed to him the casts and objects on which Gall was to make his remarks, in the same manner as when Dr. Faraday lectures at the Royal Institution there is always somebody to perform the mechanical part of the lecture. It must be allowed, however, that for the subsequent five years Spurzheim assisted his master so well in arranging his discoveries for publication that he was mentioned as joint author in the work on the 'Anatomy and Physiology of the Nervous System.' In 1824 I saw Gall again in Paris. At this epoch Spurzheim had remodelled the system of Gall, and had called it phrenology. I must say that Gall was not pleased with his innovations, and more than once in my presence spoke violently against him, calling him a plagiarist and a quack."

Again, Dr. FOSSATI wrote to Dr. ANDREW COMBE, July 2nd, 1828, reproaching him "for not giving Gall the glory which is due to him, and for ascribing too much to Dr. Spurzheim by always connecting his name with that of the founder."

JOHN ELLIOTSON, F.R.S. (1791-1868), Professor of Medicine in University College, London, showed the injustice of Dr. Spurzheim towards Gall, his vile attempts to share with Gall discoveries in which he had taken no part. He said:

"After reading some of Dr. Spurzheim's first English work, published on his arrival in England, Gall gave the book with disgust, only half cut, to Dr. Fossati, and knew nothing more of Dr. Spurzheim's sayings and writings afterwards than what was pointed out to him, and it was with the greatest difficulty that he could be prevailed upon to take any notice, even for a moment, of what was pointed out to him. I know none of the advocates of Dr. Spurzheim who is not miserably ignorant of the writings of Gall and of the history of Phrenology, and has not derived his knowledge second-hand from Dr. Spurzheim, or from one taught by him, and few who are not most unjust to Gall.

"Gall's works are clear, flowing, full, at once rigidly philosophical and rich with profound thoughts and glowing illustrations. I never take them up without finding something fresh, and feeling that I am with one of that band of mighty minds to which Bacon, Shakespeare, Milton, etc., belonged. They speak for themselves, and are totally different from the writings of Dr. Spurzheim; and yet Gall's writings are unknown to the greater part of the physiologists of the present day. It was Gall's facts that made Dr. Spurzheim a phrenologist." (*Lancet*, November 25th, 1837.)

Spurzheim's campaign in London, in 1814, was opened by a dissection of the brain at the Medico-Chirurgical Society in Lincoln's Inn Fields, and he set to work at once on the writing of a volume in English entitled "The **Physiognomical** System of Drs. Gall and Spurzheim, founded on Anatomical and Physiological Examination of the Nervous System in general and of the Brain in particular, and indicating the Dispositions and Manifestations of the Mind." This work appeared in 1815. It gained some adherents, but the University and other official authorities ridiculed and condemned it. Gall and Spurzheim were described as itinerant philosophers, quacks, and mountebanks, and this criticism was made in ignorance of Gall's real work, but on Spurzheim's presentation of it, his vainglorious disciple.

Particularly vehement were the criticisms by the *Edinburgh Review*. On reading these articles, Spurzheim went to Edinburgh, giving lectures and demonstrations there, but they were of no avail. Spurzheim thereupon published an "Examination of the Objections made in Britain against the Doctrines of Gall and Spurzheim," which was reviewed by the Editor, Lord JEFFREY (1773-1850), himself, who wrote that their ideas of the anatomy of the brain had no claim to originality, that they were known a hundred and fifty years before. Spurzheim had also an introduction to DUGALD STEWART (1753-1828), the philosopher. He waited on him, but Stewart refused to receive him. This discourtesy was consistent, for did he not write in the Supplement to the *Encyclopædia Britannica*: "Is there no Arbuthnot now to chastise the follies of our craniologists?"

Edinburgh, at the beginning of the XIXth century, had a medical school of great importance, rivalling London in its foreign reputation. It was important that Spurzheim should succeed there, but the only convert he made—though he grew into an eminent disciple—was a Writer to the Signet, GEORGE COMBE (1788-1858). Spurzheim had the good fortune to meet him, to convince him of the truth of his doctrine, and to leave him not only an enthusiastic disciple, but a practical and skilful master and teacher of it. After seven months, Spurzheim returned to London.

In 1817 he published his work entitled "Observations on Deranged Manifestations of the Mind."

In 1818 he went to Paris to marry Mademoiselle Perier, an accomplished woman, who made the drawings for his lectures.

In 1824 the French Government prohibited all lectures without its special permission, thus stopping Dr. Spurzheim. He did not visit England again until 1825. Meanwhile, in 1820, the *Edinburgh Phrenological Society* had been formed, with George Combe as its President. In 1823 they started their *Phrenological Transactions*. Subsequently, **all over England societies were formed,** aided by George Combe.

It was the practical philosophy of phrenology which made so many converts in England. It dealt with the emotions and passions of man, with the springs of human conduct, and not merely with the intellect. It must not be taken, either, that all the adherents accepted the localisations of phrenology; they may have thought them possible; but **it was the analysis of character and the practical philosophy of life which attracted them.**

In 1827 Spurzheim lectured at Cambridge University by permission of the Vice-Chancellor. In 1829 he visited Dublin, and was elected an Honorary Member of the Royal Irish Academy. In 1832 he went to America and lectured in Boston and at Harvard University. He died there on November 10th.

Spurzheim's error consisted in attempting to erect a complete edifice before there were materials suitable or sufficient for the foundation. The attempt to form a complete organology was premature so long as the knowledge of the parts was so meagre and imperfect. He did not follow Gall's plan of detailing the origin and progress of each of his discoveries of organs and of stating a number of individual instances in proof to his readers. He merely made assertions, so that one was inclined to think that he had reasoned himself into the belief in faculties, and then considered where their organs were most likely to lie. He presented his system to the British public as a perfect doctrine of the mind and the joint work of master and assistant; so that **Gall had to suffer for Spurzheim's errors.** Spurzheim and his successor, George Combe, instead of recognising the importance of Gall's anatomical and physiological labours, and drawing attention to them, as scientists would have done, looked more at the deductions which could be drawn from them. Principles which were yet in question they extended. Not only was Gall's work not continued, but no steps were taken either by Spurzheim, or by George and Andrew Combe who had forty years' time, to make it better known and to get his books translated. When £6,000 was left by Mr. Henderson for the promulgation of Gall's doctrines, George Combe, as trustee, published his own works with that money. When Gall died, **no obituary notice was published** in the *Phrenological Journal;* only the bare announcement of his death appeared.

Spurzheim and Combe held, and the philosophers BAILEY (1791-1870) and BAIN (1818-1903) refuted, the idea that phrenology was in itself a system, or the whole, of mental and moral philosophy; and the latter exposed also the insufficiency of the psychological analysis implied in the former's terminology. Spurzheim and Combe also disregarded Gall's warning that there are many large and well-formed brains which yield no intellectual fruits proportionate to their apparent capacity

and that correspondence between brain development and mental development is a very complex thing.

George Combe, in his reply to Dr. P. M. ROGET (1779-1869), who criticised the subject, said: "The title which Gall and Spurzheim give to their science is Phrenology." Now Gall nowhere called it that or by any other name. He invariably contented himself with the expression, "Functions of the Brain."

So firm was the belief of Spurzheim and his followers in the accuracy of their localisations, and that the size of each organ was a measure of its capacity, that JAMES STRATON (-1856), Secretary of the Phrenological Society of Aberdeen, invented a system of measurement of the different parts of the cranium which he claimed gave the size of the organs with **mathematical accuracy.** (Contributions to the Mathematics of Phrenology, Aberdeen, 1845.)

With Spurzheim and his followers **the brain was soon neglected** and the cranium became the principal object of their science. With them the question was whether or not we can tell people's characters by examining the size and shape of their heads; whereas with Gall it was always whether abnormal formation of the brain and circumscribed lesions would give any clue to its physiology. He wrote as early as 1796, that is long before the publication of his big work:

"They call me a craniologist, and the science which I have discovered, craniology. I rather think that the wise men have baptised the child before it was born. The object of my researches is the **brain.** The cranium is only a faithful cast of the external surface of the brain, and is consequently but a minor part of the principal object."

Gall would have nothing to do with indiscriminate character-reading from the head. His object was to elucidate the *structure and functions of the brain* as the organ of the mind; and in Gall's hands, at least, that object was pursued by the most strictly orthodox scientific methods, by the observation of facts, the induction of general laws from them, and the correction and control of such generalisation by experiment and further observation. The anatomy of the brain in man and the lower animals, its form and structure, were the groundwork of his labours; and in this dry region of pure science he proved himself a sound and original investigator of the first order. Infinite pains were taken in the collection of facts, and no theory was advanced without a mass of evidence to support it.

Gall's teaching was never made known in England. Many people thought, and many still think, that its essence is contained in what can be learned from looking at one of the phrenological busts, where it is made to appear as if the human mind could be parcelled out in a number of bumps, each one a chamber for some busy occupant. The remark made by SIR JOHN FORBES (1787-1861), in the *British and Foreign Medico-Chirurgical Review*, is as true to-day as it was in 1840: "We have heard and read much in opposition to phrenology, and we can affirm that the phrenology opposed was scarcely ever that of Gall, but usually **its miserable caricature** as exhibited by half-informed enthusiasts."

One of the earliest converts to Phrenology was none less than the celebrated Dr. **JOHN ABERNETHY** (1764-1831). He started as an opponent:

"I anticipate nothing but mischief from Gall and Spurzheim's Physiognomy or Cranioscopy becoming generally known and accredited. Suppose a man to have large protuberances on that part of the head where they are said to indicate excess of cautiousness; suppose him apprised that such excess tends to produce melancholy musings and irrational apprehensions, which may hold the mind spellbound and appalled, till suicide is welcomed as the only means of escape from seemingly insupportable gloom and horrors. Suppose him with this information seized with a fit of temporary despondency; will he now strive to rouse his mind to active exertion and employ it on other subjects? Will he not rather think the effort

useless and be inclined to submit to his doom from the belief that it is the result of unalterable organisation ? "

After a closer study of the subject he lectured upon it at the Royal College of Surgeons in 1821, when he said :

" In looking over the list of faculties, in order to see if I could reconcile them to analogy and reason, I could discern no order nor connection between them. The whole presented to me a rude appearance quite different, as I then thought, from what is found in nature. But after a more attentive consideration, light began to dawn upon me ; and, beginning to consider the faculties in a certain way, and to group them after a certain order, the whole gradually formed themselves before me into a system of surprising symmetry ; and—like the disjointed parts of an anamorphosis, when seen from the proper point of view, collecting themselves under one elegant design—delighted me with the appearance of that very order and beauty that I would beforehand have expected to find in the mental faculties. The harmonious junction of the organs, the beautiful adaptation of the faculties to each other, and to the phenomena of mind, as observable in every state in which it exists, are far too remarkable, and the coincidences far too numerous and exact, to have occurred by chance. As soon would a number of letters shaken out of Swift's Laputan machine fall of themselves into a scientific treatise, as would the names of thirty-five or thirty-six faculties, put down at random, compose a complete and well-combined scheme of the human mind, such as this appears actually to be. The inference is, I think, irresistible, either that the scheme, which appears so well arranged, has been invented by Drs. Gall and Spurzheim, or (if they actually proceeded, as they tell us, and founded it piecemeal by a gradual and patient examination of facts) that the harmony and systematic junction of these scattered members forms a very strong presumption—to say no more—in favour of the accuracy of their separate observations, and of the system being truly founded in nature. Had Drs. Gall and Spurzheim sat down with the purpose of constructing a system from their own imagination, it is next to morally impossible that they could have contrived one which harmonises so completely with itself, and with the actual state of the mental faculties, and the uses to which these faculties are subservient. This is a problem which has puzzled the most eminent philosophers of ancient and modern times ; and all attempts to solve it have hitherto been fruitless, so as almost to conclude that its solution was beyond the reach of human ingenuity. If, then, these gentlemen have actually succeeded in inventing a system like this, which affords a key to the mental constitution of man, and a facility of accounting for the diversities of human character and intellect, far surpassing any other system that has ever yet appeared—supposing it to be, as all other systems have been, purely hypothetical—it would entitle its authors to rank as philosophers with the highest names that ever adorned the annals of the world."

Dr. Abernethy confessed his " inability to offer any rational objection to the new doctrine, as affording a satisfactory explanation of the motives of human conduct," and quieted his Scotch countrymen, who had religious objections against it. He even invited Spurzheim to give a series of demonstrations on the brain to his pupils at St. Bartholomew's Hospital, and resigned his chair to him on these occasions.

It was Abernethy, who, by his College of Surgeons' lecture, **caused the spread of phrenology** ; not any effort of Spurzheim.

Guided by so competent an authority as Abernethy, every medical man set up a phrenological bust in his surgery, in recognition of the respect which he entertained for the phrenological doctrine. This became so general that a surgery was considered to be but incompletely furnished without such a bust ; and a phrenological head was a regular item in the order for an outfit such as was supplied to medical men in those days by the firm of Maw, Son, and Thompson, surgical instrument makers, of London. The example thus set by the surgeons was followed by the chemists, who, from the erudite appearance which it gave, placed a phrenologica

head in their windows. Thus exposed, these busts often found a sale among the general public. To keep up appearances with their betters, the quack doctors exhibited them in recommendation of their profession. This so disgusted the chemists that many of them discontinued the exhibition of them.

Another convert of Spurzheim was Sir **WILLIAM LAWRENCE** (1783-1867), a pupil of Abernethy, Professor of Anatomy and Surgery, at the early age of thirty-two, at St. Bartholomew's Hospital, and President of the Royal College of Surgeons. In his lectures on "Comparative Anatomy, Physiology, Zoology, and the Natural History of Man," he speaks highly of the new doctrine.

In these lectures, delivered between 1816 and 1819, Lawrence advanced the doctrine of the evolution of the brain and mental powers, for which he was denounced as a materialist. They raised an immediate outcry, and the author was charged with "the unworthy design of propagating opinions detrimental to society, and of endeavouring to enforce them for the purpose of loosening those restraints in which the welfare of mankind exists." Lawrence was forced to bow before the storm of abuse, and announce publicly that the volumes had been suppressed as he was refused copyright. As a result he forsook anthropology altogether, and henceforward devoted himself entirely to anatomy and surgery.

Spurzheim had associated himself early during his stay in London with one **JAMES DEVILLE** (1777-1846), a dealer in the Strand who was clever in making casts of living heads and who soon became famous for his vast collection, containing many hundreds of casts of clergymen artists, painters, sculptors, navigators, travellers, poets, authors, musicians, composers, legislators, judges, lawyers, astronomers, engineers, actors, many of them men of celebrity; and even of pugilists and criminals, idiots and imbeciles, and men of different nationalities. Of George Bidder, the celebrated engineer famous for his arithmetical gifts, he made a cast of the head at the age of eight, thirteen, sixteen, nineteen, twenty-two and twenty-eight. His collection of skulls of animals numbered about 3,000. Cuvier gave him permission to make casts from all the well-authenticated skulls in his splendid museum. He also made a large collection of copies of the busts of ancient philosophers and great men in the Louvre, Florentine and Prussian Galleries and private collections.

Deville was discovered by BRYAN DONKIN, F.R.S., in 1817, and employed by him to make casts of heads for the Phrenological Society in London.

Deville was the first "professional" phrenologist. He gained his reputation as such by examining the heads of 148 *convicts* on board the convict ship *England*, when about to sail for New South Wales, in the spring of 1826. He classified them according to their likely degree of violence and mischief-making and handed the memoranda to Dr. Thomson, the surgeon in charge, who had no knowledge of the subject. The authorities allowed the publication of the Log and Proceedings of the convict ship during that voyage (*Edinburgh Phrenological Journal*, vol. iv., 1827), and they bore out the accuracy of Deville's delineations in all cases, excepting only one.

GEORGE COMBE (1788-1858)

was born at Edinburgh, studied law, and became acquainted with Spurzheim in 1816, and was for many years the chief advocate of Phrenology. He contributed nothing to brain physiology and took no steps whatever to get Gall known in England; but Combe nevertheless was an able and excellent man, and contributed much to the moral bearings of Gall's doctrine and to its philosophy.

In 1817, in the April number of the *Scots Magazine*, Combe published his first article on the subject. In 1820 he, with his brother, ANDREW COMBE, and others, founded the *Phrenological Society*, and, in 1823, the *Phrenological Journal*, which was full of information, some of it interesting at the present day. It ceased publication in 1847.

In the Glasgow Medical Society, Combe's Essays were excluded from the library. Ministers preached against phrenology, claiming that it tended to **materialism**, and of course to **infidelity**; in reply to these attacks Combe wrote a book to show that it was in harmony with the Scriptures.

His chief work was "The Constitution of Man," published in 1828, a work of which an enormous number of editions were sold, and which became a household work on account of its sound philosophy and practical teaching of the hygiene of mind, in regard to which it is on an equality with the best works of modern writers.

HORACE MANN (1796-1859), U.S. Senator, famous educationist and great reformer, said:

"Combe's 'Constitution of Man' is the greatest book that has been written for centuries. It shows us those conditions of our being without whose observance we cannot be wise, useful, or happy. It demonstrates from our very organisation, and from our relation to the universe in which we are placed, that we cannot be prospered (in any true sense of the word) unless we are intelligent, and cannot be happy unless we are good. It 'vindicates the ways of God to man' better than any polemical treatise, and I declare myself a hundred times more indebted to it than to all the metaphysical works I ever read."

LORD MORLEY, in his "Life of Cobden," says:

"Few men have done better than the author of 'The Constitution of Man.' That memorable book, whose principles have now in some shape or other become the accepted commonplace of all rational persons, was a startling revelation when it was first published. . . . We cannot wonder that zealous men were found to bequeath fortunes for the dissemination of that wholesome gospel, that it was circulated by scores of thousand of copies, and that it was seen on shelves where there was nothing else save the Bible and 'Pilgrim's Progress.'"

However, Combe sinned in **always using phrenological terms**, where others would have done just as well. He wrote **as if there were no psychology and ethics outside phrenology**; but often he did no more than to graft the more or less crude terms invented by Spurzheim on well-known and ancient truths. Here is a specimen, of interest in view of recent history:

"The national debt of Britain has been contracted chiefly in war, originating in commercial jealousy and thirst for conquest; in short, under the suggestions of *combativeness, destructiveness, acquisitiveness*, and *self-esteem*. . . . Would a statesman, who believed in the doctrines maintained in this work, have recommended these wars as essential to national prosperity? If the twentieth part of the sum had been spent in effecting objects recognised by the moral sentiments—in instituting, for example, seminaries of education and penitentiaries, and in making roads, canals, and public granaries—how different would have been the present condition of the country! . . . *All these calamities happened because Mr. Pitt and Buonaparte were not acquainted with phrenology* and the natural laws. They acted, it appears, in pure ignorance of the supremacy of the moral and intellectual faculties. Buonaparte, in particular, did not believe in the existence of justice as an innate sentiment."

In 1836, Combe was **candidate for the chair of Logic** in the Edinburgh University, but it was SIR WILLIAM HAMILTON (1788-1856) who was successful. From

1838-1840 he was lecturing in America. In 1833 his book on "Phrenology" was translated into German, and in 1844 he gave some lectures at Heidelberg, there being a short-lived interest in Phrenology in Germany.

The chief German representatives were:

Geheimrat Prof. **BERNHARD v. COTTA** (1808-1879), geologist;

J. B. FRIEDREICH (1796-1862), Editor of the well-known "Friedreich's Jahrbücher," who took up Gall's doctrine on Criminology.

Prof. **J. C. A. GROHMANN** (1769-1847), the Kant philosopher, who wrote "Untersuchungen uber Gall's Schadellehre" (1842).

Dr. **ED. HIRSCHFELD** (-1845), who, for a year or two before his death, published a small phrenological journal.

Prof. **KARL W. IDELER** (1795-1860), the famous alienist.

JUSTUS v. LIEBIG (1803-1873), the famous chemist, who analysed organic substances (1830).

Geheimrat **E. J. A. MITTERMAIER** (1787-1867), Professor of Criminal Law, Munich.

R. R. NOEL, relation of Lord Byron, who wrote a number of phrenological works.

G. v. SCHEVE (1815-1880), who also wrote several phrenological works.

LUDWIG SCHLAGER (1828-1885), of Vienna.

JOH. v. SPIX (1781-1826), anatomist.

G. v. STRUVE (1805-1870), Editor of the *German Phrenological Journal.*

Wm. WAGNER, Professor of Medical Jurisprudence, Berlin University.

George Combe, like Gall, Voisin, Deville, and others, visited prisons and diagnosed the nature of the crime of convicts from the shape of their heads. In April, 1829, he visited the Penitentiary of Dublin, accompanied by a number of men of standing eager to see a trial of the phrenological doctrine. He had a dozen convicts, selected by the Governor, brought before him and wrote out their characteristics, which were afterwards compared and found in harmony with the entries made in the Governor's case-book. (For details, see my treatise on "Scientific Phrenology," London, 1902.)

Combe's advice was much sought by the nobility in the education of children, and in 1846 **Queen Victoria consulted him** about the training of her own sons and daughters.

He died in 1858, living long enough to see the decline of the subject to which he had devoted his life's energies. He was married to Miss CECILIA SIDDONS (in 1833), a daughter of the famous "Queen of the Stage."

Dr. **ANDREW COMBE** (1797-1847),

the brother of George Combe, was a far different man, and would have achieved much had he not suffered from chronic ill-health (tuberculosis). He was **the most sagacious and far-seeing of all British writers on Gall's doctrine.** He believed that a position of importance awaited it in the future. "If true," he said, "it furnishes a key, not only to the physiology of the brain and nervous system, but to the philosophy of the mind."

After taking his doctor degree in 1817, he went to Paris to study under ESQUIROL for two years. Tuberculosis drove him to Italy, but he returned in 1821 and commenced medical practice in 1823. In 1831 he went again to Italy for two years. In 1834 he published "Principles of Physiology, applied to the Preservation of Health, and to the Improvement of Physical and Mental Education," of which 28,000 copies were sold. In 1836 he was honoured with the appointment

of Physician-in-Ordinary to the King and Queen of the Belgians. SIR JAMES CLARK (1788-1870), Physician to Queen Victoria, recommended him. For several months he resided at Brussels, but his pulmonary trouble caused him to resign and return to Scotland. In 1838 he was appointed one of the Physicians Extraordinary to Queen Victoria, in Scotland, and in 1844 one of H.M.'s Physicians in Ordinary. He was also F.R.C.P., Ed., and Corresp. Member of the I. and R. Society of Physicians in Vienna.

During a stay in Madeira, in 1843, he wrote "The Physiology of Digestion," which went through nine editions. In 1846 he wrote "The Physiological and Moral Management of Children," which went through ten editions. He died in 1847. He was joint-editor of the *Edinburgh Phrenological Journal*, which ceased publication directly after his death.

The humane and moral treatment of the insane, and the **abolition of restraint,** were advocated by Andrew Combe in an article contributed to the *Scotsman*, February 6th, 1830, and in his work entitled "Observations on Mental Derangement," Edinburgh, 1831. He therefore **preceded CONOLLY** in the advocacy of these reforms. This work continued to sell until a few years ago. In the article referred to, he protested strongly against appointing—to the duty of ministering to the mentally deranged with a view to restoring sanity—men who possess no particle of acquaintance, either professed or implied, with the philosophy of mind, and without the sympathy or kindness of disposition necessary to effect that change. He says:

"Connected with this, I may remark that a hurtful error is prevalent in supposing that all lunatics are inaccessible to reason, and insensible to the ordinary feelings of humanity, and that, therefore, it is lost time to attempt to influence them by rational and consistent kindness and friendly intercourse, and quite unnecessary to be scrupulous or otherwise considerate in what we say to them, as they can neither remember nor judge with accuracy. This, however, is a most pernicious error, favourable only to unworthy deceit, ignorance, and indolence. In the majority of cases, some, however few, of the faculties remain unaltered, and even in those which apparently involve every feeling and faculty there are glimpses of reason, and tendencies to right and sound action, which, as in all other diseases ought to be fostered and strengthened into vigour. It is for this reason that it is injurious to recovery to limit the intercourse of the insane to those who are themselves insane, as is done in our public establishments, where the only rational creatures with whom the patient can associate are his keepers and superintendent, men generally of little intellectual superiority, knowledge, or learning, and of little refinement of manner or feeling. Not only is the intellect thus deprived of the ameliorating influence of sound exercise in others, but the feelings, already separated from every object to which formerly value was attached and affection engaged, are thus left ungratified, and perhaps disgusted, and delicacy hurt by the scenes to which they are inevitably exposed; and in proportion as reason and health return, the evil becomes more afflicting, and its effects more injurious in retarding complete restoration. . . .

"Moral regimen can scarcely, indeed, be too highly estimated in the cure of insanity, and it requires only to be conducted with discrimination to render it a very effective remedy. Unfortunately the use of the term 'moral' has from its connection with mind withdrawn the notice of the practitioner too much from the bodily conditions under which the intellectual powers and moral feelings act, and thus deprived him of the opportunity of adapting different kinds of moral treatment to different forms of insanity; and accordingly we find all the inmates of an asylum subjected to the same discipline, and their employments and amusements regulated after one general plan. . . . Powerful in modifying the action of the brain, as moral arrangements are thus shown to be, the practice of subjecting all lunatics to the same regimen appears not less preposterous than would be that of subjecting all who are affected with stomachic disease to one sort of diet, food being pretty nearly to the stomach what mental stimulus is to the brain. In society we know how

ariously we must address ourselves to different individuals to produce any impres-ion upon them ; and the effect of disease disturbing the mind is not to smooth own inequalities already existing, but to make natural features stand out in arsher contrast, and therefore the necessity for discriminative occupation and ppeals to sentiment becomes only the greater by the addition of disease. The eglect of this circumstance is the chief cause of the discrepant testimonies we ossess as to the effects of music, of religious exercises, and of various other moral emedies, which, if they act at all, must do mischief when ill applied, as certainly s they do good when used judiciously. And hence the unavoidable evils arising rom lunatics associating with none but lunatics, or with keepers of no education or efinement. In such society, there cannot be the slightest regulation of moral timuli so as to adapt them to the exigencies of the moment, and of the individual ase, and a powerful means of beneficial influence to the patient is thus sacrificed. . . To be able to grapple with mind, and to influence it beneficially, we must not nly have mind ourselves, but we must be intimately acquainted with human ature, with its various feelings and springs of action, and with the relations of hese to each other, to the external world, and to the physical system ; and we must now the individual qualities of the patient, and live and associate with him to ut all these in proper operation. The mind and the body act and react on each ther without ceasing, and therefore a knowledge of the organs and functions omposing the body, and of the effects of these upon the mental states, is also ndispensable. But such a combination of requisites is not to be looked for in the alf-educated, although, it may be, good-hearted, keeper or superintendent of an sylum. . . .

" The second great principle in conducting the moral treatment of the insane is o give due exercise and occupation to the mental faculties and cerebral organs which are unaffected." Then he goes on to show that idleness increases the morbid endency and that more opportunities for occupation should be provided in asylums.

The Combes made many important converts to the doctrine of phrenology, at least o those scientific principles and practical philosophy which underlie it. We must ear in mind that the connection between mind and brain was not then an acknow-edged fact, and that most men had a very vague view what the word " mind " onveyed. To most men it was an entity without attributes.

Moreover, Gall's doctrine dealt not merely with the intellect of man, like sychology, but also with the sentiments and propensities, *i.e.*, with the motives of uman conduct. As Professor ALEXANDER BAIN (1818-1903), in his work on he " Study of Character," 1861, said : " Phrenology is the only scheme of human haracter that has hitherto been elaborated in a manner proportioned to the subject."

Gall's doctrine was also a useful aid to the study of the functions of the brain and assisted in the understanding of **mental deficiency and mental disorders,** and their reatment. If Spurzheim and the Combes had only translated Gall's works or given sufficient extracts from them, the doctrine would have found many more adherents and might even have received official recognition. As it was, **the official leaders of medical opinion remained hostile,** and the private believers in the truth and value of the subject soon turned from it with the advent of the " professional " character-reader.

It has been shown that Dr. Andrew Combe was a pioneer in the " moral " treat-ment of the insane long before any actual reform took place. The following testimonials will show that practically **all the better known English alienists of that period subscribed to Gall's doctrine,** and were avowed phrenologists, before that term acquired its present meaning.

Sir **WILLIAM C. ELLIS** (-1839), Medical Superintendent of Hanwell Asylum, wrote :

" I candidly confess that until I became acquainted with phrenology I had no solid foundation upon which I could base my treatment for the cure of insanity.

. . . I am fully convinced the dispositions of man are indicated by the form and size of the brain. . . . I could mention a great variety of cases in the treatment of which I have found the little knowledge I possess of this interesting science of the greatest utility. . . . Residing amidst 600 lunatics, no day passes ever in which the truth of phrenology is not exemplified."

JOHN CONOLLY (1794-1866), who succeeded Sir William Ellis at the Hanwell Asylum in 1839, was a member of the Warwick and Leamington Phrenological Society and the Phrenological Association, and in 1835 read a phrenological paper on "The History and Cerebral Development of King Robert Bruce." In his work on "The Indications of Insanity" (1830), he wrote :

"Many of the phenomena of disease and the observation of all mankind, seem to me to prove that the first principles of phrenology are founded in nature, and I can see nothing which merits the praise of being philosophical in the real or affected contempt, professed by so many anatomists and physiologists for a science which, however imperfect, has for its object the demonstration that for other functions, the existence of which none can deny, there are further separations and distinctions of hitherto unexplained portions of nervous matter. . . . Phrenology may save us from the present barbarous system of education of overloading those who are not naturally fitted for the burden. . . . If a man with a unique head has a unique mental power, are we to be told that there is no connection whatever between them ?"

And in a letter to George Combe (quoted in the *Journal of Mental Science*, 1879, p. 238) :

Conolly expressed his "conviction of the great usefulness of habitual regard to the principles of phrenology especially in my department of practice, and of the confusion and imperfection of the views which seem to me to be taken both of the sound and unsound mind by those who reject the aid of observations confirmed now by vast experience, and most of which may be daily verified in asylums for the insane. I am also convinced that attention to the form of the head, conjoined with that cautious consideration of all other physical circumstances, which no prudent physiologist disregards, will often enable the practitioner to form an accurate prognosis in cases of mental disorder, and to foretell the chances of recovery or amelioration, or hopeless and gradual deterioration."

Again, in a letter to Sir James Clark, December 8th, 1862 (quoted in *Journal of Mental Science*, 1869), Conolly said :

"It is rather curious that the subject of the delusions of old age, concerning which you inquire if I have written anything, has been lately and often the particular subject of my thoughts. For many years past I have kept rather full records of cases occurring in my practice. . . . Forgetfulness of words, of dates, of people, of things read and things once carefully done and written, dread of poverty, visions of wealth, foolish attachments and dislikes, strange delusions founded on dreams, and sometimes the oddest singularities. These things are very curious, and phrenology, which seems forgotten, appears the only doctrine which tends to explain them."

Sir **JAMES CLARK** (1788-1870), Physician to Queen Victoria, in his Memoir of Conolly, himself observed, after citing certain passages from modern physiologists favouring the localisation of cerebral organs :

"These observations, which are founded on inquiries into the anatomy and physiology of the brain, strengthened by recent discoveries in pathology, all point in one direction, and tend to suggest the opinion of the phrenologists that the brain is an aggregate of many different parts, each appropriate to the manifestation of a

particular mental faculty. The prediction of the late Dr. Andrew Combe, the most sagacious and far-seeing of all British writers on phrenology, that a possible position of importance awaited it in the future, appears to rest on a surer foundation than has sometimes been imagined."

Dr. **JAMES SCOTT,** Medical Superintendent of the Royal Naval Lunatic Asylum at Haslar, writes :

"As I have been for nearly ten years medical Superintendent of this asylum, my opportunities, at least of observing, have been great indeed ; and a daily intercourse with the unfortunate individuals entrusted to my care and management has firmly, because experimentally, convinced me that mental disorder and moral delinquency can be rationally combated only by the application of phrenology ; and that the man who treats them on any other system will much oftener be disappointed than he who studies the manifestations of mind and traces effects to their secondary causes by the almost infallible beacon of phrenology. . . . I unhesitatingly give it as my conviction that no man, whatever may be the qualification in other respects, will be very successful in the treatment of insanity, in its various forms, if he be not well acquainted with Gall's doctrine ; and I will add that, whatever success may have attended my own practice in the lunatic asylum of this great national establishment, over which I have presided as chief medica officer for many years, I owe it almost exclusively to that knowledge."

Sir **JAMES COXE** (1811-1878), Commissioner in Lunacy for Scotland, had the following eulogy passed on him by Sir James Crichton Browne in his Presidential Address, Royal College of Physicians, 1878 :

" From the commencement of his career Sir James Coxe interested himself in insanity. During the earlier stages of his professional training he enjoyed no opportunities of coming into contact with the cloistered insane, nor of observing the modes of treatment then resorted to, as lunatic asylums were not in those days open to students, and were unprovided with medical assistants ; but this disadvantage was, to a great extent, compensated by his having acquired from his relatives George and Andrew Combe a thorough knowledge of phrenology, which—not then fallen on evil days of charlatanism and into the evil companionship of mesmerism—encouraged the accurate observation of mental states, accentuated the relations subsisting between these and states of the nervous system, and had even some curious glimpses of foresight into the revelations of modern physiology. He saw the phrenological method of inquiry applied in cases of insanity and of peculiar turpitude in the communities of lunatics and criminals that he visited during a long sojourn on the Continent, and the influence of the information thus obtained, co-operating with the natural bent of a comprehensive but unimaginative mind, may be discerned in all his subsequent public and official acts."

W. A. F. BROWNE (1805-1885) had studied phrenology under George Combe, and afterwards the subject of insanity under Esquirol in Paris ; and he wrote to Dr. Combe and his brother, soliciting their influence in procuring the appointment as Resident Superintendent of the Montrose Asylum, and their influence got him the post. He was subsequently chosen to fill the corresponding office in the Crichton Royal Institution near Dumfries, and later became Commissioner in Lunacy for Scotland, having risen to the first rank in his profession. He wrote in his book on " What Asylums Were and Ought to be," 1837, which was dedicated to Dr. Andrew Combe, " as an acknowledgment of the benefits which he has conferred on society by his application of phrenology in the treatment of insanity and nervous disease " :

" To those who are acquainted with the doctrines of phrenology the extent of my obligations will be readily recognised ; and to those who are still ignorant of these doctrines I have to offer the assurance that insanity can neither be understood,

nor described, nor treated by the aid of any other philosophy. I have long entertained this opinion. I have for many years put it to the test of experiment, and I now wish to record it as my deliberate conviction."

In a letter to the Hon. A. Boardman, 1850, he said :

"I hereby certify that I have been acquainted with the principles of phrenology for upwards of ten years ; that from proofs based upon physiology and observation I believe these to be a true exposition of the laws and phenomena of the human mind ; that during the whole of the period mentioned I have acted on these principles, applied them practically in the ordinary concerns of life, in determining and analysing the characters of all individuals with whom I became acquainted or connected, and that I have derived the greatest benefit from the assistance thus obtained. But although the utility of the science be most apparent in the discrimination of the good from the bad, those of virtuous and intellectual capabilities from the brutal and the imbecile, it is not confined to this. In the exercise of my profession I have been enabled, by the aid of phrenology, to be of essential service in directing the education of the young as a protection against nervous disease, and in removing or alleviating the various forms assumed by insanity in the mature. For several years I have devoted myself to the study of mental diseases and the care of the insane. During my studies at the Salpetrière, Charenton, etc., in Paris, I was able to derive great additional information from my previous knowledge of phrenology, and now that I have been entrusted with a large asylum, I am inclined to attribute any little success that may have attended my efforts to ameliorate the condition of those confided to my charge to the same cause."

Sir **ARTHUR MITCHELL** (1826-1909), Commissioner in Lunacy for Scotland, was also friendly to the doctrine. He republished Andrew Combe's "Mental Derangement," stating that "the soundness of the fundamental principles of phrenology may be considered as no longer in dispute."

Dr. **LITTLETON FORBES WINSLOW** (1810-1874), in a work entitled "The Principles of Phrenology as Applied to the Elucidation and Cure of Insanity," London, 1832, said :

"A knowledge of the principles of this science will be found highly serviceable to the physician in enabling him to prevent the development of insanity in those who are hereditarily or otherwise predisposed to this distressing malady. . . . The correctness of their localisation of the functions of the brain becomes at once so plainly demonstrated, that the non-acceptance of phrenology is next to impossible."

Dr. **JOHN GLENDINNING**, of Manchester (Clinical Lectures, 1842), said :

"The business of reform in mental science has been resumed on other and sounder principles by Dr. Gall ; and phrenology will, I doubt not, generally be regarded as the only system before the public that makes any tolerable approach to what the enlightened common sense of mankind can recognise as science, and useful for practical purposes. It was the study of insanity that gave Gall the clue ; and people are unconscious witnesses against, and telling illustrations of, the unsoundness of the earlier systems."

DANIEL HACK TUKE (1827-1895), the well-known alienist, son-in-law of Conolly, in the *Asylum Journal of Mental Science*, 1856, wrote :

"The diversity, as regards the form and size of the human cranium, can only have escaped the notice of the least observant, or failed to excite some interest in the least reflective. This diversity is observable not only in regard to the whole head but also its several regions ; the head of one is large and massive, of another small and ill-developed ; but more than this, the forehead of one may be broad and ample, while that of another is shallow and retreating ; these facts are notorious.

On the other hand the mental characteristics of one individual do not contrast less strongly with those of another. Between the two extremes of the highest psychical endowments and the helpless condition of idiocy every conceivable shade of intellectual character and functions is to be met with. . . . We owe something to the phrenological school for their analysis of the mind, which (whatever may be the fate of Gall's cerebral physiology) is more practical than any which preceded it, and probably many are not aware to how considerable an extent they assume the truth of the divisions of the phrenologists."

JOHN ELLIOTSON, F.R.S. (1791-1868), Dean of the Medical Faculty in the University of London, President of the Royal Medical and Chirurgical Society, wrote in *Human Physiology*, in 1836 :

"I always taught phrenology in my lectures upon insanity, when I had the chair of the Practice of Medicine in St. Thomas's Hospital ; and notwithstanding this was stated to the University of London when I offered myself for the chair of the Practice of Medicine in that institution, I was unanimously elected, and have not only discussed the subject of insanity there ever since upon phrenological principles, as the only ones by which a person can have any knowledge of insanity, but have promised a statement and defence of phrenology on arriving at that part of my course. . . . Those who have studied it know that phrenology unfolds the only satisfactory account of the mind—human and brute ; that it contributes to establish the surest foundation for legislation, education, and morals, and presents a large department of nature in the noblest, grandest, and the only satisfactory point of view ; and that those who reject or neglect phrenology are lamentably ignorant of much which they fancy they know, and deprive themselves not only of much intellectual delight, but of much practical utility."

Dr. **SAMUEL G. HOWE** (1801-1876), the founder of the Perkins Institution for the Blind, Massachusetts, U.S.A., wrote : "Before I knew Phrenology, I was groping in the dark as blind as my pupils ; I derived very little satisfaction from my labours, and fear that I gave but little to others." He educated Laura Bridgman (1829-1889), the blind deaf-and-dumb woman who entered the Institution in 1837, on phrenological principles, and with what success all the world knows. Another inmate of that Institution, of remarkable intellect and similarly afflicted—blind, deaf, and dumb—is Miss HELEN KELLER, born 1880, who entered in 1886. Both cases are incontrovertible proofs of the mental powers being innate. They had latent gifts which only wanted drawing out. The Reports of the Perkins Institution contain a complete history.

Among well-known members of Phrenological Societies and active **supporters of phrenology,** besides those mentioned, who left written records of their views, were :

DISNEY ALEXANDER, Medical Superintendent of Wakefield Asylum.

JOHN ASHBURNER, M.D. (1816-1878).

EDWARD BARLOW, M.D., University of Edinburgh.

Sir **WILLIAM BAYNES** (-1866).

RICHARD BEAMISH, F.R.S. (-1873), member of Phrenological Association.

T. E. BEATTY, M.D., Professor of Medical Jurisprudence, Royal College of Surgeons, Ireland.

BINDON BLOOD, F.R.S.E.

CHARLES BRAY (1811-1884), author of numerous philosophical and phrenological works. (See Chapter XXII.)

Sir **CHARLES BULLEN** (1769-1853), admiral.

JOHN BUTTER, F.R.S. (1791-1877), surgeon.

CHARLES CALDWELL (1772-1853), Professor of Medicine in Lexington University; the chief advocate of the doctrine in the United States.

W. W. CAMPBELL (-1840), Lecturer on Anatomy, Royal College of Surgeons, Ireland.

RICHARD CARMICHAEL (1779-1849), of Dublin, surgeon.

ROBERT CHAMBERS (1802-1871), one of the Editors of *Chambers' Journal*, a forerunner of Darwin, with his book entitled "Vestiges of Natural History of Creation" (1844). See Chapter XXIV.

RICHARD CHENEVIX, F.R.S. (1774-1830), chemist.

JOHN CHEYNE, F.R.S.E. (1777-1836), Physician General to H.M.'s Forces in Ireland.

RICHARD COBDEN (1804-1865), the famous economist.

JOHN C. COLQUHOUN, M.D. (1785-1854).

Sir **ASTLEY COOPER** (1768-1841), the famous surgeon.

J. J. COWAN (1812-), Lecturer on Anatomy.

Judge **P. C. CRAMPTON** (1782-1862), Professor of Law in Trinity College, Dublin.

JAS. GEO. DAVEY, Lecturer on Insanity, Bristol Medical School.

CHARLES DICKENS (1812-1870), the celebrated author.

BRYAN DONKIN, F.R.S. (1768-1855), engineer and inventor, formerly an auditor of Gall in Vienna, who, together with Dr. Elliotson, discovered Deville, the phrenological bust maker, and formed the London Phrenological Society and later the Phrenological Association, which met concurrently with the British Association in different towns in Great Britain.

BRYAN DONKIN, C.E. (1835-1902), the former's son.

JAMES L. DRUMMOND (1783-1853), Professor of Anatomy, Belfast.

ROBERT DUNN, F.R.C.S.

W. F. EDWARDS, F.R.S. (1777-1842), naturalist.

J. ESDAILE (1808-1859), surgeon. (See Chap. XXXVII).

RICHARD S. EVANSON, Professor in the Practice of Physic in the Royal College of Surgeons, and Secretary of the Phrenological Society, Dublin; one of the founders of the Phrenological Association.

FRANCIS FARQUHARSON, M.D., F.R.C.S., surgeon; Vice-President of Phrenological Society.

ROBERT FERGUSON, M.P. (1767-1840).

Sir **WILLIAM FERGUSSON** (1808-1877), surgeon.

Sir **JOHN FIFE** (1795-1871), Lecturer on Surgery.

Sir **JOHN FORBES,** F.R.S. (1787-1861), Editor of the *British and Foreign Medical and Chirurgical Review*; member of Phrenological Association.

H. S. GALBRAITH, Medical Superintendent Glasgow Royal Asylum.

WILLIAM GREGORY, F.R.S. (1803-1858), Professor of Chemistry in the University of Edinburgh and President of the Royal Medical Society.

W. A. GUY (1810-1885), Professor of Forensic Medicine, King's College, London.

Sir **HENRY HALFORD** (1766-1844), Physician to George III., George IV., William IV., and Queen Victoria.

Hon. **DOUGLAS HALLYBURTON** (1799-1852), M.P., member of the Phrenological Association.

ROBERT HAMILTON, F.R.S.E., (1749-1830) surgeon; member of the London Phrenological Society.

S. HARE, Medical Superintendent of Leeds Asylum.

ROBERT HARRISON, M.D., Professor of Anatomy and Physiology, Royal College of Surgeons, Ireland.

JOHN HASLAM (1764-1844), Medical Superintendent of Bethlem Asylum.

Sir **HENRY HOLLAND,** Bt. (1788-1873), the famous physician, was a member of the Manchester Phrenological Society.

JOHN HOUSTON, M.D. (1802-1845), Lecturer on Surgery, Dublin.

W. HOWITT (1792-1879), well-known author.

ROBERT HUNTER (1805-1865), Professor of Anatomy and Physiology in the University of Glasgow.

WILLIAM HUNTER (1805-1867), Professor of Logic in the Andersonian University of Glasgow.

JACOB (1790-), Professor of Anatomy, Dublin.

JAMES JOHNSON (1777-1845), Physician Extraordinary to King William IV.

THOMAS LAYCOCK, F.R.S.E. (1812-1876), Professor of Medicine and Medical Psychology, Edinburgh ; author of " Mind and Brain " (1860). See Chapter XX,

WILLIAM LAUDER LINDSAY, M.D. (1829-1880), author of " Mind in Animals."

HUMPHRY LLOYD (1800-1881), Professor of Natural History, Trinity College, Dublin.

LONGFIELD, Professor of Political Economy, Dublin.

FILIPPO LUSSANA, M.D. (1820-1898), author of " Lezione di Frenologia," Parma, 1864. (See Chapter XXXII.)

JAMES MACARTNEY (1770-1843), Professor of Anatomy and Surgery, Trinity College, Dublin.

Sir **JOHN MACINTOSH** (1765-1832), Lecturer on Medicine and Pathology, Edinburgh.

W. C. MACINTOSH, Medical Superintendent, Perth Asylum.

Sir **FRANCIS MACKENZIE,** Bt.

Sir **GEORGE MACKENZIE,** Bt., F.R.S. (1780-1848), geologist; member of the Aberdeen Phrenological Society and Phrenological Association; author of " Illustrations of Phrenology."

Sir **JOHN MACKENZIE** (1765-1832), member of the Edinburgh Phrenological Society.

ALEXANDER MACKINTOSH, Medical Superintendent Dundee Royal Lunatic Asylum.

D. MACKINTOSH, Medical Superintendent Newcastle Asylum.

CHARLES MACLAREN (1782-1866), Editor of the *Scotsman.*

ROBERT MACNISH, M.D. (1801-1837), medico-psychological writer, author of " An Introduction to Phrenology."

Sir **HENRY MARSH,** Bt. (1790-1860), Consulting Physician, Dublin General Hospital, President Dublin Phrenological Association.

G. MARTELL, Surgeon to Portsmouth Prison.

HARRIET MARTINEAU (1802-1876), the novelist.

H. MAUNSELL, M.D., Professor Royal College of Surgeons, Ireland.

THOMAS MAYO, M.D. (1790-1871), author of *Pathology of the Human Mind* (1838).

J. AITKEN MEIGS (1829-1879), Professor of Medicine, Pennsylvania College ; known for his " Catalogue of Human Crania," Philadelphia, 1857.

W. F. MONTGOMERY, M.D., Professor Queen's College of Physicians, Ireland.

Sir **ALEXANDER MORISON** (1779-1866), author of " Lectures on Insanity " (1848).

Dr. **MORRISON,** Lecturer on Anatomy, Newcastle School of Medicine.

PATRICK NEILL, F.R.S.E. (1776-1851), naturalist.

J. P. NICHOL (1804-1859), Professor of Astronomy, University of Glasgow ; member of the Phrenological Society.

DANIEL NOBLE, M.D. (1810-1885), author of " The Brain and its Physiology " (London, 1846), " Elements of Psychological Medicine " (1853), and " The Human Mind " (1858).

CARL OTTO (1795-1879), Professor of Forensic Medicine and Pharmacology, University of Copenhagen ; published " Phrenologien," 1825. (See Chapter XX.)

ROBERT OWEN (1771-1858), the philanthropist and social reformer, member of the Phrenological Association.

D. B. REID, F.R.S.E. (1805-1863), chemist.

Sir **BENJAMIN WARD RICHARDSON,** M.D. (1828-1896).

BENJAMIN SILLIMAN (1779-1864), Professor of Chemistry, Yale College, U.S.A

SAMUEL SOLLY, F.R.S. (1805-1871), Lecturer on Anatomy and Physiology, St. Thomas's Hospital ; author of " The Human Brain " (1836) ; member of the Phrenological Association.

JAMES STEWART, M.D., physician to H.R.H. the Duke of Sussex.

WM. STOKES, F.R.S. (1804-1878), physician.

JOS. STRATON, F.R.S.E. (-1856).

EDMUND S. SYMES (1805-1871), surgeon ; member of the Phrenological Association.

ROBERT B. TODD (1809-1860), author of " Anatomy of the Brain " (London, 1845), and Joint Editor of the " Cyclopædia of Anatomy and Physiology."

Sir **WALTER C. TREVELYAN,** F.R.S.E. (1797-1879), member of the Phrenological Association.

ALFRED RUSSEL WALLACE (1823-1913), the great naturalist, colleague of Darwin. (See Chapter XXIV.)

H. C. WATSON (1804-1881), President of the Royal Medical Society, Edinburgh.

WILLIAM WEIR, M.D., Lecturer on the Practice of Medicine, and afterwards Lecturer on Phrenology, Andersonian University, Glasgow, a chair being endowed in 1845 ; Editor of the *Glasgow Medical Journal.*

Rev. Dr. **DAVID WELSH** (1793-1845), Professor of Church History, Edinburgh ; member of the Edinburgh Phrenological Society.

RICHARD WHATELY (1787-1863), Archbishop of Dublin.

Sir **C. WHEATSTONE,** F.R.S. (1802-1875), inventor of electric telegraph ; member of the Phrenological Society, Edinburgh.

FRANCIS WHITE, President Royal College of Surgeons, Ireland.

H. T. M. WITHAM, F.R.S.E.

In 1836 the *Edinburgh Phrenological Society* numbered 630 members, 105 of whom were doctors. Their museum contained 463 skulls, 280 busts, and 100 masks of eminent or notorious individuals. The collection is now in the Museum of the new University Buildings.

The *London Phrenological Society,* founded by Dr. Elliotson in 1824, consisted of 300 members, 100 of whom were medical men. It owned 300 to 400 specimens. Dr. Spurzheim owned 800 to 900, Mr. Holm 300 to 400, etc.

There were Phrenological Societies **in every big town** in Great Britain, and lectures on Phrenology were given at the London and St. Thomas's Hospitals, and at the London Institution.

Now, the question may well be asked : **Were all these men mistaken ?** Were Gall, Spurzheim, and Combe deceivers, and the large number of eminent men we mentioned the deceived ? Some people evidently think so. Thus one of our leading medical journals, in a review of one of my early lectures, said :

" We are not inclined to subscribe anything to the credit of Gall and Spurzheim. They kept up a noisy and futile controversy for half a century, and caused a great deal of mind force to be wasted in wrong directions. The only lesson worth speaking of which the phrenologists left behind is a telling illustration of the enormous misleading force of mental predisposition. In fact, the rise and diffusion of phrenology forms a very curious and instructive chapter in the history of human error."

I have already shown—as I believe, to the satisfaction of every unprejudiced reader—that Gall was one of the great investigators well deserving of a monument in medical history. Nor was the controversy which he raised "noisy and futile." The noise was all on the side of his adversaries, and those who have the patience to follow me in the further history of medical research and philosophy will come to see that the controversy was not futile; on the contrary, **the shadow of Gall has pursued our modern investigators** so persistently that they "swore at him" in their works to hide the fact that they were preaching his doctrines. And the moral is: **Truth cannot be suppressed; it must be revealed some day!**

Let us compare the opinion just quoted with that of another authority.

Sir **SAMUEL WILKS** (1824-1911), late President of the Royal College of Physicians, London, wrote in "Guy's Hospital Reports," 1879:

"It seems astonishing at the present time, when phrenological societies have ceased to exist, and we look calmly back on the achievements of their members, to contemplate the bitter animosity which was exhibited towards them by their opponents in all classes of society. Physiologists simply ignored them, and looked upon the attempts to apportion out the brain into organs corresponding to the functions of the mind as gratuitous and fanciful; whilst the literary and religious public became their bitterest antagonists because they made mental processes depend upon organisation. The virulence and abuse poured upon phrenologists by reviewers and magazine writers would seem almost incredible were not the evidence before us to attest it. . . . It was true, of course, the phrenologists were materialists, in the sense that they endeavoured to associate all mental phenomena with the brain. They did not hesitate for a moment to state the principle on which their new science was founded, and one of their leaders, Dr. Engledue, was the first who used the term *cerebration* to designate the operation of the brain. They discarded the psychical notion of the human individuality, as expressed by Addison in the *Spectator*, where he says: 'What we call the faculties of the soul are only the different ways or modes in which the soul can exert itself'; but they announced their doctrine as expressed by one of the earliest teachers of the system in such words as these: 'The right method is at last attained. Mind is studied as it is constituted by the Creator in its natural relation to the body, not in a state of fanciful existence. The facts of the physiologists are substituted for the phantasies of the metaphysicians. Locke talked of an algebra of morals. Phrenology almost holds out the prospect of realising such an idea. It unites into one the philosophy and physiology of man.' And Spurzheim, in speaking of the older methods of mental philosophy, says: 'One fact is to me more positive and decisive than a thousand metaphysical opinions.'

"In myself considering phrenological works in an unprejudiced spirit, I cannot but be struck with the great object which the writers presented to themselves, and the mode in which they proposed to prove the truth of their doctrine. Their object was the same as that which is now considered most rational. They discarded the notion that the brain was to be regarded simply as associated with the mind and there left, but they looked upon it as a compound and complex organ. They were the first who replaced the old method of anatomists, of slicing up the brain, by unfolding and dissecting it. They showed that it was made up of parts, each having its own function. They erred no doubt in hastily framing a system whose correctness did not admit of proof [the system was Spurzheim's, not Gall's]; but out of it arose discussions on the different faculties of the body and mind, which must have made the phrenological societies in London overflow with interesting debates. They discussed the subject of language in a manner which had never before been attempted, as well as co-ordination, time, the muscular sense, the feeling of resistance, and kindred subjects. Aphasia, indeed, seemed clearly understood, and language was located by them in the region where the physiologists are now agreed to place it. If phrenologists had not stated so strongly their belief in the existence of separate organs in the brain, but had used their system merely as an hypothesis, no objection could have been urged against it, for it developed for the first time a number of theories as to the nature of the different faculties of the

mind. The transactions and reports of the old phrenological societies give accounts of debates on subjects of the deepest interest, such as can nowhere be found in the records of other learned societies, for, on the one hand, there was merely the metaphysical system to explain mental phenomena, and, on the other, the simple physiological one which gave little more account of the brain or its functions than could be discovered in the laboratory by experiments on animals.

" The opposition they raised was due to their assumption of the functions of the surface of the brain, whereas it was clear to physiologists that it had other properties than those assigned to it by phrenologists. The latter were, however, able to answer the objection ' that injuries of the brain were not attended by loss of that mental quality which the new system would demand ' by declaring that the brain was double, and they did not even deny that the brain had other functions than those of mental action. . . . That they also associated the will and movements with the anterior portion of the brain may be seen in the writings of Dr. Combe, the great apostle of phrenology. He maintained that the anterior lobes were connected with the will, and that their convolutions bore an analogy to the peripheral expansion of a simple nerve of motion. The fibres which ultimately constitute the convolutions, although proceeding from the motor and sensory tracts, may reasonably be presumed to perform functions distinct from motion and sensation. One view is that the organ of mental faculties which *use* muscular motion and sensation as their instruments of manifestation, and the relations of the convolutions to the two tracts in question, accord with this view," etc.

Seeing how the phrenological doctrine flourished about the year 1840, **what was it that caused its downfall ?** Certainly not any opposition, for a fair number of the medical profession, if not officially, at least unofficially, gave it its support. No, the disintegration came from within.

There were three events which ruined the doctrine. The *first* was the adoption of a purely **materialistic** tendency, at a time when most people, and consequently a large number of its followers, were devoutly religious.

It was a retired medical practitioner, Dr. **L. E. G. ENGLEDUE**, of Southsea, formerly President of the Royal Medical Society of Edinburgh, who, on June 20th, 1842, in an address at the Annual Meeting of the London Phrenological Association, **by expounding extreme materialistic views** which acted like explosives on the Association, broke it up. He affirmed that phrenologists were in error in propounding that the brain is the organ of the mind, inasmuch as **there is no such thing as mind.** He knew only of the brain ; and the brain was simply a viscus with its own proper functions, like the liver and kidneys. Here are some of his own words :

" We contend that mind has no existence—that we have to consider matter only. What is organised matter ? Merely a collection of atoms, possessing certain properties and assuming different and determinate forms. What is brain ? Merely one kind of organised matter. What do we mean by **cerebration ?** The functions of the brain—one of the manifestations of animal life resulting from a peculiar combination of matter. The varied changes of form which this matter assumes gives rise to the various manifestations of cerebration in the different tribes of beings, and the varied changes of cerebration in the same being originate in molecular alterations—merely other expressions of a new condition.

" The belief in the existence of ' mind ' is an exemplification of the tendency in uncultivated man to personify all the actions of nature—is a barbarous recognition of the manifestation of a property resulting from a peculiar molecular arrangement of matter, and which arrangement **necessitates** the exhibition of the property. The philosopher witnesses the phenomena of thought and acknowledges that the brain is essential to its production—but he is not satisfied with this knowledge, and because he cannot understand and see distinctly how these functions are produced, he, like the savage, has recourse to an external, unknown, invisible agent—to a spirit. Can greater ignorance be manifested ? The philosopher feels the difficulty, but instead of using his best endeavours to unravel the mystery, he cuts the knot,

and enlists a power which he has not seen and cannot appreciate, for the purpose of explaining phenomena for which, as cerebral physiologists, we contend there is already a sufficient cause."

At the conclusion of Engledue's address, some members, after protesting against the views expressed, quitted the hall, and the same week **sixty-five members withdrew from the Association.** The *Zoist*, Dr. Elliotson's paper, defended Engledue, but the *Phrenological Almanac*, No. ii., wrote :

" Our science has received a blow, from the effects of which it will take at least one generation, if not much longer, to recover. Well may we exclaim : ' Save us from our friends ! ' for our enemies, open and concealed, have not injured the science so much during the last twenty years as has been done by the author of the ill-timed and ill-judged essay delivered as an introductory address at the opening of the Phrenological Association. It appears that a very general dissent from his opinions was expressed by the audience ; but those only who were present can know the degree of dissatisfaction, not to use a stronger term, with which his opinions were received by very nearly the whole of the persons present. With one or two exceptions, all who spoke used the very strongest language in combating and reprobating his erroneous views, and all remarked upon the gross impropriety of introducing such discussions to a general audience."

H. G. ATKINSON, the co-worker with Miss Harriet Martineau (1802-1876), the novelist, in their " Letters on the Law of Man's Nature and Development," (1851), expounded similar views to those of his friend Engledue.

" I feel," said he, " that I am as completely the result of my nature, and impelled to do what I do, as the needle to point to the north, or the puppet to move according as the string is pulled. I cannot alter my will, or be other than what I am ; and cannot deserve either reward or punishment."

Atkinson's comparison between a puppet and man has often been made, but is absurd, for the puppet is made by man and does not move unless man pulls the strings which he has attached to it. The " motives " which move man cannot be compared with the strings of a merely mechanical automaton.

Engledue, Atkinson, and other phrenologists were simply the forerunners of a materialistic wave which swept over Europe in the middle of the last century. We shall refer to it in a succeeding chapter.

The *second* cause of the downfall of phrenology was **its association with mesmerism,** which in those days was violently opposed, though now acknowledged under a new name—hypnotism.

When, in 1842, Dr. Elliotson brought before the Royal Medical and Chirurgical Society the " account of a case of successful amputation of a thigh, during the mesmeric state," Dr. James Copland (1791-1870), the chairman, contended that " if the account of the man experiencing no agony during the operation were true, the fact was unworthy of their consideration, because pain is a wise provision of nature, and patients ought to suffer pain while their surgeon is operating ; they are all the better for it, and recover better ! " It was only three years later that chloroform was discovered.

Mesmerism was declared as disproved long ago—like Gall's doctrine, by the same French Academy ; the witnesses of Elliotson's experiments were declared as credulous, the operators as fraudulent, and the patients as impostors. **JOHN ELLIOTSON** (1791-1868), a great physician, who was the first to use the stethoscope and to adopt the practice of auscultation in England, introduced in 1819 by Lænnec (1781-1826), had to resign his professorship in the University. (See Chapter XXXVII.) It must be remembered that there are fashions in medicine as there

are in wearing apparel. A doctor in practice must feel the breeze of popular sentiment with as much attention and accuracy as he does his patient's pulse. What we have not learned is, that even when a subject is practised exclusively by quacks, there may still be some truth in it. What is science to-day was mysticism or quackery in the past. Medicine itself is the outcome of practices which we should not recognise to-day. The "exclusiveness" can be carried too far. Even if mesmerism or animal magnetism, as it was also called, was pure charlatanry in the early part of last century, that was no reason to reject the paper on the strictly scientific investigation of these phenomena, under the term of "hypnotism," which JAMES BRAID (1795-1860), the Manchester surgeon, offered to the Medical Section of the British Association in 1842. Thirty-eight years later, in 1880, the British Medical Association invited a German professor, Dr. W. T. PREYER (1841-1897), to deliver an address at their annual meeting and explain to an English medical audience what Mr. Braid, their distinguished countryman, whom the Germans had learned to honour, had done.

Elliotson claimed to have succeeded also in stimulating the various brain centres in hypnotised subjects, giving rise to a manifestation of those dispositions and capacities located in these regions. This so-called Phreno-Mesmerism was declared, like all the mesmeric phenomena in those days, a pure fraud; later, when hypnotism was accepted, it was explained on the theory of silent "suggestion." But my own experiments in that direction, which have been made under every possible test, excluded any chance of suggestion. The phenomena are so extraordinary that they are bound to arouse scepticism; but as I said, I have found them true (see the author's "Hypnotism and Suggestion," London, 1910), and the fact may encourage some future investigator—in a generation to come—to examine this subject further and develop its possibilities. (See Chapter XXXVIII.)

The *third* cause of the downfall of phrenology was the **advent of the professional character-reader.** The professors of phrenology were, most of them, literally nothing more than "professors"; that is to say, they knew no more of phrenology, not to mention Gall's works, than can be learned from the markings on a phrenological bust. They learned to tell the time by the face of the clock, but did not trouble to understand, and frequently were too uneducated to understand, its works.

This soon caused all Gall's brain physiology and moral philosophy to be forgotten; the phrenological doctrine lost its meaning, and came to be looked upon as a system by which one could tell character or fortune from the protuberances on the head. Just as one looks down upon telling fortune by cards or by the lines of the hand, so was phrenology condemned. This is how men who look only on the surface of things came to group astrology—phrenology—palmistry together; but we should have expected less superficiality from a psychologist like Professor JASTROW ("Fact and Fable in Psychology," 1901).

Already, in 1835, professional phrenology had grown to such an extent, at least in America, that a protest was raised in the *American Annals of Phrenology* of that year:

"There are many abroad teaching the public phrenology who stand in eminent need of instruction themselves. They read a few pages of a work on the subject, and suddenly appear as men full of wisdom and experience. The most prevailing evil is the practice of examining heads; not of well-chosen cases, where examinations may be of use to the science, but indiscriminately. Every head, whether common or uncommon, receives a formal judgment. Not content with satisfying a few inquirers, who may have had their curiosity excited, there are individuals who make it their business, have their shops, and receive pay for their manipulations, at so much per head! This practice only degrades the science. It turns a dignified science into a system of *legerdemain*, and those who are really able to promote the

true philosophy of man will be prevented from investigating the subject, on account of the repulsive appearance of its exterior. . . . In making these remarks, we allude to no particular individual, but to many of whom we have heard. We respect their motives but we protest against their practices. We entreat them to desist, and to aid in promoting phrenology in a way more in accordance with scientific taste."

GEORGE COMBE wrote (*Lancet*, July 4th, 1840):

"In America I find phrenology flourishing in astonishing vigour as a practical art. Wherever I have gone I have found men who call themselves practical phrenologists exciting a vulgar curiosity concerning the science; examining heads, predicating character, using it, in short, as a species of palmistry, and extracting, as I have been told, large sums of money from the people by their skill."

In 1843, we find the following observations in the *Phrenological Almanac*:

"It becomes us as zealous advocates of phrenology to become also guardians to the public for the purity of the science, by the bold exposure of quackery in all its forms. Much as this science has suffered from those misled philosophical opponents, it seems now likely to be travestied by a set of impudent and illiterate quack manipulators. Manipulations, properly conducted by professional phrenologists, are philosophic experiments, and cannot be too highly recommended; but this important practical department of the science we leave to be followed up by those whose professional engagements admit of it. Manipulations for the gratification of personal vanity are practised by peripatetical quacks, who are apt to be confounded by the ignorant with the members of the phrenological school. Their sole aim is to fill their own pockets, by playing upon the weakness and vanity of those who are so foolish as to pay them for being bamboozled."

FLOURENS must have had the professional phrenologists in his mind when he wrote: "Les hommes qui la pratiquent sont des charlatans, et les hommes qui la croient sont des imbéciles." (Quoted by Dr. George Harley, *Medical Times and Gazette*, 1873.)

Learned professors have judged the subject by the popular exhibitions they saw of it, and unfortunately Gall had to suffer in consequence. This explains such statements as that made in D. J. HILL'S "Elements of Physiology," 1900: "Phrenology is a pseudo-science which professes to localise mental faculties by excrescences on the cranium."

But what are we to say to such a mistake as the following, by **JAMES DREVER,** in "Instinct of Man," Cambridge, 1917: **"Gall was certainly more than half charlatan** . . . but Spurzheim and Combe were not charlatans, and phrenology as such was not only very significant historically, but it exercised an important influence on the development of psychology, of educational theory, and to an even greater extent of physiology"? Who originated the doctrine—Spurzheim or Gall? Dr. Drever has now become "Combe Lecturer" on Psychology in Edinburgh University, a chair I presume to be endowed by the same "Combe Trust" that employed Dr. Andrew Wilson a few years ago, another opponent of Gall's doctrine, who seized every opportunity to belittle it. Surely the funds which George Combe left were for the propagation of his teachings, and not for their misrepresentation.

And why should not a man's character betray itself in the shape of his head, as well as his face, general appearance and bearing? It must not be forgotten also that some men have a natural bias for physiognomical observation, as every experienced doctor ought to have.

A man who thus could read character magnificently, to the astonishment of any unprejudiced mind, was L. N. FOWLER (1811-1896), who came to England from the United States in 1860. He was the best known professional phrenologist, and his character readings, as I have often witnessed, were wonderfully accurate, and helped more than anything else at that time to keep up public interest in the subject.

If professional phrenologists had been contented with delineating character, no great harm would have been done ; but they insisted on giving addresses on brain physiology as a preliminary to their demonstrations, in order to explain the principles of the science, of which they were really ignorant. It is on their explanations of the doctrine that such statements are based as the following :

" As a matter of fact, knowing how little relation there is between the bumps on the skull and the brain lying underneath, I would as soon think of attempting to read a person's character and ability by his bumps as I would of scrutinising the ridges on the dome of St. Paul's in order to discover the sort of theology taught by the Dean and Chapter."

The learned professor who made that statement did not know that the size and shape of the brain can be judged by the size and shape of the skull, and cannot have heard of that new science "anthropometry," which promises to run dangerously close to the practices of the despised phrenologists. A representative writer on the subject says :

" Anthropometry promises to be of great value. Measurements of the heads of the most eminent men in the same profession have shown that they are very nearly of the same size and shape. Take, for example, electricians : the heads of Lord Kelvin, Sir William Preece, Professor Perry, and Mr. Crompton are almost exactly the same in size and shape. This no doubt holds for other professions, but extensive measurements of the heads of men eminent in the various professions have yet to be made. When such data have been obtained **the parent may acquire valuable information about the best career for his boy by measurements of his head.** Though measurements with the callipers are valuable, and are very easily made, much more information can be obtained by taking the horizontal contour of the head by a machine somewhat similar to those used by hatters."

The writer of the above would find much valuable information and hosts of measurements in the *Transactions* of the various phrenological societies. Thus modern anthropology has come back to the old phrenology.

CHAPTER XVIII

FLOURENS AND OTHER CRITICS OF GALL

GALL'S biography would not be complete without giving the opinions of his critics—his contemporaries and posterity. Some have already been quoted, others will be mentioned when we deal with the enormous influence he exercised on subsequent philosophy and scientific research. This chapter will be restricted to those criticisms which brought about the neglect of Gall's doctrines and their condemnation ; those, in fact, on which modern opinion of Gall is based. Of course, as we have already seen, there were some men of distinction who wrote in his favour, or, at least, passed an unprejudiced judgment ; but they were few and far between, and failed to stop the attacks on Gall, many of which were expressive of as much rancour and animosity as if Gall had been a criminal. Such language is used sometimes in the writings of political opponents, but rarely in scientific disputes ; and the fact that Gall was denounced in such terms should satisfy us that his opponents were not arguing as scientific men. Considering that practically all his discoveries have been re-discovered in recent times, as will be shown in succeeding chapters, some valuable lessons may be drawn from the opinions quoted.

GERMAN CRITICS

We have already mentioned **J. G. WALTER** (1734-1818), Professor of Anatomy in Berlin, as the first formidable opponent Gall had the pleasure of meeting.

Another was **KARL A. RUDOLPHI** (1771-1832), Professor of Physiology of the Royal Academy of Science, a Swede, first established at Greifswald, then at Berlin. Rudolphi did not approve of Gall bringing in the evidence of comparative anatomy in support of his theory, for **" beasts,"** he thought, **" should not be compared with man."** According to him, it is only the minds of animals that require different cerebral parts for the manifestation of different aptitudes and instincts. For man, the Creator would have been able to constitute, perhaps ought to have constituted, mind entirely independent of this vile inert matter. With this view, it is not surprising that Rudolphi, in his "Treatise on Insanity," wrote : "I have had occasion to examine many hundreds of brains, but I have never found anything which was in accordance with the theory of Gall." He states that he has not seen the enlargements of the spinal cord, the decussation of the pyramids, the structure of the cerebellum, of the annular protuberance, the formation of the corpus callosum, the origin of the optic nerve, etc. "The cerebral parts are all formed of the same substance ; they are not sufficiently dissimilar to allow them to be considered as distinct organs."

Professor **J. F. ACKERMANN**, of Heidelberg (1765-1815), successor to Sömmering in the chair of Anatomy, in a brochure against Gall's doctrine (1806), declared that Gall's discoveries amounted to nothing, since he had not been able to demonstrate the **vital principle,** or life itself, and to explain the functions of the soul. He argued against centres in the cortex, but believed there must exist certain regions in the

brain, in which impressions are treasured up, and he thought that these parts were the optic thalami. In addition to this inferior organ of the soul, he admitted with ERNST PLATNER (1744-1818), another of a more elevated order, in which thought and the comparison of impressions are carried out: this last organ, according to him, was the medullary part of the hemispheres. He considered that there was "an extremely subtle, nervous medulla, soft and almost fluid, which converts itself by degrees in the cavities of the brain into animal vapour, and which becomes a medium between the soul and the nerves of sense."

On the other hand, **FRIEDRICH ARNOLD** (1803-1890), pupil of Tiedemann, in his "Lehrbuch der Physiologie des Menschen" (1838), praised Gall; and **KARL FRIEDRICH BURDACH** (1776-1847), Professor of Physiology in the University of Königsberg, in his compendious work on the brain, "Vom Baue und Leben des Gehirns," Leipsic, 1819-26, acknowledged the greatness of Gall, spoke of him as the most renowned natural philosopher, and put him foremost as a brain anatomist.

A most virulent opponent of Gall was the well-known Vienna anatomist, **JOS. HYRTL** (1811-1894), author of the "Lehrbuch der Topographischen Anatomie." He certainly cannot have read Gall's works. To him Gall's craniology was "charlatanry." Science, he said, ignored Gall's doctrines completely, just as it has to ignore other erroneous theories which are advanced from time to time **"which do not deserve the honour of being refuted"**; it would be futile to discuss them. One of his objections was that Gall regarded only the surface parts of the brain. Then he repeated the tittle-tattle of supposed mistaken diagnoses made by Gall. Brain and skull do not agree in conformation was another objection.

Hyrtl relied on and quoted the criticisms of ANDREAS RETZIUS (1796-1860); but Retzius had relied on the evidence of Flourens. Nevertheless, he admitted "there is nothing absurd in the localisation of psychical activities in special parts of the brain."

Hyrtl, like others, did not criticise Gall, but the vague conception of what he thinks was his theory. But imagine what harm these professors did in instilling these false ideas in a number of students every year, for most of whom it was enough for the rest of their lives "that their great teacher thought and said so."

The celebrated German physiologist, **JOHANNES MÜLLER** (1801-1858), pupil of Rudolphi, founder of the physico-chemical school of physiology, in his "Handbuch der Physiologie des Menschen" (1837), wrote identically with Gall:

"In no part of physiology can we derive greater aid from comparative anatomy than in the physiology of the brain. Corresponding with the development of the intellectual faculties in the different classes, we meet with very great differences in the form of the brain, which are highly important in aiding us to determine the functions of the different parts of the organ. . . . The brain undergoes a gradual increase of size from fishes up to man, in accordance with the development of the intellectual (?) faculties. All parts of the encephalon, however, do not keep pace equally with the development of the intellectual powers. It is in the cerebral hemispheres that the increase of size in the higher animals chiefly takes place."

Compare Müller's statement with the passage in the *Edinburgh Review*: "We deny that there is any connection or proportion whatever to be observed, on a comparison of animals with each other, between their intellect or inclinations and the number of parts in their brains."

Müller, however, had evidently not read Gall's work, for he had the impression that Gall located the Wolffian faculties of memory, imagination, etc., and says, what Gall himself said: "There is no circumscribed area in the brain, in which *memory, imagination*, etc., can have their seat." And he was against the localisation theory *in toto* because **injuries to the head,** in his experience, **do not affect the mental powers;** an erroneous view, which Gall had exposed.

A very popular work is the "History of Materialism" (1875), by **F. A. LANGE** (1828-1875). This is a fairly modern book, and therefore we should expect some newer criticisms of Gall. But what do we find? Lange still relied on antiquated authorities. He said:

"It still holds good, **as Johannes Müller said** in his 'Physiology': 'With regard to the principle, its possibility cannot *a priori* be denied; but experience shows that the system of organs proposed by Gall has absolutely no foundation in facts, for **the history of injuries to the head is directly opposed to the existence of special regions of the brain destined for particular mental activities.**' The frontal lobes of the cerebrum have to carry a mass of such important organs, that the destruction of a part of them in serious injuries of this region must always become noticeable, especially as intelligence, talent, etc., are here concerned, the disappearance of which is easier to establish than the change of a moral quality. *Yet in the large number of brain injuries in the frontal part of the head, which have been under exact observation, nothing has ever yet been found that can be made without extreme violence to point in this direction.* There are even cases in which quite unequivocally *both* frontal lobes of the cerebrum have been seriously affected and destroyed, and in which not the least disturbance of intelligence was observed. (!) If any one shows me that a slight injury to some portion of the brain makes an otherwise healthy cat give up mousing, I will believe that we are on the right path of physiological discoveries. But even then I will not assume that the point has been found in which the ideas of mouse-hunting have their exclusive seat. If a clock strikes the hours wrongly because a wheel is injured, it does not follow from this that it was this wheel that struck the hours. . . . It is with them (the cerebral functions) much as if one tries to find the various activities of a locomotive, so far as they can be externally observed, localised in the individual steam-pipes or in particular parts of the machine. Here the faculty of expelling smoke, there a similar faculty of running quickly or slowly, and elsewhere again the capacity for drawing burdens. In our whole traditional psychology the actions of men are classified, without any regard to the elements of their origin."

In answer to Lange's objection, taken from Müller, it has to be pointed out that the latter was a physiologist by profession, and Lange was a journalist by profession, and that therefore neither was in a position to make clinical observations as to whether injuries of the head ever lead to the loss of any of the primitive mental powers. But the reader will find in this work over 1,000 cases cited, showing that injuries to circumscribed portions of the brain do affect particular mental qualities. I have never observed localised injuries in cats—my investigations deal only with human beings—but it will be shown by overwhelming evidence that instincts similar to the mouse-hunting instinct in cats may be lost in man. The comparison of a wheel of a clock and a circumscribed area of the cortex is not a good one; for we know that from the brain centre goes forth the energy for the manifestation of a certain tendency, but nothing goes forth from the wheel, which is merely a passive agent. Neither is Lange's comparison of the cortex of the brain to a locomotive a good one. If psychology is ignorant of the elements of mind and character, of the springs which move to action, it is psychology that is at fault. It is too late in the day to argue whether there are specific centres in the brain. Why should the locomotive objection be brought against Gall's theory, and not equally against the theory of the motor and sensory centres, and the various speech centres of modern physiologists, to which it is much more applicable?

ANDREAS RETZIUS (1796-1860), of Stockholm, the originator of the classification of skulls into brachycephalic and dolichocephalic, orthognathic and prognathic, in an examination of Gall's doctrine ("Die Phrenologie vom wissenschaftlichen Standpunkte aus beleuchtet," Tübingen, 1844), was adverse to it, because of the **unity of the "ego."** Moreover, Gall's anatomy must be bad because his physiology was unsound. **Gall knew nothing of the convolutions of the brain.** Many mammals

have no occipital lobes. There have been great minds with extraordinary small heads. He made no reference to the fact that Gall explained all these points, so we must assume that he never read his works. Retzius concluded that he did not dismiss the doctrine entirely; his objection was that, in his philosophy, **Gall had destroyed the unity of the mind and that he based his conclusions on an anatomy which had no existence.** Retzius recognised, however, that his own skull classification and scheme of measurement would be of no value if the brain and skull did not agree in conformation; he therefore conceded that point.

K. RIEGER ("Über die Beziehungen der Schädellehre zur Physiologie, Psychiatrie und Ethnologie," Würzburg, 1882) **declares Gall a "swindler."** Gall's doctrine is dead. Any child to-day can see its errors. Gall's psychology consists of impossibilities. "For genuine scientists, **Gall's errors were so crude, that they could be treated only with pitiful contempt.** . . . But genuine scientists are so few, that false doctrines, however grave their errors may be, do infinite mischief."

A. BÄR (1834-), in his work, "Der Verbrecher in anthropologischer Beziehung," Leipsic, 1893, commenced with the false statement that Gall designated his system "phrenology." Nowhere in Gall's works can that term be found. Then he asserted: "The formation of the skull is in no wise dependent on that of the brain."(!) He relied still, and that in the year 1893, on Flourens' argument that **the brain acts as a whole,** and localisation of functions is impossible. He admitted that Gall is the founder of what is now called "criminal anthropology"; LOMBROSO (1835-1909) did not acknowledge the fact.

ENGLISH CRITICS

Gall's doctrine met in England and Scotland with a very hostile reception, which took the form of ridicule and abuse of every imaginable description.

The *QUARTERLY REVIEW*, in its notice of Madame de Stäel's *L'Allemagne*, censured her for being "by far too indulgent to such **an ignorant and interested quack** as the craniologist Dr. Gall." *BLACKWOOD'S MAGAZINE* was more expressive still. It called Gall an "infernal idiot."

Sir **JOSEPH BANKS** (1743-1820) proclaimed it "damned nonsense"; while Sir **ASTLEY COOPER** (1768-1841) pronounced it to be "calculated to bring immortality to its author." (*London Medical Journal*, 1832.) Sir **SAMUEL WILKS** (1824-1911), in an admirable review in "Guy's Hospital Reports," 1879, also expressed his admiration for Gall's doctrine. (See previous chapter.)

Dr. **JOHN GORDON** (1786-1818), of Edinburgh, an esteemed lecturer on anatomy and physiology, wrote in the *Edinburgh Review*, 1815, No. 49 and succeeding numbers:

"**The writings of Drs. Gall** and Spurzheim **have not added one fact** to the stock of our anatomical knowledge, respecting either the structure or functions of man; **but consist of such a mixture of gross errors, extravagant absurdities, downright misstatements,** and unmeaning quotations from Scripture (!), as can leave no doubt, we apprehend, in the minds of honest and intelligent men as to the real ignorance, the real hypocrisy, and the real empiricism of the authors. . . . We look on the whole doctrines taught by these two peripatetics, anatomical, physiological, and physiognomical, as a piece of **thorough quackery** from beginning to end. . . . To enter on a particular refutation of them would be to insult the understandings of our readers. Indeed, we will flatter the authors so far as to say that their observations are of a nature to set criticism at defiance. They are **a collection of mere absurdities, without truth, connection, or consistency, and incoherent rhapsody, which nothing could have induced any man to have presented to the public, under the pretence of instructing them, but absolute insanity, gross ignorance, or the most matchless arrogance.** . . . Such is **the trash, the despicable trumpery,** which two men, calling themselves

scientific inquirers, have the impudence gravely to present to the physiologists of the XIXth century as specimens of reasoning and induction. . . . Well has the learned and witty historian of John Bull's indisposition remarked, there is nothing so impossible in nature but mountebanks will undertake; nothing so incredible but they will affirm. . . . There are a certain number of individuals, however, in every community, who are destined to be the dupes of empirics. So it would be a matter of surprise if these itinerant philosophers did not make some proselytes wherever they came."

Anatomy had passed its verdict—in the person of Dr. Gordon; physiology demolished Gall—in the person of Dr. **P. M. ROGET** (1779-1869). In his text-book on that subject, he argued first of all that **the brain is uniform—acts as a whole,** for all the diversity of mental functions, for: "Does not the same stomach digest very different and even opposite kind of aliment? Yet we do not find one portion of that organ is destined for the digestion of meat, and another for the digestion of vegetable matter." This from a teacher of physiology, apparently not aware that digesting is no more than digesting, whether it be performed on turtle or roast beef, animal food or vegetable! Again, this same author said: "Nerves perform the double office of volition and sensation; but the different bundles of fibres which convey such impression, the one to the muscles, the other to the sensorium, are wrapped up in the same sheath, and are so intimately intermixed during their course as to constitute a single cord." According to Roget, if a nervous cord, which is in reality single in its nature, can perform a double function, there could be no reason why the brain may not do the same. He had looked at a nervous cord which performed two very distinct functions; and because, to his eye, it looked single, he drew the conclusion that the same part can perform two duties which are entirely different in their nature. But PROCHASKA (see Chapter X.) did the same, and could not avoid the conclusion "that the nervous fibres conducting the impressions to the central organs, and transmitting motor impulses from them, were distinct." Finally, Roget asserted that "there is not a single part of the encephalon which has not, in one case or other, been impaired, destroyed, or found defective, without any apparent change in the sensitive, intellectual, or moral faculties." I wonder if persons who make such a statement, and believe it, have ever asked themselves the question: "Of what use, then, is the brain?"

In 1826, Lord **JEFFREY** (1773-1850), the Editor of the *Edinburgh Review,* designated the doctrine of Gall as "crude," "shallow," "puerile," "fantastic," "dull," "dogmatic," "incredibly absurd," "foolish," "extravagant," and "trash." In his opinion, "there is no connection between body and mind." If so, then insanity is not a bodily disease.

Lord **BROUGHAM** (1778-1868), too, asserted that "the ordinary course of life presents the mind and the body running courses widely different, and in great part of the time in opposite directions, and this affords strong proof that **the mind is independent of the body."**

On the other hand, **W. B. CARPENTER** (1813-1885), the celebrated physiologist of the middle of the XIXth century, wrote in the *British and Foreign Medico-Chirurgical Review,* 1846: "There is a very general correspondence between certain forms of the cerebrum, arising from the cerebral development of its different portions and certain leading diversities of character, which might not unfairly be regarded as indicating that these several divisions are the special instruments of particular groups of intellectual or moral faculties."

Yet later, in the fifth edition of his "Human Physiology," he changed his mind on this subject, and, like LANGE ("History of Materialism," 1875), compared the brain to a steam engine "which may be employed in carrying it forwards and backwards, according to the direction given to its action," and judged from this steam-engine argument that "it must be fundamentally erroneous to attempt to

parcel out the cerebrum into distinct 'organs' for these respective faculties; the whole of it, so far as we can judge, being called into operation in every kind of mental activity." Yet, when speaking of animals, Carpenter said: "When the cerebrum (cerebral hemispheres) is fully developed, it offers innumerable diversities of form and size among various individuals; and there are many diversities of character." He evidently meant to say that the hemispheres of the brain of man and the higher vertebrates present as many diversities in form and size as there are diversities of individual character. Gall said no more; but Gall proceeded to observe carefully the two series of facts, to compare them, and to draw deductions as to how far the form and size of certain parts corresponded with certain mental characteristics.

However, Carpenter did not keep to this view, for he later asserted that "comparative anatomy and experiment alike sanction the conclusion that the purely instinctive propensities have not their seat in the cerebrum." Of what use, then, is the animal brain? That question does not seem to have occurred to Carpenter.

Up to 1873, this celebrated physiologist held the view that "the cerebral hemispheres, as the organ of thought, do not act in isolated portions, but as a whole"; but he again abandoned this view when he became acquainted with the results of experiments made by Ferrier (see Chapter XX.). When the *Times* newspaper, not being acquainted with the change of opinion, credited him with the old view, Carpenter contradicted the statement in a letter to the *Times*, September 27th, 1873. Then once more he reverted to his old view:

"The cerebrum," he wrote, "is the material organ through whose instrumentality all the processes of thought and feeling are carried on. Take, moreover, the existence of facts, such as that **injuries to the head affect, not unfrequently, one or more of the mental powers, while others remain perfectly sound,** has appeared to not a few physicians to make the supposition far from unreasonable that different portions of the cerebral hemispheres have different functions allotted to them."

Carpenter said that head injury not infrequently affected one or more mental powers; yet Müller, Lange—and, as we shall see further on, Schopenhauer—asked: "Whoever heard of such a thing?" and on that ground condemned Gall's doctrine. Carpenter not only accepted this view, but proceeded to locate the intellect in the *posterior* lobes, on the ground that only the quadrumana and man possess them.

Sir **BENJAMIN BRODIE** (1783-1862), a pupil of Abernethy, in his examination of Gall's doctrine ("Psychological Inquiries," 1855), was of the same view as Carpenter that the posterior lobes are lacking in the lower animals. He said:

"The fact is that the posterior lobes exist only in the human brain, and in that of some of the tribe of monkeys, and are absolutely wanting in quadrupeds." And he was of opinion that, "in the bird's brain, what appears to a superficial observer to correspond to the hemispheres is found, on a more minute examination, to be apparently the *corpora striata* developed to an enormous size."

We have already quoted Gall on this subject. The fact is that in many animals, such as the elephant, the dolphin, the ape, etc., the cerebellum is as much covered by the posterior lobes as it is in man. The error has its source in the position of the head, more or less horizontal or vertical in animals. Comparing the male and female brains in the same species, it will be observed that in all females the posterior lobes are more developed, more completely covering the cerebellum than in males. If these lobes were connected with the higher intellectual faculties, it should follow that women excel men as to the noblest faculties of the mind.

Sir **THOMAS SPENCER WELLS** (1818-1897), *Medical Times and Gazette*, 1860, said: **"This bubble has been so often and so demonstratively exploded,** that we scarcely

think men of science are bound any more to trouble their heads about it. That such a fanciful idea as that of reading a man's soul by the language of bumps on his head should be taught and believed in is nothing wonderful. What outrages on common-sense, on natural laws, on scientific facts, will men not teach and men believe ? "

In a letter to Dr. F. James C. D. Carson (1772-1843), he replied : **" Our mind is made up about it,** just as it is made up about mesmerism, homeo-quackery, or perpetual motion." Our minds are made up on a good many subjects, but did we give the other side a patient hearing ?

" Our mind is made up about it as it is made up about mesmerism," wrote Spencer Wells. But mesmerism has since been adopted by the medical profession, owing to Heidenhain and Charcot. True, we modified the method of its induction, made a change in the theory, called it by a different name and proved the originator to have been only a quack whose work one could not seriously consider—and mesmerism in its new garb under the title of hypnotism or " suggestion " flourishes ; indeed, in the treatment of functional disorders of the nervous system, it is frequently a valuable aid. Yet Dr. Elliotson, when he tried to induce the profession to take up the practice, was kicked out of the University College Hospital, deprived of his official position, and practically of his livelihood. Should not that be a lesson to us ?

No comparison of scientific merit is possible between Gall and Mesmer.

Sir **FREDERIC BATEMAN,** in his work on " Aphasia or Loss of Speech," 1890, wrote :

" In spite of all that has been said against Gall, and all that has been written in depreciation of his labours, beyond all doubt his researches gave an impulse to the cerebral localisation of our faculties, the effect of which is especially visible in our own days, and I look upon his work as a vast storehouse of knowledge, and as an imperishable monument to the genius and industry of one of the greatest philosophers of the present age."

Before that, in 1869 (*Journal of Mental Science*), Bateman wrote :

" Gall's labours would undoubtedly have met with more hearty reception from his contemporaries had not the Austrian priesthood raised the cry of ' materialism ' as applied to his doctrines. The great German psychologist had no such heterodox notions as his adversaries maliciously attributed to him, for as Hufeland philosophically observes, ' he was employed in analysing the dust of the earth of which man is formed, not the breath of life which was breathed into his nostrils.' As in Gall's days so in ours, this very indefinite and unmeaning word ' materialism ' is used as a kind of psychological scarecrow to frighten all those who are endeavouring to trace the connection between matter and mind. Surely there is nothing contrary to sound theology in assigning certain attributes or functions of an intellectual order to certain parts of our nervous centre ? The cerebral localisation of our diverse faculties, and the plurality of our cerebral organs, strikes no blow at the great principle of the moral unity of man. The same power that caused the earth, like a spark from the incandescent mass of unformed matter, hammered from the anvil of omnipotence, to be smitten off into space, this same power, surely, could just as well ordain that a multiplicity of organs should be necessary to the full development of man's mental faculties as that the manifestation of them should depend on the integrity of one single organ."

Dr. **CHARLTON BASTIAN** (1837-1915), F.R.S., friend and trustee of Herbert Spencer, in " The Brain as Organ of Mind," **claimed to have examined Gall's doctrine and found it " fallacious in almost every respect."** He continued : " Though it would have been almost needless but for the fact that amongst the general public

there are probably very many who may be glad to know upon what precise grounds the system should be rejected." Gall's doctrine is fallacious because :

Reason *one* : Gall considered " the grey matter of the convolutions—the matter which we now believe to be so largely concerned with the most delicate and subtle of brain functions—to have no proper nerve function at all." (!) We have seen that the opposite was the case. Gall was the first to point out the importance of the grey matter of the convolutions.

Reason *two* : That " his analysis of the human mind was supposed to have been complete." Gall emphatically said it was not complete.

Reason *three* : That Gall located his faculties in bony prominences : for example, " philoprogenitiveness in the occipital protuberance." The falsity of this accusation has already been proved.

If there are many Bastians in our Royal Societies, it is not at all surprising that they refuse to discuss Gall. The discussion would damage the reputation of some of the members, and, in consequence, we might question their reliability in other departments of knowledge.

Scientific men complain of the spirit of orthodoxy of theology, but they can be no less intolerant, Bastian, who did not hesitate to misrepresent Gall's teaching, had to experience the orthodoxy of the Royal Society later in life, when they would not allow a report of his experiments on the " origin of life." Bastian then wrote a letter to the *Times*, February 28th, 1912, in which he complained that Star Chamber jurisdiction still remains in the headquarters of Science itself—the Royal Society. He complained that a paper by a Fellow like himself, of forty years' standing, had to be submitted to a committee to decide whether such paper should be accepted or not. " Unfortunately," he says, " scientific intolerance as well as Papal intolerance still exists."

Sir WILLIAM OSLER (1849-1919), writing on Servetus, admits that " next to theology itself the study of medicine has been a great heresy breeder." Dogmas of science and doctrines in medicine are as tenaciously held as they are in the case of the theologian. There has scarcely ever been a really important advance made in science and philosophy which has not met with much bitter opposition on the part of the men who were most prominent at the time in that science ; at least, they made things very uncomfortable for the discoverer, and, on many occasions, this opposition has taken on the character of real persecution. The history of science is full of examples of this orthodoxy, showing that formal scientific bodies refused to consider seriously what were really great discoveries, or that scientific editors not only rejected papers representing valuable original research, but even did not hesitate to discredit their authors in such a way as to make it extremely difficult for them to pursue their studies in science successfully, and still more to prevent them from pursuing their scientific investigations under favourable circumstances. Science claims to hold her lofty head far above the disturbing influence of sentiment or passion. Yet there are no controversies more bitter than those between rival scientific workers, and the temper shown in such disputes affords ground for thankfulness that there is no likelihood that a scientific Inquisition will ever be established. If such a thing were to come to pass, scientific heretics would fare very ill. New truth, even of direct practical importance, so far from being welcomed, is too often treated as an undesirable alien or even as a criminal anarchist. The only justification for such conduct is that medical men, and scientists in general, have to protect their beloved science from foolish innovators. They are conservative because, for one great discovery that proves its actual right to the title, there are at least a hundred that are proclaimed with loud blare of trumpet, yet prove to be valueless. On the other hand, it is a lasting disgrace that it should have been the lot of so many men who have loved knowledge for its own sake, and who have given themselves without stint and without hope of material reward to labour for the

lightening of the darkness in which we exist, to die in neglect and privation for the opinion they held; while those who apparently rejected their views have republished them in a new garb without acknowledgment, and have reaped fame where they have not sown. The fact is that great men are apt to become fossilised. In their young days, shortly after becoming qualified, they may have done some research work which gained them reputation and position as lecturers and examiners at universities, and official positions in learned societies, and ever afterwards they rest on their past glory. Year after year they repeat the same doctrines to their students, deriding any innovation. Their convictions have become so ingrained that they cannot revise them.

Great injustice has been done to Gall, especially by those in secure official positions, the professors in universities, for he was not one of them. And who does not know the despotic decisions of learned societies on novel doctrines introduced by "outsiders"! In former days, learned bodies could evoke the help of the State to save them from preachers of unorthodox doctrines; when that power was gone, they boycotted the works and ostracised the author of doctrines which threatened to upset their orthodox teaching. True, the sanctity of science and the dignity of the profession, the welfare of the public must be safeguarded; but this should not be done at the cost of fair hearing and degrading methods of misrepresentation.

It is perfectly clear and palpable that those who rejected Gall's doctrine did not do so on account of insufficient evidence, because they had not examined the evidence already in existence. No! The real cause was the intellectual indolence and apathy which prevented their taking this step, and induced them to content themselves with assuming its falsehood. The author can remember the annual tilts that used to be made against Gall's doctrine by physiological and anatomical teachers for the edification of their students. Usually, the mastoid process of the skull, which forms so remarkable a bump behind the ear, was selected; and it was pointed out that this was described by Gall as the organ of "combativeness"; others selected the occipital protuberance and described it as the seat of the sexual instinct by Gall. As these bony prominences are not set up by the cerebral contents of the skull, the students were much entertained. If a professor of physiology (D. J. HILL: "Elements of Physiology, 1900,") sees no more in Gall's doctrine than "a pseudo-science which professes to localise mental faculties by excrescences on the cranium," we are not surprised when an official medical journal declares that Gall's doctrine "is unworthy to be countenanced by a scientific profession." This is an easy way of preventing a discussion which might disclose that not all official lecturers are authorities on the subject which they are paid to teach.

This contempt for Gall and his doctrine had the effect, as will become evident in later chapters, that men convinced of the truth of the principles of Gall's doctrine have earned fame by giving them to the world as their own, not necessarily from any dishonest motive, but because they were afraid to confess their derivation. Whenever I come across a book which starts by abusing Gall, I suspect the author of having borrowed largely from him, and I am rarely disappointed.

It is easy to sneer at Gall's localisations. Any tyro can do that! We must take his whole work, and keep in mind that it was published at a time when the anatomy of the brain was still imperfectly known, and its physiology was not yet in existence. Gall struck out an entirely new line. He failed in getting his theories accepted, because—in his own words: "To oppose received habits, to brave the decisions of learned societies, to expose conceit, to overturn the pretended knowledge of the anatomy and physiology of 3,000 years, etc., how can it be expected that one should succeed with such elements?" Had Gall discovered only a new foramen in the skull, or a new fissure in the brain, every medical student would know his name and revere him. But because he revolutionised the whole knowledge of the structure and functions of the nervous system by his numerous discoveries, he was not understood, and in the end was disregarded. No one can dispute the title which his most formidable opponent, Flourens, gave him: "The Founder of Cerebral Physiology."

We have already in a previous chapter shown that what contributed largely to the destruction of Gall's doctrine was its popularisation—minus its scientific basis—by his successors, its hasty completion into a system under the title of "phrenology," and the advent of professional "character-readers," who, ignorant of Gall and his work, made a travesty of the whole subject. Nearly all the criticisms of Gall during the past century are worthless, for they were hardly ever based on a knowledge of Gall's works, but only on the miserable misrepresentations of itinerant "professors" of phrenology. I have already shown how opposed Gall was to "character-reading." Here are some further remarks of his in proof of this:

"Birth, social position, education, laws, usages, and religion exert the greatest influence on the occupations, on the mode of action of the organs, and the moral character of man. It would therefore be rash to conclude that the actions of an individual respond simply to the predominant features of the cerebral organisation. . . . Whoever would wish to foresee or judge a man's actions must not only know his natural disposition, but also all the external elements that concur in producing his determinations; for the acts of reason and will are often diametrically opposed to the instigations of the desires, wants, and passions. . . . Let us not forget that many occupations, apparently very unlike, require the employment of nearly the same moral and intellectual powers. The faculty of observation, the force and promptitude of the judgment, prudence and circumspection, the exact knowledge of external data, constitute equally the genius of the physician, the general, and the diplomatist, etc. . . . There are too many average people; and birth, social position, education, customs, etc., exercise an influence sometimes stronger than that of the hereditary organisation. . . . I do not examine heads, unless some scientific information is to be gained thereby."

Gall examined heads when there was some peculiarity in the mental condition of the individual or some abnormality in the size or shape of the cranium; and he did this not to read character, but to determine whether he could get any aid thereby in discovering the seat of the elemental qualities of the mind. For this reason he was pleased with his tour through Germany, for:

"This journey afforded me the opportunity of studying the organisation of a great number of men of eminent talents, and of others of very limited capacity, and I had the advantage of observing the difference between them. I gathered innumerable facts in the schools, and in institutions for orphans and foundlings, in asylums for the insane, in reformatories and prisons, in law-courts, and even in places of execution; the multiplied researches on suicides, idiots, and madmen have contributed greatly to correct and confirm my opinions. I have had the assistance of several dissecting rooms and physiological laboratories; I have compared antique statues and busts with the records of history, etc."

Finally—what all critics forget—**Gall sought to confirm his localisations by clinical and pathological evidence,** that is, by a recognised scientific method. This evidence I have reserved for separate chapters (XXIX.-XXXII.), when we shall deal with each localisation individually.

The following arguments are directed also against popular character-reading:

"I teach further, that **it is only an extraordinary degree of development of an organ which becomes discernible on the surface of the brain and skull;** and that although we can thus judge, in many cases, of the leading dispositions of an individual, we cannot estimate the use which he has made of them through education, principle, and exercise. . . . Thus the charge is unfounded when I am accused of distinguishing the worthless and useless from the virtuous by the shape of their skulls. All this is impossible, because moral, social, civil, and religious conduct is

the result of many and different concomitant causes, and especially of many powerful external influences; for instance, education, example, habits, laws, religion, age, society, climate, food, health, and so forth. Thus instead of my doctrine being injurious to any human being, it leads us to forbearance with our mutual weaknesses, and teaches us, when we know their sources, to avoid their detrimental consequences.

"If, in social life, I perceive the external sign of a well-developed brain organ, I can say with confidence that, in this man, the disposition of the faculty which is connected with this organ is stronger than the dispositions of his other qualities. But I am ignorant whether circumstances have permitted this individual to devote himself to the pursuit to which this principal disposition would direct him."

Any attempt to explain the real doctrine of Gall is met with the dogmatic reply: "Our mind is made up, Gall was buried over a century ago." Yes, the mind is made up, but it is made up on *falsehoods*, or at least based on a superficial knowledge derived not from Gall's works, but from popular phrenology. Supposing anyone wished for information on the subject, he naturally would turn to the "Encyclopædia Britannica," where in the latest (11th) edition, he would find, under "Brain," an article written by one of our greatest physiologists and neurologists, **CHARLES SCOTT SHERRINGTON,** F.R.S., Professor of Physiology in the University of Liverpool. Such a high authority, one would assume, would make no statement negligently, but there it is:

"Flourens and others of his contemporaries had already shown not only that intelligence was resident exclusively in the brain, but that it was resident exclusively in that part of the brain which is the forebrain. Now Gall placed certain of his **twenty-seven intellectual faculties in the cerebellum,** which is part of the hindbrain. . . . All these 'faculty organs' were placed by Gall at the surface of the brain."

Prof. Sherrington must know that Flourens came after Gall, and, in any case, could not have been the first to show that "intelligence is resident exclusively in the brain"; for that knowledge is as ancient as the Greeks; and so is the conjecture of its relation to the forepart of the brain, which Flourens did not admit till forty years after Gall's death, in 1863. Secondly, Gall did not place *certain* faculties in the cerebellum, but only one, and that one was not intellectual. Thirdly, Gall did not place all his faculties at the surface of the brain, but Providence put the most highly organised structure, the cortex, *i.e.*, the cell area, at the surface of the brain, and Gall included in each of his centres the white fibrous matter as well; and if Prof. Sherrington means that Gall did not place any centres within the middle fold of the brain, he might have convinced himself of the contrary by opening Gall's "Atlas of the Brain," or my own book on "The Mental Functions of the Brain" (1901), which contains reproductions of Gall's brain illustrations; and he would have seen that Gall extended the functions of the convolutions in the middle line downwards in exactly the same manner as he and his co-workers have done in the case of their motor and sensory centres (*e.g.*, leg centre).

It is disastrous to science that the minds of many thousands of students and future medical practitioners are thus biassed against the subject, and hold it in contempt for ever afterwards. To most of them it is not worth consideration, because their tutors, whom they revere, have pronounced against it.

Part of the opposition to Gall probably arose from the fact that men are filled with fear or repugnance at the thought of confining the mind in space, and, still worse, of depositing it in cortical pigeon-holes according to its various forms of activity. But, as we shall have occasion presently to show, we do not mind nowadays locating muscular and sensory centres and even mental centres of a kind.

FREDERICK PETERSON, Chief of the Nervous Clinic, New York, in the *American Medico-Surgical Journal*, 1905, wrote of Gall's doctrine as the "Science of Bumps," "which," he says, "is as dignified a title as it deserves," that "Prochaska began to

expound it in Vienna in 1796. Gall followed in 1798." (!) " It was founded upon the observation of the heads of men and lower animals, and of **busts and pictures.** . . . It was an entirely empirical study of the exterior of the head, and **no careful anatomical investigations were made** by these men [Prochaska (!) and Gall] of the brain or its convolutions, or of the thickness and structure of the skull and scalp. . . . It was the attempt to establish a rather startling new science in a short period of time, and **the ardour of its exponents was greatly stimulated by the pecuniary reward to which it almost immediately led."** Then followed a glowing description of the substitute, " the new phrenology."

Such inconsidered statements as the above explain why books and lectures on Gall are boycotted by the medical profession. It is because these critics cannot afford to have their stupidities exposed.

JACQUES LOEB (1859-), Professor of Physiology in the University of Chicago (now Chief of the Department of Experimental Biology in the Rockefeller Institute), in his work, " Comparative Physiology of the Brain and Comparative Psychology," London, 1901, says :

" Gall was an industrious worker in the anatomy of the brain and at the same time a **huge fraud.** The anatomy of the brain was not sufficiently sensational for him, so he enlivened things somewhat by grafting upon his anatomy the worst **metaphysics** he could get hold of. The various **nooks and corners of the brain** became the seat of soul-powers of his invention. This artificial connection between metaphysics and brain-anatomy or histology has since become traditional." Yet Loeb himself introduces metaphysics. " It is obvious," he insists, " that the assumption of a localisation of psychical functions in the cortex is opposed to the elementary facts of *associative memory of consciousness.*" He believes in anatomical separation of fibres but not in localisation of psychic elements.

On the other hand, his colleague, **CHARLES K. MILLS** (1845-), Professor of Neurology in the University of Pennsylvania, was of other opinion. He said :

" In some quarters a tendency to rebel against the extreme differentiation of the brain into areas and sub-areas and centres is exhibited, but close attention to the facts, particularly those which are being obtained through clinico-pathological observation, would seem to show that this differentiation is even much greater than has been supposed by the most ardent believer in localisation. . . . If the insanities are essentially disorders of the brain, as all must admit in a final analysis of the subject, and if the brain is recognised not as an organ all parts of which are necessary to every function, or an organ, one part of which is sufficient for all functions, but as an assemblage or confederation of separate organs, or centres, each of which is independent, or at least autonomous, it follows that the facts and principles of cerebral localisation must play an important rôle in the solution of psychiatric problems, and especially in the elucidation of psychic symptoms, and the causation, duration, and the prognosis of the different types of insanity."

FRENCH CRITICS

One of the most brilliant and thorough-going opponents of Gall was undoubtedly A. F. LÉLUT (1804-1877), alienist. Though a Frenchman and able to read Gall's work, he preferred to attack the latter through his disciple Spurzheim ; hence the titles of his books, " Qu'est ce que la Phrénologie ? " (Paris, 1836) ; " De l'origine phrénologique de la destruction chez les animaux " (1838) ; and " La phrénologie, son histoire, ses systèmes et sa condemnation " (1853). Lélut was quite willing to accept mental faculties minus brain matter, but on no account would he accept mental faculties with brain matter, his main objection being that **Gall's organology was materialistic.** He admitted that Gall denied this, but he quoted various state-

ments of Gall that **certain areas are invariably associated with motor manifestations** to substantiate his assertion. Thus he pointed out that Gall found a certain region of the brain from which the head and body are energetically raised, and other groups of muscles elsewhere ; and he contended that " to assert that certain parts of the brain exercised such an influence over particular parts of the muscular and osseous system was nothing short of lowering man to the level of a mechanical toy." **What do the discoverers of the motor centres in the brain say to this ?** How would Hitzig, Ferrier, Horsley, Munk, and all the others have fared in the time of Lélut ? And yet some of them go on repeating what Lélut, Rudolphi, Ackermann, etc., thought of Gall.

Then Lélut proceeded to show that Gall's doctrine, or phrenology, as he called it, is not original. But his proof is purely metaphysical. He next pointed out that the **convolutions are not distinct enough** to admit of centres. He then declared that if there is any truth in Gall's doctrine, it must be shown by the **application of the cephalic index.**

He measured various animals from ear to ear and from front backwards : carnivorous (dog, cat, and fox) on the one hand ; frugivorous (horse, sheep, ox, and rat) on the other, and he arrives at the following conclusions :

1. Frugivorous and insect-eating birds have brain and cranium of the same width in proportion to their length ;

2. Carnivorous animals have not wider heads than frugivorous in proportion to their length ; the contrary is the case.

Lélut's measurements are absurd. In measuring from ear to ear he was not measuring the temporal lobes only, but also part of the frontal and parietal lobes ; a narrow but high head may equal a wide but low head. The same objection must be brought to the measurement from the nose to the occipital protuberance, in which case we go over three lobes. When we attempt to compare the brain capacity of one animal with that of another, with the view of ascertaining the quality of their respective mental manifestations, we must first determine *what are the exact homologous parts that are comparable.* To draw any such inference as Lélut has done, from a comparison of two brains, by simply weighing or measuring the whole mass of each, would be manifestly of no scientific value. Equalised brains do not display equivalent, nor indeed analogous, results. To postulate such a doctrine would be as irrational as to maintain that the walking capacities of different persons are directly proportionate to the weight of their bodies.

We need hardly mention that Lélut was against all cerebral localisation, even that of the speech centre.

JEAN PIERRE FLOURENS AND GALL

JEAN PIERRE FLOURENS (1794-1867) was commissioned by the Academy of France to test Gall's doctrines in 1822. He had been an admirer of Gall, but now became his most formidable opponent. He had written of him as being :

" the profound observer whose genius has opened for us the study of the anatomy and physiology of the brain. One can estimate his work only at its true value if one is acquainted with the depth of ignorance which prevailed when he appeared. I shall never forget the impression I received the first time I saw Gall dissect a brain. It seemed to me as if I had never seen that organ."

Flourens was a follower of Descartes, and dedicated his report, when it was published in book-form, to him. He was an out-and-out believer in one indivisible intelligence. The **unity of the " ego "** united him with the great philosopher. Descartes had emphasised the indivisibility of the psychical functions and had

demanded a unitary "seat of mind." As his choice of the pineal gland could not be sustained, in the face of more recent experience, Flourens substituted for it the total mass of the cerebral hemispheres.

Similarly, Flourens believed in a centre of "life," and in 1827 defined in detail the vital knot (noeud vital), previously made out by A. C. LORRY (1725-1783) in 1748, and C. J. J. LE GALLOIS (1770-1814) in 1812, at the junction of neck and head, or, more precisely, on the floor of the fourth ventricle, and this was regarded as the seat of the vital principle. It is really the respiratory brain centre. This centre, according to more recent investigations, is so extremely sensitive to any increase or diminution of the partial pressure of carbon dioxide in the blood that a diminution 0·2 per cent. of an atmosphere, or 1.5 mm. of mercury, will cause apnœa, while a corresponding increase will double the breathing.

Flourens started his investigation with a preconceived notion, the notion of the unity of mind, and therefore expected to find the brain a unity. We shall see in the course of our history that the preconceived opinions of investigators have vitiated many of the experiments which have been conducted since that time. According to the psychological view of the observer, so have been the results.

Flourens' indivisibility of the "ego" appealed to the philosophers of his time, especially in metaphysical Germany, where the opinion about Gall changed on the appearance of Flourens' report. The notion that the brain might by any possibility be ever parcelled out into distinct areas of differentiated activities was thenceforth habitually stigmatised as contemptibly ridiculous and unworthy of scientific consideration. **Flourens' opinions dominated the medical world for fifty years to the exclusion of all progress in our knowledge of brain functions.** It was he who by his experiments, which were wrongly conducted, brought about the neglect from which Gall's works have suffered ever since. It will be of interest, therefore, to go more fully into the matter and give Gall's criticism of his method; the more so, as **many of the remarks apply equally well to experiments made since** and even at the present day. Indeed, every physiologist should read the history of this controversy.

Not Flourens, but **LUIGI ROLANDO** (1773-1831), began those vivisection experiments on the brain which to this day hold undisputed sway. Rolando ("La vera struttura del Cervello," 1809) had removed in successive layers the brain of a **hen,** and had found that when the entire hemispheres were destroyed the hen could still "eat, drink, and walk," which according to Flourens meant that its "intelligence" was preserved, which he thought impossible; therefore Rolando's experiments must have been wrongly conducted; indeed, he "mutilated," but did not destroy the parts on which he operated, in the opinion of Flourens.

Flourens took a live **pigeon** for his experiment, and removed its brain in successive stages. As a result of his observations, he came to the conclusion, contrary to Rolando and Gall, that the whole of the cerebral mass is homogeneous, that nothing prevents the functions of one part being transferred to another, and that so long as one little part is left, the intellectual faculties and consciousness will still remain. He wrote:

"Thus one may remove, anteriorly, or posteriorly, from above, or from the side, a considerable portion of the cerebral lobes without destroying their functions. Even a small portion of these lobes, therefore, suffices for the exercise of their functions. In proportion to the extent of the removal, all the functions become impaired, and gradually fail; and beyond certain limits they are altogether annihilated. The cerebral lobes, therefore, co-operate as a whole in the full and complete exercise of their functions. Finally, when one form of perception is lost, all are lost; when one faculty disappears, all disappear. There are, therefore, no

special seats either of special faculties or special perceptions. The faculty of perceiving, judging, and willing one thing resides in the same region as that of perceiving, judging, and willing another; consequently, this faculty, essentially one, resides essentially in one organ."

Flourens' report, was accepted by the Academy and by all the world, and it was regarded as a fatal blow to Gall's position; but his experiments were in turn set aside fifty years later, having been wrongly conducted, and only **on animals too low in the scale** of organisation to show the highly complex functions with which the human brain is endowed. It was Flourens who had given the death-blow to Gall's doctrine, and yet there is not a man to-day who accepts his deductions.

"As all who, like the writer, ever listened to the earnest pleadings of that enthusiastic dogmatist can testify, it was difficult to resist conviction while under the spell of his eloquent expositions. Now, Flourens, removing the brain in different directions by successive slices, announced as proven propositions: A small portion of the cerebral lobes suffices for all their function; there are no separate seats for various functions or various perceptions; when one perception is lost, all are lost; when one mental faculty goes, all others follow in its immediate train. The metaphysical conception of the unity of mind seemed once more to have regained ascendancy." (W. H. Walshe, "The Colloquial Linguistic Faculty," London, 1885.)

Flourens' report which had obtained the prize of the Academy—though Cuvier did not agree with it—was entitled, "Experimental Researches into the Properties and Functions of the Nervous System in Vertebrate Animals." It was two years later, in 1824, published in book-form, was reprinted in an enlarged edition in 1845, and still further enlarged in 1863. The cause of this further augmentation of his original work was that he had renewed his experiments, forty years after his first investigation, and had applied a new and ingenious method. **He applied small metal balls to the surface of the brain of animals and let them slowly sink through.** The balls in every case forced their way in course of time right through to the base of the brain, **without any disturbance of function whatever resulting.** Only where the balls stood directly over the vital centre (in the medulla), death followed when they had sunk completely through. This experiment excited the admiration of the scientific world, though how it could prove or disprove any psychical quality whatever, one fails to see. This was the **scientific** way of going "in search of the soul." Physicians and surgeons have every day thousands of cases of brain injuries, derangements and diseases before them, changing and destroying the mind and character of man in every possible way; yet we shall show that such material, for want of systematic observation, is almost neglected to this very day. No! we must sink metal balls into the brain of a pigeon to gain the gold medal of a learned society!

Gall protested that brain mutilation does not disclose mental function:

"It is a notorious fact, in order to discover the functions of different parts of the body, our anatomists and physiologists prefer the employment of mechanical methods to the accumulation of a great number of physiological and pathological facts; to collecting these facts, repeating them or waiting for their repetition, in case of need; to drawing from them slowly and successively the consequences, and to publishing their discoveries with philosophic reserve. The method, at present so much in favour with our physiological investigators, is more sensational and gains the approbation of the majority of ordinary men by its promptitude and visible results."

After referring to the contradictory results of these mutilation experiments, Gall adds:

" It is but too notorious that these violent experiments have become the scandal of the academicians who, seduced by the glamour of ingenious operations, have applauded with as much enthusiasm as superficiality the pretensions to glorious discovery made by these mutilators."

Even Sir CHARLES BELL, though such a violent opponent of Gall, acknowledged that :

" It is doubtful whether the contradictory practice of cultivating *physiology* by the cutting up of living bodies, and thus throwing them into a *pathological* state, has not propagated more error than truth. As evidence in favour of this view of the subject, it is well known that it is a rare occurrence for any two of those experimenters to agree in their results."

BÜCHNER'S phrase, written some thirty years later, is well known. It is that Flourens had cut away " the soul " from his fowl bit by bit. " Even conceding that the higher mental functions of the fowl—functions so difficult to define—had really fallen away in these vivisections, even then the supposition does not follow, since the cerebrum need still be only a necessary factor in the production of these activities, but by no means their seat."

It is undoubtedly a fact, again brought home to us by more recent experiments, that the scalpel cannot disclose the thoughts or feelings of an animal, and that we cannot by destruction of portions of the brain discover the loss of particular functions, when we have wrong notions, or no notions at all, of what these functions are. We can ascertain but little when we unseal in the dissecting-room the door of the mind. Well might the satirist say, in his exaggerated language :

" Was ever such an ass as that
Who hoped by slicing mutton fat
And pulling candlewicks to pieces,
To tell why light should spring from greases ?
Yes, one :—that still more precious fool
Who, in the anatomic school,
Expected with dissecting knife,
To learn from death the laws of life."

—*Bévanger.*

Besides Flourens, there were also Rolando (1773-1831), F. Magendie (1783-1855), and others, conducting experiments on the brain. **Gall himself repeated them, to be in a better position to criticise them.** He was thus able to explain why these experiments by mutilation of the brain have such contradictory results when made by different investigators, and why they are all to some extent vague and uncertain, and in some cases entirely barren.

He said :

" When we read of the experiments of our physiologists on the brain, we are almost induced to believe that the whole nervous system, especially the cerebrum, cerebellum, etc., is only composed of pieces of wax applied one over the other. One is removed, and another is removed, and the loss of one or another function instantly takes place. No one thinks of the state of suffering, trouble, and uneasiness of the animal, of the blood that inundates the injured parts, and which it is necessary to staunch at every instant, which very often immediately coagulates, and requires such compression, friction, and searing, that the part operated on rarely presents a smooth and clean surface to enable us to ascertain with exactness how deep and to what extent the lesion or extirpation has been practised. The experimenters always assure us that the experiments have been a thousand times repeated ; but, with a few exceptions, it is hardly possible to perform twice absolutely the same operation ; which explains why every time, unless the experimenter wishes to impose

upon us, the accidents attending the operations vary, which also brings about a variation in the results. This single circumstance is generally sufficient to make this sort of experiment disgusting to all those who seek new truths with candour without self-love, without the incitements of a fugitive vanity. M. Flourens assures me that, in order not to confound the parts on which he has operated, and not to attribute a result to another organ than that to which it belonged, he has by turns experimented separately on the nerves, spinal cord, brain, the different parts of the brain, and that, in the exploration of each of these parts, he has taken the most scrupulous pains to involve that part only on which he was experimenting, and by this means to avoid all foreign complication. He adds that it is always necessary to be as careful as possible of those parts which furnish blood : 1. Because the loss of blood greatly abridges the life of the animal, and it is quite necessary that the animal should live to furnish the results of the experiments ; 2. Because the blood being effused in the cerebral mass, produces those compressions, the results of which, being confounded with those of the experiments, complicate and often destroy them. I conclude from this that M. Flourens knew perhaps better than his predecessors with what precautions similar experiments ought to be performed. But is it not to be feared that by this he has in a great measure pronounced his own condemnation ? Is this localisation of the cerebral parts and their results possible ? **Where is the anatomist or physiologist who knows with precision all the origin, the extent, the ramifications, and connections of a particular brain part ?** You remove the cerebellum, at the same instant you wound very seriously the medulla oblongata and spinal cord, the annular protuberance, the tubercula quadrigemina ; consequently your results belong not only to these parts, but also to all those that communicate with these mediately and immediately. You believe that you have isolated the tubercula, but those tubercula have connections with the corpus olivare, the medulla oblongata, the cerebellum, with the optic nerve, and with many convolutions. The optic thalami and the corpora striata are connected below with the crura of the hemispheres to the annular protuberance, the medulla oblongata, the pyramids and spinal cord ; above, with all the cerebral convolutions ; by their surface to the different commissures, such as the anterior commissure, the great commissure, or corpus callosum ; to the fornix or septum lucidum. Thus there does not exist a cerebral part of which we do not know that it has very multiplied relations with other parts. I do not even except the corpora mamillaria, the pineal gland, infundibulum, etc., etc. And surely the connections that are unknown to us are still more numerous. This being established, how can we prevent the reciprocal influence of all these parts, especially when they are irritated, injured, acerated, or removed ? And how can we isolate their results ? This beautiful idea of localisation is then only a fine and presumptuous chimera. To arrive at a cerebral part, we must perforate, break or cut the bony parts ; we must wound or tear violently the membranes which envelop the nervous system and which establish, among all its parts, an intimate connection by means of the vascular and arachnoid membranes. And as these membranes penetrate not only the ventricles and convolutions, but also the whole cerebral mass, the loss of blood, their irritation, inflammation, etc., must inevitably complicate the experiment and its results.

" M. Flourens frequently makes horizontal sections of the cerebral parts ; this procedure would imply that the centres in the different parts of the brain are composed of horizontal layers placed upon one another. This disposition does nowhere occur, not even in the annular protuberances. Upon the anterior pair of the tubercles, on the surface of the brain, etc., you can remove a very delicate layer of non-fibrous substance ; but this substance only contains the early rudiments of an infinite number of nervous filaments, which are continued into the interior of the cerebral masses. Throughout, the white filaments of the cerebellum, cerebrum, corpora striata, optic thalami, crura of the brain, annular protuberance, and tubercula, course and diverge from below upwards ; throughout, they plunge either diagonally, perpendicularly, or obliquely towards their apparatus of supply ; and from thence to their ramifications. The converging fibrils in inverse order arrive from the surface of the brain and cerebellum to form the different commissures. Thus this art, so much recommended and extolled, of removing the organ by layers, is in opposition to the structure of the cerebral parts. They talk to us of the

medulla oblongata, the annular protuberance, as cerebral parts, that it would be easy to isolate; but they are not more difficult to isolate than the tubercula quadrigemina. These are still a part, the continuation of the medulla oblongata and medulla spinalis. They are at the same time formed by ganglia, one part of which gives origin to the fibrillæ of the optic nerve. So in a great degree is the medulla oblongata a continuation of the medulla spinalis; besides that, it contains many masses of non-fibrous substances, which, like so many ganglia, are the origin of many nerves of the greatest importance, having very different functions. The annular protuberance is not alone composed of the nervous bundles of the two hemispheres of the cerebellum, or the commissure of the cerebellum; it is also the continuation of many bundles of the medulla oblongata and spinal cord, the anterior and posterior, or inferior and superior, pyramids, and it contains a considerable quantity of non-fibrous substance, placed between the transverse and longitudinal bundles, and which create new filaments for the crura of the brain, the tubercles, etc. We see, then, throughout the brain, the parts very materially complicated, which renders any localisation absolutely impossible. This localisation only becomes practicable where the particular nerves are already disengaged from the common masses, in order to join the apparatus where the special function takes place. This is applicable to all the nerves which take their origin from the medulla oblongata, etc. More than this, you cannot isolate or localise the nerves of the senses before they are complete and joined to the apparatus of the sense. The origin of the nerves of taste is confounded with the masses of origin of many other nerves; the auditory nerve is confounded with the nervous and non-fibrous masses of the fourth ventricle; the optic nerves, at first, with all the mass of the tubercles, with the corpora geniculata and their contiguous parts, with the crura of the brain, and with the greyish layer situated immediately behind their junction. The olfactory nerves are at first intimately united with the grey substance placed on the interior and inferior convolutions of the middle lobes, with the anterior cerebral cavities, etc.

"Either those who experiment on the brain, and the cerebral parts, have never had a clear and just idea of the organisation of the nervous system, or they impudently calculate to make dupes; and they succeed marvellously, since, in spite of the refined precision of their precepts, they find their readers and judges in a greater ignorance than that in which they themselves are of the most essential facts of the cerebral organisation.

"The corpora striata are wanting in reptiles, and the optic thalami in fishes; but they all possess the tubercula quadrigemina, and consequently vision. (Flourens, p. 20.) Thus whenever animals have a common organ, they have also the common function. If certain apparatuses are wanting in reptiles and fishes, it follows that certain functions are also wanting. It is then not true that animals have all the same cerebral parts, and that they all have the same parts as man. The different parts then are destined to different functions. As this difference of composition does not only exist in different species of animals, so far as the cerebellum, cerebrum, medulla oblongata and spinalis, corpora quadrigemina are concerned, but also for the greater or less complicated composition of the cerebral lobes, it necessarily results that the different parts of these lobes are destined for different functions. A singular thing this! They prove the existence of one organ for muscular contractility; another for excitation; another for the connection of particular contractions into uniform motions, and another for volition and sensation. They wish even by carefully slicing the cerebellum to be able to destroy the power of flying, or flying and walking, or at the same time, flying, walking, and standing (Flourens, p. 40). And yet they manifest a hypocritical aversion for the plurality of the centres for the qualities and faculties of the mind, so essentially different!

"I can point out to M. Flourens that the corpora striata are never wanting in reptiles, and that it is not true, as he says, that the volume of the tubercula quadrigemina is, in all species of animals, in direct proportion with the volume of the optic nerves and the eyes.

"Our celebrated experimenter maintains, that all the parts capable of exciting contraction have the grey substance within and the white substance without; that an inverse disposition of these two substances constitutes the character of the

non-exciting parts, that is to say, of the cerebral lobes and the cerebellum; and that we can then judge *a priori* of the properties of these parts by their structure, and reciprocally of their structure by their properties. All this proves that M. Flourens does not yet understand the true use of the two cerebral substances. **There is throughout, where the nervous filaments take their rise,** without regard to its locality, internally or externally, **a non-fibrous grey substance.** . . .

"I have proved in the fourth volume of my large work, and I have made it sufficiently clear in this edition, that each fundamental power, essentially distinct, includes sensation, perception, memory and recollection, judgment and imagination; since these common attributes are nothing else than modifications, different degrees of each faculty. Even each propensity, each instinct, includes volition, in the acceptation that M. Flourens himself gives it in hens, pigeons, rabbits, etc. Thus, so long as a single fundamental propensity or talent exists, all the general attributes also exist; so long as there exists a single atom of matter, a single plant, all the general attributes of matter and plants exist. Therefore, so long as we shall not have destroyed all the seats of the fundamental powers, sensation, memory, judgment, volition remain.

"Let us now see the experiments of M. Flourens:

"'1. I removed from a pigeon, by careful and successive slices, all the anterior portion of the right cerebral lobe, and all the superior and middle portion of the left.'

"This way of experimenting supposes an organisation of the brain absolutely contrary to that which really exists. Where has M. Flourens ever seen that the brain of any animal whatever is formed by layers? If he wishes to have us believe that, in his experiments, he tries to remove one faculty after another, he must attack each cerebral part, each division of fibres into bundles, at their origin . . . and follow it to its ramification upwards; and then follow it again from the surface down. . . . But M. Flourens has no idea of it, consequently all his experiments, even should he give us millions, never can have the least demonstrative value as regards the seat of any mental power. He mutilates all the organs at once, weakens them all, extirpates them all at the same time.

"'Vision became more and more enfeebled, and by little and little, as I advanced (while he removed the layers), and was not totally lost until the layers in the neighbourhood of the central nucleus of the two lobes were suppressed.'

"M. Flourens has not told us what is the central nucleus, and this central nucleus, precisely because it is the central nucleus, the origin and receptacle of all the rest, might it not be that very limited small portion, but sufficient to permit of the continuance of all the faculties?

"'But from the moment vision was lost, hearing was also, and with this and sight, all the intellectual and sensitive faculties.'

"Why does M. Flourens always insist on vision? The destruction of the brain, since, according to him, it is the seat of all sensation, and every intellectual faculty, should necessarily bring about the loss of all the senses, and all the sensitive faculties. Why, then, so many evasions?

"'2. From another pigeon I removed by successive cuts, also very carefully made, the whole anterior and posterior portion of the two cerebral lobes, to within a few lines of the central nucleus. As this ablation proceeded, the sight gradually and sensibly became enfeebled; hearing the same; all the other faculties like hearing and seeing; and when one was entirely destroyed, they all were.'

"Granted that M. Flourens has found the measure of the successive diminution of sight and hearing; how in making his successive ablations has he also made observations on the relative diminution of the intellectual faculties of the pigeon?

"'3. Finally, on a third pigeon, I uncovered, thus to speak, and exposed the central nucleus of the two lobes, by the successive and gradual ablation of all the superior, posterior, and anterior layers. At each new cut, vision lost its energy; and when the animal no longer saw, it no longer heard, willed, remembered, judged, and was absolutely in the condition of an animal entirely deprived of his lobes.

"'4. Thus, first, we can remove either from before, behind, above, or from the side, a certain extent of the cerebral lobes without destroying their functions. A limited portion of these lobes is then sufficient for the exercise of their functions.

Secondly, as this slicing goes on, all the functions become weak and gradually diminish in energy, and beyond certain limits they are entirely destroyed. The cerebral lobes then concur in their totality in the full and entire exercise of their functions. Thirdly, finally, when one sensation is lost, all are lost; when one faculty disappears, all disappear. There are not then different seats, neither for different faculties nor different sensations. The faculty of perceiving, judging, or willing one thing resides in the same place as that of perceiving, willing, judging another; and consequently this faculty, essentially one, resides in a single organ.'

"Let us reason like M. Flourens: We exhaust a man by bleeding: All the functions of the cerebrum, cerebellum, medulla oblongata, spinal cord, heart, lungs, stomach, etc., become enfeebled. We cut off his head, we kill at a single blow: the functions of these same organs cease. Hence the faculties of sensation, thought, sight, hearing, taste, smell, motion, respiration, digestion, circulation of the blood, secretion of bile, etc., reside in one and the same organ."

"'5. Each of the different organs of the senses have no less a distinct origin in the cerebral mass. We have already seen that the primordial principle of the action of the retina, and the play of the iris, is derived from the tubercula quadrigemina. In like manner, the sense of taste, smell, hearing, as well as vision, derive their particular origin from the particular eminence which gives rise to their nerves.

"'6. We can then, by destroying separately each of these particular organs, destroy separately each of the four senses which are derived from them; and we may, on the contrary, destroy, if not all these senses, all their result by a single blow, by the simple destruction of the central organ, where their sensations are effected and completed.'

"But where is this central organ? As a very limited portion of the brain suffices for all the functions, and as all the parts concur in all the functions, this central organ is then each part, each little portion of the brain; thus this central point is either found throughout the brain, or is nowhere found."

"'P. 122: 'In the last analysis, the cerebral lobes, cerebellum, tubercula quadrigemina, medulla oblongata, medulla spinalis, the nerves, all the essentially different parts of the nervous system, have all specific properties, peculiar functions, distinct effects; and, notwithstanding this wonderful diversity of properties, functions, effects, they do not the less constitute a single system. One point of the nervous system being excited excites all the others; a point weakened enervates all; there is a community of reaction, alteration, energy. Unity is the grand principle which reigns throughout; it governs all. The nervous system forms then but a single system.'

"Unity is the constant dream, the *ne plus ultra* of declaiming metaphysicians. The universe is but one: millions of suns, planets, comets are but one; the human race is but unity; different nations, the Chinese, French, Japanese, Africans, Germans, Turks, Greeks, are but one; the head, chest, abdomen, extremities, superior and inferior, the nervous, lymphatic, sanguinous systems, the liver, heart, intestines, etc., are but one. The senses, cerebrum, cerebellum, tubercula quadrigemina, medulla oblongata and spinalis, are essentially different; they have each different and specific properties, particular functions, distinct effects. They are, according to Flourens, in a complete and fundamental independence of each other (p. 27). Each of them can be separately preserved, destroyed, restored, as the organ of each is preserved, destroyed, or restored (p. 102); and they are one!!!

"'The cerebral lobes,' says Flourens, 'can lose, either from before, behind, above, or from the side, a certain portion of their substance, without losing their functions.' Yes; without losing the common attribute of every propensity or determinate faculty.

"This reasoning is contradicted by a great number of pathological facts. I repeat: the appreciation of cerebral lesions and their consequences requires:

"1. An exact knowledge of the organisation of the brain and the reciprocal vital influence of the different parts;

"2. A detailed knowledge of the functions of the brain, of the different fundamental qualities and intellectual faculties, the instincts, propensities, and talents, etc.

" So long as the experimenter is not acquainted with these two indispensable conditions, all his experiments to ascertain the animal functions of the brain and the different cerebral parts are but the groping of a blind man. In all my researches the question was to discover not the vital functions or the reciprocal vital influences of the different parts of the nervous system, but the animal functions, moral qualities, and intellectual faculties, and the seats of their organs.

" ' The cerebral lobes,' continues M. Flourens, ' effectively concur, altogether, in the exercise of their functions ; it is very natural that one of their parts can supply another ; that intelligence can consequently subsist or be lost by each of them.'

" In consequence of this supposition, the different species of animals should not differ among themselves, but by different degrees of the totality of the moral qualities and intellectual faculties ; very nearly in the same way that a piece of lead of six pounds differs from another piece weighing an ounce. But as certain species are deprived of certain faculties with which other species are endowed, it follows that some must be deprived of certain cerebral parts, with which others are possessed. How can we explain, on this hypothesis, the development and non-simultaneous destruction of the animal functions of the brain ? How can you conceive of partial geniuses, partial idiots, partial mental alienation, precocious geniuses in one single faculty, the different degrees of our different qualities and faculties, the antagonism of our qualities—the double man within us ? Truly, if we consult ever so little the most ordinary facts, the pretensions of our experimenter appear more and more absurd."

P. 236, Flourens explains : " But, independently of this peculiar and exclusive action of each part, there is common action for each part, that is to say of each upon all, and of all upon each."

This latter sentence agrees with what Gall has said, and said better :

" Each nervous part has its peculiar functions, although they all exercise a reciprocal influence, and are all more or less subordinate to each other. The plurality of the organs does not exclude the unity of their action. Life takes place with many organs, and a single volition, with many instruments of voluntary motion. But if it were the reciprocal influence, which could impress on a system the character of the unity of an organ, all the parts of the animal would be a unity, since all the parts influence each other."

Gall continued :

" Flourens confines himself, so far as function is concerned, like the philosophers, to generalities, which are really very nearly the same in all animals. All are excitable, all have sensibility, all have also volition ; and if to eat, drink, walk, fly, crawl, swim can be included under the empire of the intellectual faculties, they all possess intelligence."

Gall said he had made out the parts of the brain which have to do with intellect, feelings, and animal propensities, and determined their localisation.

" Now the materials are in your hands. Cut, pinch, prick, remove, cause your martyrised animal to live as long as you will, and show us which of these faculties continues or ceases to manifest itself ! You cannot deny the existence of these qualities and faculties, since all the actions of man and animals attest them ! Or prove to us that it belongs only to their volition, to the direction of what you call intelligence, that the tiger has the propensities of the tiger, the sheep those of the sheep ; that one bird sings and another does not ; that one man excels in poetry, another in observation, another in music, etc. ; **where will you show us the material conditions of these phenomenon at the point of your scalpel !** None of you thus far have had either the philosophy or the courage to meet these questions ; otherwise you would have soon been convinced of the insufficiency and nullity of your cruel experiments."

Flourens, early in the sixties, also published a little book, *De la vie et de l'intelligence*, wherein he admitted that Gall rendered physiology a great service in proving

that the brain is exclusively the organ of the intellectual faculties and the moral qualities; but he strongly objected to his cutting up, not only *the* intelligence into so many little intelligences, but also to the cutting up of the brain into so many little brains, organs, or centres. He also considered the associating of these organs with supposed distinct mental faculties an extremely fallacious performance on the part of Gall. But **Gall's greatest crime, according to Flourens, was that he denied the freedom of the will** (?), and without free-will there can be no morality. Gall had not proved his organs anatomically. He could not circumscribe them, could not distinguish them in the brain; hence they must have arisen in his imagination. Seeing them on the skull is not the same thing, for skull and brain do not agree in conformation. (!) **Descartes,** he says, **meditated for days in a corner of his room** (s'enfermait dans un poêle), **frivolous Gall went into company to see slyly what he could discover.** Flourens was not aware that he gave Gall with this statement the greatest testimonial; for the two methods of study mentioned distinguish the naturalist from the metaphysician.

Though the doctrines of Flourens met with general acceptance, they were contested on experimental grounds by some physiologists, particularly by **J. B. BOUILLAUD** (1796-1881), in "Journal de Physiologie Experimentale" (1830). The experiments of Bouillaud on pigeons, rabbits, and dogs led him to conclude that **destruction of the anterior lobes alone caused symptoms of profound dementia.** Though the animals were able to feel, see, hear, smell, and to execute a number of spontaneous and instinctive movements, they were unable to recognise their relations to the objects by which they were surrounded. They were unable to feed themselves, and had, in general, lost **all reasoning powers.** An animal, said he, in whom the anterior lobes have been destroyed, "though deprived of the exercise of a more or less considerable number of intellectual acts, continues to enjoy its sensory faculties; a proof that 'sensation' and 'intellection' are not one and the same function, and that they have separate localities."

But Bouillaud was ignored, like Gall. In consequence of the results of the experiments by Flourens, Longet, Budge, and Schiff, special localisation of function in the cortex was discarded; and orthodox physiology taught, even against the strongest evidence to the contrary, the equivalence of mental function; that is, **the brain, as a whole,** not any definite portion, was considered to be the physical substratum of mental activity.

Even the localisation of motor centres, vaguely indicated by Gall and proved in the seventies, was denied in those days. In 1842 **F. A. LONGET** (1811-1871), in his *Anatomie et Physiologie du Système Nerveux*, Paris, 1842, affirmed that he had experimented upon the cortical substance of dogs, rabbits, and kids, had irritated it mechanically, cauterised it with potash, nitric acid, etc., and had passed **galvanic currents** through it in different directions, without obtaining any sign whatever of resulting muscular contraction.

We now know that an animal deprived of its hemispheres is still capable of movements towards a definite purpose; only it is no longer a **conscious** participant or agent in the purpose to be subserved. The animal is no longer an active agent, impelled to these movements by desires which are mental affections, and experiences no longer the pleasure which the consciousness of the sensation gave it.

If the cerebral hemispheres are removed in a teleostean or **crayfish,** in whom there is only a rudimentary cortex, the animal is to all intents and purposes unaffected. It can distinguish between a worm and a piece of string, and will rise to red wafers in preference to those of another colour. The operation does not damage the primary centres of vision—the optic lobes—and in these fishes the eye is the most important sense organ.

A **shark,** however, subjected to the same operation, is reduced to a condition of complete quiescence. This is due to the circumstance that in this fish the principal

sense organ is that of smell, and severance of both olfactory tracts produces the same result as removal of the entire cerebrum. In either case the path between the olfactory bulbs and the centres that control the cord are interrupted.

A **frog** from which the cerebral lobes have been removed will respond to appropriate stimuli with all the movements of which a perfect frog is capable. It will swim, leap, and crawl. When placed on its back, it will easily and at once regain its normal position. When placed on a tilting-board, it will constantly adjust the position of its body so as to maintain an equilibrium. It will croak with the regularity of a music-box when its flanks are gently stroked. Thrown into the water it will swim with great regularity of motion until it is exhausted or finds something—as a small piece of wood placed in contact with it—upon which it can crawl. When submerged in the water, it will rise to the surface for air; it will not, as if it possessed only a spinal cord, remain quietly in water the temperature of which is gradually raised, but will make violent efforts to escape. It is guided by the light, for it avoids objects that cast a strong shadow. On the other hand, it appears stupid; it pays no attention to the flies that are placed near it; by careful occlusion of all stimuli it may be kept motionless for hours. We cannot argue from this, however, that it is without sensations, for it may be hungry; and HEUBEL ("Pflüger's Archiv," vol. xiv., p 162) asserts that a sound frog may, with careful manipulation, be made to lie still on its back for a long time. Removal of its hemispheres does not entirely abolish its apparent spontaneity; it still continues to feed itself, for instance, by catching passing insects. It is not until the optic thalami are removed also that it becomes a purely reflex animal. If the brain and the anterior end of the bulb are removed the lower centres of the cord are set free, and the result is incessant movement provoked by slight stimuli. R. L. WILBUR, of Cornell University, U.S.A., tried to prove that in animals the cerebrum was the seat of consciousness and volition. He decerebrised a frog and put it in a large open jar, where it remained for five years, *i.e.*, until its death. During all that period the animal never showed signs of any initiative, its only movements being very slight and attributed to muscular weariness, like that of persons asleep. The eyes, optic nerves, and optic lobes of the brain were uninjured, and the animal could evidently see, but without understanding. The most attractive frog food put before it was absolutely unnoticed, and it was fed every day of its brainless life by an attendant, who would open its mouth and with forceps push a bit of fresh meat or fish far enough back into the throat to arouse the reflex mechanism of swallowing. If touched, the body would move or leap; if placed in water, it would swim until some support was reached; if turned upon its back, it would promptly and vigorously right itself—but it would never move of its own accord.

A **bird** thus operated upon remains perfectly motionless, sleepy, and unconscious, unless it is disturbed. When disturbed in any way, it will move; for instance, when thrown into the air it will fly; but these movements are, as in the frog, purely reflex in character; when the animal is made to fly its movements are directed by the sense of sight, the optic lobes being still intact, and it will select a perch to settle on in preference to the floor. It will start at a noise; it will not eat voluntarily; it exhibits no emotions such as fear, sexual feeling, or maternal instincts. When laid on its back it will easily regain its feet, and will stand in a natural and easy posture. It will tuck its head under its wings, clean its feathers, pick up corn, and drink water presented to its beak. It will start at sharp sounds or flashes of light.

In **mammals** the operation of extirpation of the brain is attended with such severe hæmorrhage that they die very rapidly, but in some few cases where the animals have been kept alive the phenomena they exhibit are similar to those shown by a frog or pigeon. The difficulty of the operation was overcome by GOLTZ, of Strassburg, in dogs, by removing the cerebrum piecemeal. One dog treated in this way lived in good health for eighteen months, when it was killed in order that a thorough examination of the brain might be made. It was then found that not only the hemispheres but the main parts of the optic thalamus and corpus striatum had been removed also. Though it still could carry out co-ordinated movements, its reactions were entirely reflex, and memory, emotions, feelings, and the capacity to learn were absent.

The rabbit or rat thus operated upon will stand and run and leap. Placed on

its back, it will regain its feet. It will follow with its head a bright light held in front of it ; it will start and tremble, or run, at a shrill or loud noise. It will utter a prolonged cry when pinched. Its muscular motions are obviously co-ordinated in response to sensory impulses from the organs of touch, hearing, and sight.

The **higher animal** loses just those characters which distinguish it from the lower ones. The higher it is, the more fatal the effects, the immediate disturbance is more severe, the return of function slower, and the permanent loss is greater.

SECTION III

HISTORY OF MODERN BRAIN RESEARCH

CHAPTER XIX

HISTORY OF THE DISCOVERY OF THE BRAIN CENTRES FOR SPEECH

DURING the whole course of his evolution, no possession which man has acquired has exercised a stronger influence on his higher development than the power of articulate speech. Some philosophers even thought that our faculties were due to the possession of speech. That was not the opinion of Gall. He said :

" Since Condillac, philosophers have exhausted themselves in reasonings on the influence which signs in general, and spoken language in particular, exercises on our ideas and our knowledge. They maintain that without signs we should hardly think ; that it is only articulate words which can lead us to abstract ideas ; that signs and language develop our faculties, give birth to our inclinations, our sentiments, affections, passions ; that, without signs, we could not compare our simple ideas, nor analyse our compound ones ; that in this way languages are necessary to thought as to speech, to the possession of ideas as to their expression ; that without language we should have only few ideas, and these very few confused and incomplete.

" The doctrine so pompously announced is false ; namely that language, that signs in general, have called forth, directed, and fixed the progress of the human mind in its combinations and researches. I admit that the history of signs is, at the same time, the history of the successive advancement of human knowledge. But it is knowledge, inclinations, sentiments, talents which have produced the signs ; never could any sign give rise to any inclination, sentiment, or talent. It is necessary first to have experienced these, and then to have found the acceptation of the word or sign invented by others. Speak of metaphysics in the most distinct terms to an animal, idiot, or a man of very limited powers ; and it is like talking of colours to a blind man. Boast to a miser of the pleasures of beneficence ; to a cruel man of the charms of compassion ; you will never, with all your signs, awaken benevolence in the miser, or humanity in the cruel man."

Speech, according to Gall, is indissolubly bound up with the intellect and the state of the feelings :

" The language of gesture and verbal language are the product of the activity of the faculties, inclinations, affections, and passions of men and animals. It is in the nature of man and animals to produce certain sounds as soon as they are affected ; as soon as they experience the necessity of communicating with their fellows. It is an effect so necessary to their organisation, that it even takes place in spite of them ; and these seem almost always to depict the various affections so well, that they become the most certain and the most distinct natural signs. Before all language, the organs of our qualities and faculties are active, and however little

this action may be felt, it manifests itself either by gestures, or by sounds, or words, or by both in combination. It follows that those external signs, for the most part, are proportioned to the action of the internal faculties ; it is by means of language that man and animals communicate their feelings and their ideas ; and consequently the language of each species of animal, of each people, of each individual must be more or less rich and just, according as the sentiments and the thoughts are more or less numerous, clear, lively, and determinate. No language whatever can have more signs than those who form it have ideas or feelings. Language and knowledge always are in concert ; and in their progress, the equilibrium always establishes itself between the interior faculties and the signs. In order to transmit to my hearers or my readers in a clear manner my ideas and my feelings, I try to impress myself with them, to personify them, if I may be permitted to use the expression, and the proper language spontaneously presents itself. This is the reason why the most perfect language is always employed by the most profound and enlightened men ; and whenever language is poor, vague, imperfect, vacillating, the sentiments and the course of the ideas are open to the same charge. The language of brutes is, for the same reason, very limited ; and thus it may be conceived why that of certain savages is composed of only three hundred words. The words are created only in proportion to the need we have of them."

Gall recognised a special brain centre for speech, through which by association the faculties can manifest themselves ; and he was the first to recognise the lesion of aphasia or loss of articulate speech.

"The cases of disease, which I have quoted, in which the patients had *full knowledge of things*, without being able to find or pronounce their names, prove that the action of the internal forces precedes signs ; that it is, in some measure, independent of these, and, finally, that arbitrary signs, like spoken language, can give rise to ideas and sentiments only so far as they have become by use means of *association*. If it were true that, without signs, we should hardly think, and that nothing but articulate words can lead us to abstract ideas, then children would scarcely think before knowing how to speak. Now, experience shows that, before speaking, children acquire an infinity of notions, which, without thinking, would be impossible. Children even commence the operations of their intelligence by making abstract ideas for themselves."

In support of his argument, Gall also quotes the case of a blind deaf-and-dumb person, blind and deaf from birth, who showed a keen desire to know objects and indicated reflection in all his actions. The senses of smell and touch were very keen, the countenance was very expressive, and, in general, his natural language was not that of an idiot, but of an intelligent being. He was not taught, but himself invented numerous signs to convey his thoughts and desires.

Dr. Howe, as we have already mentioned, founded his education of Laura Bridgman, a similarly afflicted woman, on Gall's principles.

Gall was the first to locate the centre for articulate speech and verbal memory at the basal extremity of the third frontal convolution and the island of Reil—marked in his Anatomical Plates between the Figures xv. (anterior border of third frontal convolution) and 39 (at posterior border thereof, abutting on the fissure of Sylvius) ; this part of the brain, when well developed, pressing on the posterior part of the superior orbital plate.

This important discovery was achieved by Gall :

Firstly, by the observation of injuries to the orbital region of the brain, which, he found, were not infrequently followed by loss of memory for words.

Secondly, by the observation of cases of apoplexy, which, when the hæmorrhage is on the left side, are often accompanied by loss of articulate speech, not through any impairment of the vocal organs, but by lesion of the cerebral centres for speech. There is retention of the faculty of intelligent comprehension of what is said, and the person appreciates the meaning of words uttered in his hearing, but loses the power

of *voluntarily* using words to express ideas. The ideas are present in consciousness, and in their logical order, but he is not able to reproduce them as an articulate phonic combination. He cannot repeat what is said to him; sometimes, however, he can express his own thoughts in writing.

AUSTIN FLINT (1836-1915), in his "Physiology of Man" (1873), vol. iv., p. 351, asserts that the first accurate record of loss of speech was furnished by POUR-FOUR PETIT, in his *Nouveau Système du Cerveau*, in 1766. (If François Pourfour du Petit is meant, he lived 1664-1741.)

The case referred to is as follows: A cavalry man, age 35 years, had hemiplegia of the entire right side. "He could move the tongue only with a great deal of difficulty, and could not protrude it from the mouth, nor pronounce any word." Post-mortem: "I found on the left side, the entire anterior protuberance which contains the internal and superior corpora striata, the middle and the external or inferior, dissolved and converted into a substance resembling the lee of wine."

It will be seen that this is not a case of true aphasia, but one of paresis of the tongue. Moreover, that the lesion of apoplexy of one side may destroy the power of speech appears to have been known to physicians of almost all ages. What we claim for Gall is that he was the first systematic observer and the first to define the region anatomically. Subsequent experience has shown that he was right.

Here is **the first case of aphasia,** or loss of speech, which came to the notice of Gall over a century ago:

"Edouard de Rampeau, aged twenty-six, received from a foil, the point of which had been broken on the cushion, a blow on the middle part of the left canine region, near the nostril, in a direction oblique from below upward, and slightly so from without inwards. The instrument penetrated to the depth of about three and a half inches, across the left nasal fossa, crossed the cribriform plate of the ethmoid near the insertion of the falx cerebri, and appears to have penetrated in a vertical direction and somewhat obliquely from before backward, to the depth of five or six lines in the internal posterior part of the anterior *left* lobe of the brain, in such a manner as to approach the anterior part of the temporal lobe.

"The patient experienced a very considerable hæmorrhage at the instant of being wounded, and a large quantity of splinters escaped through the nose and mouth. Patient lost the sight of the left eye for a month, and subsequently saw all objects double. The sense of smell was temporarily extinguished. The taste was equally destroyed. It returned by degrees on the right side of the tongue, but not on the left. The whole of the tongue was drawn to the right in opposition to the hemiplegia, which existed on the right side, the mouth being drawn to the left. The sensibility remained unaffected.

"The memory of names was wholly extinguished, while the memory of objects which could be demonstrated to him was perfectly sound. Patient, though knowing the physician well and recognising him, could not recall his name, and always designated him as Mr. 'Such-a-one.'"

May I call the attention of the reader to the minute and careful description given by Gall, and also to the fact that, whereas almost all cases of loss of speech recorded after Gall, and especially after Broca, were observations made on apoplectics—in whom the hæmorrhage frequently destroys larger areas of the brain, so that deductions for localisation are difficult—Gall observed also **cases of circumscribed injury,** especially through the damage done by a foil, which at that time, when duelling was common, were not infrequent. It is evident that this latter circumscribed injury of the brain of a healthy young patient is of far greater scientific value than the damage done to the brain of an old man owing to the bursting of one of his diseased blood-vessels. This we have to keep in mind in the discussion that follows.

Gall and his followers recorded a number of cases of aphasia, for over sixty years,

before the medical profession officially condescended to take any notice of the existence of such a lesion.

That the much despised phrenologists, before the time when "character-reading" became almost their exclusive occupation, were scientific observers is shown by the following case, recorded by ALEXANDER HOOD, a surgeon of Kilmarnock, in the "Transactions of the Edinburgh Phrenological Society," 1823, p. 235:

"The patient, a sober and regular man of sixty-five years of age, possessed of the ordinary knowledge of written and spoken language, on the evening of September 2nd, 1822, suddenly began to speak incoherently, and became quite unintelligible to all those who were about him. 'It was discovered that he had forgotten the name of every object in nature. His recollection of things seemed to be unimpaired, but the *names* by which men and things are known were entirely obliterated from his mind, or rather he had lost the faculty by which they are called up at the control of the will. He was by no means inattentive, however, to what was going on; and he recognised friends and acquaintances perhaps as quickly as on any former occasion; but their names, or even his own or his wife's name, or the names of any of his domestics, appeared to have no place in his recollection. By way of experiment, I would sometimes mention to him the name of a person or thing—his own name, for example, or the name of some one of his domestics, when he would repeat it after me distinctly, once or twice; but generally, before he could do so a *third time*, the word was gone from him as completely as if he had never heard it pronounced. When any person read to him from a book, he had no difficulty in perceiving the meaning of a passage, but he could not himself then read; and the reason seemed to be that he had forgotten the elements of written language, viz., the names of the letters of the alphabet. In the course of a short time he became very expert in the use of signs; and his convalescence was marked by his imperceptibly acquiring some general terms, which were with him at first of very extensive and varied application. In the process of his recovery time and space came both under the general application of *time;* all future events and objects before him were, as he expressed it, *next time;* but past events and objects behind him were designated *last time.*'

"In the month of December, 1822, his convalescence was so complete, that he could support conversation without much difficulty."

In the *Phrenological Journal* of August, 1825, p. 28, Mr. Hood reports the death of the patient, having occurred on August 17th, after an attack of apoplexy. The post-mortem examination revealed a lesion in the *left* hemisphere "half an inch from the surface of the brain, where it rests over the middle of the supra-orbital plate," and a cystic cavity was found extending from the anterior part of the brain opening into the ventricle. The right hemisphere was normal.

Now, Mr. Hood's case could not be stated more clearly for a modern clinical lecture; yet it was ignored.

Here is **another case** from the same "Journal," No. 39: "Affection of the Faculty of Language from injury of the brain":

In this case, subsequent to a fall, there was a loss of the power of moving the left side of the body, and of articulating words, with the exception of one or two of the simplest monosyllables. The patient was quite aware of his situation, and understood all that was said within his hearing, while at the same time he could not apprehend the meaning of written or printed language. About seven months from the time of the accident he died. On dissection, there was found, among some other morbid appearances, a very distinct softening, to the extent of about a shilling, but of little depth, on the inferior surface of the anterior lobes.

The *Lancet* in those days supported phrenology, and it is now quite interesting to read in its pages the report of a case of aphasia (February 1st, 1824), where the author had to argue with all his powers of intelligence that the loss of speech in the

case quoted was not due to any injury of the vocal organs or tongue, but was a *lesion of the brain*. By way of contrast he cited cases of injury to the vocal organs in which the patient was still able to speak, though imperfectly.

Here is **another case,** by Dr. S. JACKSON (*Lancet*, June 13th, 1829) :

Rev. M. R., aged forty-eight, enjoying excellent health and whose intellect was of a high order, awoke one morning with loss of speech. He could neither speak nor write, being unable to recall words. After forty ounces of blood were drawn from the arm, speech returned, though a difficulty continued to recall the *names of things*. Dr. Jackson drew the inference, that as the loss of language was the only derangement of the intellectual faculties, it must have a separate seat in the brain, and he recorded the case as a strong confirmation to the general truth of the doctrines of phrenology.

And yet **another case** of aphasia, recorded by W. A. F. BROWNE (1805-1885), with critical remarks in the *Edinburgh Phrenological Journal*, 1834 :

" Many years ago there was brought into the Infirmary of Edinburgh a man who was suffering from some febrile affection. He was under the able and excellent Dr. Wm. Pulteney Alison. The patient seemed to understand what was said to him, but his replies were quite unintelligible, because he made use of words which had a meaning quite different from what he was apparently anxious to convey. The words denoted something which had no connection with what he intended to say. This he sometimes made known by gestures ; and then his wants would be guessed at. This would imply that he could understand the proper meaning of words when used by another, though he could not recall them himself. This poor man died. His body was opened and closely examined, and its condition commented on with his accustomed care and ability by Dr. Alison at the next clinical lecture. But what he particularly called our attention to was the want of power in the patient to use the proper words to express his thoughts, as well as the fact that there appeared not the slightest lesion or injury of the *eye*, where Dr. Gall placed the organ of language. [Marked on phrenological busts on the eye, and most critics of phrenology draw their information from them, thinking it waste of time to read Gall's works.- And he therefore concluded that the case was unfavourable to the doctrine main] tained by Gall. Now here is a great physician and physiologist, and a most candid and estimable man, making an important assertion—important because it was certain to create in the minds of scientific and accomplished young men a prejudice which any careful student of Gall's doctrine could in a moment contravene. And when he declared as a proof that there was purulent matter found at the side of the sella turcica which extended transversely at the posterior inferior part of the anterior lobe of the brain, he was not in the least aware that he was giving an accurate description of the organ of language in a state of incurable disorganisation, while all the other convolutions of the frontal lobe were in a healthy state. But as the size of the organ can be measured by the position of the eye in the bony orbit, the good doctor was under an erroneous impression as to its true position in the brain."

The next is a case of aphasia through injury, recorded by Dr. JAMES INGLIS, of Halifax, in the *Edinburgh Phrenological Journal*, 1836, p. 68.

" Mary Wilson, age thirty-three, was shot by a sheriff's officer named Blair on Thursday, December 24th, 1835, in the village of Sprigholm, near Castle Douglas. The ball entered the cranium at the external orbital angle of the frontal bone. It appeared that, on the night of the injury, she had had an epileptic fit, and did not gain complete consciousness till Saturday morning. She then had the use of all her faculties, the memory was unimpaired, and she answered questions correctly. She complained of a dull, heavy, constant pain in the region of the wound. A probe was introduced into the wound, and, after penetrating about an inch and a quarter, was stopped by a splinter of bone pressing on the anterior lobe of the

brain. On passing the probe a little to the right towards the middle line the bullet was distinctly felt, having penetrated both tables of the bone and got imbedded in the internal one. The bullet and several splinters were removed, including one of the orbital plate, which was pressing down upon the eye, causing the woman to complain of something 'pricking' the eyeball.

"Two days later the mental condition attracted attention. She observed and knew every one, and understood whatever was said to her. 'She appears to have lost the memory for words. She cannot express her wants.' The nurse in attendance said to the physician: 'I wonder many times that she does not speak, for her tongue is well enough, and when she wants anything she cannot name it, so that we have to bring a number of things to her, and when it is what she wants she gives a kind of smile.' Two days later she began to improve; she spoke, but in monosyllables only. A fortnight later further improvement. 'Still, however, she forgets some words several times before she can recollect others to express her ideas in succession, and often stops short in the middle of a sentence, telling her nurse to finish it for her.' Two months later the memory for words was quite restored."

A similar case was recorded by the celebrated physician, J. L. C. SCHROEDER VAN DER KOLK (1797-1862), who supported Gall's views (*Gazette Médicale*, September 5th, 1857):

A bony splinter pressed on the brain above the left eye and caused loss of speech, which faculty was completely restored after the removal of the fragment by trephine.

SIR FREDERIC BATEMAN mentioned **a curious case** of circumscribed injury in the *Journal of Mental Science*, vol. xiv.:

Sarah Hase, age twenty-nine, ruptured a vein within the orbit and lost the faculty of speech. The protruding eye receded under appropriate treatment and her power of speech returned.

SIR BENJAMIN BRODIE, M.D. (1783-1862), an avowed opponent of Gall, in his "Psychological Enquiries," announced his grave suspicion that there is in the brain a special organ of speech. In support of his view, he quoted two cases of young children who were unable to speak, although the intellectual faculties were seemingly perfect.

Meanwhile the phrenologists of France were also not idle.

J. B. BOUILLAUD (1796-1881), editor of the "Journal of the Paris Phrenological Society," placed the faculty of articulation of speech in the frontal lobes of the brain, based on his observation of **116** cases of loss of speech. (Archives Gén. de Médecine, 1825: Récherches cliniques propres à demontrer que la perte de la parole corresponde à la lesion des lobules antérieures et à confirmer l'opinion de M. Gall, etc.) He offered a prize of 500 francs for any well-authenticated case disproving his observation.

He was followed by **G. ANDRAL** (1797-1876), with 37 cases.

Then **MARC DAX,** in a paper read before the Medical Congress at Montpellier in 1836, reported impairment or loss of speech in **140** cases of right hemiplegia, from which he concluded that the faculty of articulate language was situated in the left anterior lobe, or, as he put it, that "lesions of the left half of the encephalon are coincident with forgetfulness of the symbols of thought."

His son, **G. DAX,** published further cases, and limited the seat of the faculty of speech to that portion of the left hemisphere which borders on the fissure of Sylvius. He sent a treatise embodying his own and his father's cases to the Imperial Academy of Medicine of France for consideration (1863). Bouillaud, Jules Béclard (1818-1887), and Lélut (1804-1877), that fierce opponent of Gall's theories, were to report on

Dax's paper, which bore the title: "Observations tending to prove the constant coincidence of Speech Disorders with lesions of the left hemisphere."

At the meeting of the Academy, December 6th, 1864, Lélut said he regretted that the Academy had imposed upon him this task, which he ought to have declined. There were many points in physio-psychological science on which his opinions never could be changed or modified. Among these were the relations which it is attempted to establish between certain mental faculties and certain parts of the nervous system, and amongst these the attribution of the faculty of language to a particular part of the brain. This was neither more nor less than phrenology, and he had paid too much attention to this pseudo-science to have recourse to it. Such being the case, he would only speak in his own name, leaving it to his colleagues to express their opinions separately. Dr. Dax, it appeared, had collected about 140 cases, in which speech disorders were always found connected with some lesion of the left hemisphere, the lesion of the right hemisphere producing no disorders of this kind. If such a fact were true, then the brain—that mysterious organ—would be still more mysterious. Lélut concluded by citing what he called a truly startling fact, that of an epileptic in whom the left hemisphere was reduced to a pulpy mass, yet whose speech was perfect to the moment of death.

We have quoted Sir **SAMUEL WILKS'S** examination of Gall's doctrine in the last chapter, and will now continue the quotation, giving his remarks "On Gall's Discovery of Aphasia and the Seat of Language":

"In whatever way we may regard the first inquiries of Gall, it is interesting to see with what enthusiasm the phrenologists set about proving their doctrine as to the seat of language. The earlier volumes of their 'Transactions' contain numerous cases of aphasia connected with disease of the brain, which no doubt involved the third anterior convolution. **The description of these cases is most excellent, and the aphasic condition seems so perfectly understood, that it is really surprising why all that is known about it nowadays should not have been taught equally well fifty years ago.** Our works on physiology, strangely enough, were silent on the subject of speech in connection with any localised seat in the brain, while a heterodox literature contained the whole of the facts which have only just now been taught in the schools.

"One can only account for the ignorance of physiologists and the medical profession of well-established doctrines by their antipathy towards the phrenological school, which prevented any of its literature entering the portals of our college libraries.

"As most modern writings on aphasia entirely exclude the work performed by phrenologists, although done anterior to that usually quoted, I will offer the notes of some cases taken from their 'Reports and Transactions.'" Here follow the notes. ("Guy's Hospital Reports," 1879.)

It will be seen presently that **the French method of issuing an adverse report on a subject which is not acceptable to orthodox science is preferable to the British method of boycotting it altogether,** for the former method keeps the members acquainted with what is being done in the way of research by outsiders, and they can profit by it, for rarely is an investigation so bad that there is not some kernel of truth in it; whereas the latter method is an absolute bar to progress.

We have shown that it was Flourens who, by his experiments which seemed to prove the brain a unity, brought about the neglect and discredit of Gall's doctrine. The faith in the dogmatic assertion of Flourens of the unity of the brain was first shaken when the localisation of the speech centre was accepted by scientists.

PIERRE PAUL BROCA, of Paris (1824-1880), was the man who brought this about. He had been an opponent of cerebral localisation, but was converted after a meeting of the Anthropological Society, when AUBURTIN asserted that—at least—Bouillaud's localisation was proved. He thereupon started to give attention to the

subject at his hospital, where he soon met with a case confirming his localisation. A second case afterwards confirmed Broca that the lesion was "on the upper edge of the Sylvian fissure, opposite the island of Reil, and occupying the third left frontal convolution." (Broca: "Sur le Siége de la Faculté du Language Articulé, avec deux observations d'Aphémie (perte de la parole)," Paris, 1861; and "Remarques sur le Siège, le Diagnostic et la Nature de l'Aphémie, Bulletin de la Société d'Anatomie," July, 1863.)

Broca's discovery was suppressed for a time owing to the action of ARMAND TROUSSEAU (1801-1867), who, however, later became a convert and termed Broca's aphémie—aphasie, *i.e.*, aphasia.

Broca merely confirmed the theory which was already current, by adding two more cases; and **having had the advantage of the new topography of the brain,** he was able to name the seat of the lesion, namely the posterior part of the third left frontal convolution. Broca was acclaimed as a great discoverer, but he had discovered nothing new, and had added only two cases, that of Laborgne and Lelong. Still, it was well that he received so much acclamation, for it had the effect of counteracting Flourens' influence and establishing the possibility of a localisation theory. Text-books spoke of the great Broca; none of the great Gall. But even the writer of the hostile article on Phrenology in the *Dictionnaire Encyclopædique des Sciences Médicales* had to admit that "but for Gall, we should not have discovered aphasia, the keystone of all modern brain physiology." ADOLF KUSSMAUL (1822-1902), "Die Störungen der Sprache," Leipsic, 1877, and SIR FREDERIC BATEMAN, in his work on "Aphasia," have also done justice to Gall. And SIR JAMES CRICHTON BROWNE (1840-) is reported to have said at the Bradford Meeting of the British Association for the Advancement of Science, in 1873: "Ferrier locates the 'memory for words' in the very part indicated by the phrenologists as the 'organ of language.'"

It is astonishing that Broca's localisation of the speech centre should have met with such ready acceptance, for the first case submitted by him presented a lesion extending over a large area, and involving not only the third frontal convolution, but the lower portion of the ascending frontal and parietal convolutions, together with a large part of the first temporal, nearly the whole of the supramarginal, and part of the angular gyrus. The second case was that of an old man, eighty-four years of age, who was said to have suffered from senile decay; and in this case there is some doubt whether the third frontal convolution was involved at all. The acceptance of the localisation was almost entirely due to the popularity among a large section of medical men in France of Gall's doctrine, and the confirmatory observations by Bouillaud and the Dax's. **It is surprising with what slender evidence inquirers are sometimes satisfied, so long as the meagre testimony harmonises with their beliefs.** It is only when theories are propounded which go contrary to opinions already expressed that the critical faculty comes into use. The brains on which Broca's observations were made have been preserved in the Museum of Pathological Anatomy in Paris, where they still may be seen.

Broca's discovery did not annihilate all opposition to the localisation theory. A host of men did not accept his localisation of the speech centre, and published cases disproving it. BATEMAN and MOUTIER quoted cases in which a tumour destroyed both frontal lobes, and the patients, instead of being speechless, were remarkably loquacious. My own observation of similar cases leads me to the conclusion that while the inflammatory process of the brain cells persists, the functions of the area involved are exalted; when inflammation proceeds to destruction, then the function is extinguished. In the above cases, destruction and death may have been simultaneous.

HENRY MAUDSLEY (1835-1918), in a lecture before the Medical Society of London, November 9th, 1868 (reported in the *Lancet*), argued against Broca's

localisation of the speech centre, having been promulgated too hastily and received too rashly. He went on to say :

" To my mind there has been nothing like it in psychology since Descartes located the soul in the pineal gland. It appears to me that these atrophied brains —the brains of persons who died inmates of a lunatic asylum—afford very indifferent support to the theory which was extracted from them ; indeed, it is not easy to see why M. Broca might not, with equal justice, have maintained that a faculty of sanity was located in the third left frontal convolution. . . . Where would the advocates of Broca's theory suppose that the faculty of non-articulate language of an intelligent deaf and dumb person was located ? To what particular convolution would they assume that the ideas must travel in order to get themselves expressed in gesture language ? Would they locate all the bodily movements in the convolutions ? . . . Broca and his followers seem to have deceived themselves by the creation of a wonderful metaphysical entity distinct from the phenomena, which they call a 'speech faculty,' and locate in a portion of the third left frontal convolution. Every idea of the mind is then supposed to be obliged to travel there from the most distant convolutions of both hemispheres, from the north and the south and the east and the west of the brain, to get itself spoken—translated into a muscular act of speech. In no other way can it get outward articulate expression. But if this be so, it will be necessary to suppose that nerve fibres from all the ideational centres of all the convolutions converge to this particular convolution. We know that communicating fibres, the radiating fibres of the cerebrum, do converge from all parts of the convolutions to the motor centres below ; but of any similar fibres converging to a particular convolution we have not the shadow of any evidence. Now **the truth is that there is no more a special faculty of speech in the mind than there is a special faculty of dancing, or of writing, or of gesticulating.**"

Though in the case of Gall, medical men reject with indignation the suggestion of prominences in the brain or skull having any functional significance, they are nevertheless willing to admit them when it suits their purpose. Thus when the brain of Gambetta, the great orator and statesman, was examined by DUVAL (1844-1907) and CHUDINSKI (Report of the Anthropological Society of Paris, and " L'Aphasie depuis Broca," Paris, 1888), Mathias Duval said :

" What person has ever been a greater orator and improviser of speeches ? In him the third left frontal convolution was enormously developed. It actually exhibited a double folding or reduplication in this area, indicating an exceptionally active disposition as far as eloquence and command of language were concerned—qualities for which Gambetta, of all men, was markedly distinguished."

Broca proved in 1861 that the seat of the important centres of speech is in the posterior part of the third frontal convolution of the left hemisphere, where it abuts on the fissure of Sylvius and overlaps the island of Reil. Later he enlarged the speech area, and we now understand by Broca's area that cortico-subcortical area which surrounds the ascending branch of the Sylvian fissure, including its bifurcations. This makes Broca's convolution include what DÉJÈRINE calls the *orbital portion*, the cap and foot of the convolution. By the foot, we mean the part situated between the præ-central convolution and the horizontal and ascending branch of the Sylvian fissure. NAUNYN (1839-), at the Medical Congress at Wiesbaden, 1897, also declared the speech centre to reach to the base of the third frontal convolution, and FLECHSIG (1847-) regarded the island of Reil as the association centre of speech. In a large percentage of cases of disturbance of speech due to cerebral lesions, the adjacent parts of the parietal and temporal lobes are also involved.

The **Island of Reil,** or insula, is deeply placed below the surface and hidden from view. It is seen on lifting up the overhanging parts of the brain, namely the two

opercula, lying between the two branches of the Sylvian fissure. The brain of the ape and also of the microcephalic idiot with defective speech goes no further in its development ; the front part of the insula district remains uncovered and exposed to view on the surface of the cerebrum. In man, however, two additional opercula grow out and ultimately cover over the fore part of the insula. These opercula belong to the lower and back part of the frontal lobe, and are supposed to be more or less called into evidence in connection with the acquisition of articulate speech.

The insula itself is regarded by FLECHSIG as an association centre. WALDSCHMIDT found it under-developed in deaf-mutes, and the same has been pointed out by DONALDSON. MEYNERT, CORNILLON, LEPINE, SPITZKA, and others have regarded the insula as the cortical centre for speech ; CHARCOT maintained that it might, though exceptionally, preside over the speech function to the exclusion of Broca's convolution. Besides those already mentioned, WYLIE and MILLS have also contributed to the literature on the insula.

In all true aphasics, the connection between ideas and articulate language is interrupted within the cerebral cortex.

ADOLF KUSSMAUL (1822-1902) in " Die Störungen der Sprache," Leipsic, 1877, said : " All disturbances of speech can be brought under two great classes, according as the connection between the conception and the word is impeded in the direction from the former to the latter, or *vice versa*, from the latter to the former. When the first happens, the expression suffers ; when the second, the understanding." He means, however, the " understanding " as applied especially to articulate language.

According to JULES DÉJÈRINE, the damage in pure motor aphasia is not cortical, but *subcortical, i.e.*, the grey matter of Broca's area is intact, but its efferent fibres contained in the subcortical white substance are destroyed. Thus the grey matter of this centre is isolated from the motor centres necessary for speaking aloud, but, being itself intact, " internal " language remains possible.

Broca's aphasia, or motor aphasia, is characterised by inability to speak, although the patient understands what is said to him—he has internal language—and was until recently supposed to retain complete intellectual capacity ; that is to say, he is speechless, yet understands what is said to him, as shown by his being able to write his wishes down on paper. Some thus afflicted retain the power to pronounce words of one syllable, but are obliged to resort to writing in order to communicate anything further. Others possess a small stock of words, which they make more serviceable with expressive gestures. Others, still, are simply able to speak a few senseless, and often very extraordinary, syllables and words.

Some aphasics, however, lose also the **capacity for writing.** This agraphia, or inability to express thought in written language, which not infrequently accompanies aphasia, may be incomplete or absolute. Some patients, who have formerly been highly cultivated, become unable to produce a single letter with the pen. Others can write long rows of letters, but arrange them for the most part in meaningless fashion, with an intelligible word occurring here and there.

We shall see in a succeeding chapter that in the seventies and eighties of last century there was a wave of enthusiasm for localisation. Among the areas then mapped out for special function was also the angular gyrus, the destruction of which was discovered in 1877 by ADOLPH KUSSMAUL to cause so-called **word-blindness,** that is, inability to recognise the latest learned objects, letters, and words, whilst the recognition of objects, properly so-called, is unimpaired or comparatively so. The inability to recognise letters and words leads to **inability to read,** therefore this condition is also called " alexia." Words can be spoken, and can also be heard, understood, and remembered ; but their written or printed symbols are not understood ; they appear meaningless pictures, although in other respects the visual functions remain unimpaired.

Sometimes patients cannot read written or printed characters, but the power of **reading figures** is preserved intact. The memory for words and letters is completely independent of that for figures, and such functional independence leads us to presume anatomical independence.

Cases are also on record in which the patients, though word-blind, still retained the power of **reading musical notes.** We shall deal with this peculiarity in a later part of this work.

KARL WERNICKE (1848-1905) first described, in 1874, what he termed **sensory aphasia,** a disorder due to a lesion in the superior temporal convolution and characterised by the fact that the patients, while perfectly aware of the least sound or noise, are incapable of understanding the significance of the words they hear. KUSSMAUL (1876) regarded it as an incomplete form of psychical deafness, and called it **word deafness.** MUNK confirmed the observation. *Word-blindness and word-deafness were now combined by Wernicke under the one term—sensory aphasia*—meaning a condition in which the patient speaks but does not understand, his speech being more or less incoherent, and due to a lesion of the posterior part of the superior temporal, angular and supramarginal areas which obliterates the images of spoken and written language.

The inability of some patients to write or read led **WUNDT** ("Principles of Physiological Psychology," 1902, fifth edition) to assume a "writing" and a "reading" centre in the brain. Their localisation is "somewhat less assured," says he, but he makes no objection to them.

Indeed, the seats of the various elements of which "speech" consists are so widely spread over the brain, that pathologists like WERNICKE and LICHTHEIM have drawn up a geometrical scheme of their connections, to explain their working. Looking at such a map, one can not help wondering how little of the brain is left for all the other mental processes; and the question occurs to one's mind: **Of what use is the brain to animals, if the identical parts in man are necessary for the complicated apparatus of speech?**

In **reading aloud,** the impressions of the words enter by the eyes, reach that portion of the visual sphere known as the visual word centre, travel across to the auditory word centre by association fibres, where the memory of their sounds is revived; another tract of association fibres connects this to the sensory motor area in Broca's convolution, called by Bastian the glosso-kinæsthetic area, whence motor impulses originate which finally reach the muscles concerned in pronouncing the words originally seen.

Writing from dictation is just as complex. The course of the impulses is by the auditory channels to the auditory word centre, then by association tracts to the visual word centre, where the shapes of the letters composing the words are revived; another association tract carries the impulse thence to the sensory-motor area connected with the movements of the hand (Bastian's cheiro-kinæsthetic area) near the middle region of the Rolandic cortex, and finally the movement of writing is accomplished.

If the diagrams explaining all the divers elements of speech and the various forms of aphasia are correct, then **the brain must be primarily a wonderfully constructed speech machine,** and the thoughts themselves, for which this mechanism serves, come from nowhere.

Notice also the large number of cases of lesion of the parietal and temporal lobes (Chapters XXX. and XXXI.) in which no word-blindness and no word-deafness took place.

In 1906 the whole scheme of speech centres received a rude shock.

PIERRE MARIE (1853-), in "La Semaine Médicale," 1906, declared Wernicke's localisation to be founded rather upon theory than fact, and denied the assertion,

often made, that in Broca's aphasia there is no intellectual disorder; on the contrary, he asserts that in every case there is more or less pronounced difficulty in understanding spoken language. Looked at superficially, he says, such patients may appear of normal intelligence, but closer attention, and the performance of more complicated acts, discloses their incapacity. He is unable to admit the existence of pure word-deafness, as **he has never observed a single instance of it,** and the few cases which have been published have been vitiated by some error. If a patient cannot understand the significance of words, Marie does not attribute this to word-deafness but to defective comprehension, his opinion being that Wernicke's area is an *intellectual* (?) and not simply a sensory centre. Word-blindness, according to him, exists clinically, but the lesion which causes it is one of the posterior cerebral artery and not of the middle cerebral artery.

Marie asserts that in every aphasic there is trouble to comprehend spoken language, but that the tests ordinarily used are not adapted to bring the defect out. It is not enough to ask the patient to "put out your tongue" or "hold up your hand." He also claims to have observed that these patients no longer possess the power of intelligent mimicry so as to supplement their defects of speech. He affirms there have been cases,though limited in number, in right-handed persons, in whom the isolated destruction of the posterior part of the left frontal convolution was not followed by aphasia, and gives as the reason why such cases are exceptional that it is rare to find this region alone destroyed, aphasia being generally due to obliteration of the middle cerebral artery at a point above the origin of the branch to this convolution, so that its destruction is associated with that of parts which are the true seats of the function in question. Secondly, he states, that in fifty per cent. of the typical cases of Broca's aphasia, the third left frontal convolution was absolutely normal.

According to Marie, the aphasia of Broca is the aphasia of Wernicke minus speech. The essential difference between them is that in the latter the patient can speak, and in the former he cannot; otherwise they resemble one another in many respects; in both there is incapacity to read and write, and inability to understand what is said when the question is complicated.

The third term which Marie desires to define clearly is **anarthria,** or pure motor aphasia, the inability to articulate words, the consequence of a lesion of the brain. It is marked by a loss of speech, or, at least, of comprehensible speech, to such an extent that it may be possible to confound it with Broca's aphasia, but the distinctions are numerous and decisive. The sufferers from anarthria understand perfectly what is said to them when the phrases are not complicated; they can read and write and are capable of indicating by signs the numbers of letters or syllables of which are composed the words they are unable to articulate. Marie's anarthria corresponds to Déjèrine's "subcortical motor aphasia"; but Marie prefers the term anarthria to avoid confusion with true aphasia, which includes, in the first place, inability to understand language, dependent upon intellectual decay, and, in the second place, loss of the power of reading and writing, neither of which is found in anarthria.

The lesion of anarthria, according to Marie, is at the base of the brain, not confined to either hemisphere, in the white matter between the insula and the lenticular nucleus, or in the anterior part of the "knee" of the internal capsule. It is an ataxia of phonation. Broca's aphasia is often merely aphasia complicated by anarthria, or anarthria complicated by aphasia. The only part of the brain, lesion of which gives rise to aphasia is the area of Wernicke, that is, the gyrus supra-marginalis, the angular gyrus, and the posterior portions of the first two temporosphenoidal convolutions. Broca's aphasia occurs in those cases where, in addition to a lesion of Wernicke's area or of the white fibres thence derived, there is also anarthria due to a lesion in the lenticular nucleus or its neighbourhood. Most commonly this is due to softening, the result of obliteration of the middle cerebral artery which causes destruction of the entire brain area mentioned.

According to LICHTHEIM and DÉJÈRINE, subcortical aphasias are characterised by pure word-deafness or pure word-blindness or pure motor aphasia; but

Marie believes this classification to be absolutely artificial, neither Broca's nor Wernicke's aphasia being purely cortical, the lesion being always found to extend into the subjacent white matter.

Marie finds the association theory of language inadequate to explain the phenomena noted clinically in sensory aphasia. This condition varies much in intensity, but in all cases what is noted is not a loss of certain words, but a general enfeeblement of understanding of words. According to the severity of the case, words of one or more kinds disappear, and the order of their disappearance is constant; thus proper nouns disappear first, verbs last. Marie's view is that true aphasia is one and indivisible; motor and sensory forms cannot be distinguished. It consists, not in a defect of perception, but in a general intellectual enfeeblement, "characterised especially by a loss in the stock of things learned by didactic processes." Though isolated words are perfectly understood, the patient fails to carry out a complex act, and this failure indicates a general intellectual impairment, not a mere loss of understanding of words.

Marie admits that the emotional life is usually well preserved in aphasics.

Marie claims that, in many cases of aphasia, Broca's area is uninjured; and that in cases where Broca's area is injured, aphasia is not always present. If Marie is right, what an indictment of brain investigators! How careless they must have been in their examinations, when they confirmed Broca's observation for forty years! What guarantee have we that other modern localisations are correct! It means that **pathologists saw what they "expected" to see.**

Now, Gall laid more stress on cases of aphasia due to circumscribed lesion of the brain through injury than he did to the cases of aphasia in apoplectics; for, in the latter, as we have pointed out already, all the blood-vessels of the brain are in a state of degeneration, softening takes place in more than one region, and thus the whole problem becomes complicated. Moreover, Gall's speech centre, as all his so-called organs, include not merely a certain area of grey matter, but the subjacent fibres as well, and he frequently points out that the lesion may be in one as in the other. In my opinion, the whole subject wants further systematic inquiry —and that by men who have no preconceived notions of what they may expect to find.

Marie claims that Wernicke's zone—the temporo-parietal area—is not the area for the auditory and visual centres of speech but is an intellectual area; and that the aphasia of Wernicke is due, not to disturbance of auditory and visual processes, but to intellectual disintegration. If Marie is right on this point, what a maze we are in! According to him, the posterior temporal area is connected with intellectual processes; we shall see later that other observers say the central parietal area alone is connected with the highest intellectual powers; others say the same of the occipital lobes; others of the frontal lobes; and finally there are some who declare the entire brain to serve for intellectual processes! We shall see presently that **the confusion in which the localisation theory is now involved is largely due to the hasty deductions drawn by observers, otherwise eminent, from isolated cases.** Let us have the material first! The theorising can be left to the next generation.

With reference to this discussion of aphasia and its connection with the intellect, we must remember that the speech centre is in the midst of the intellectual zone (if we accept the frontal lobes as the seat of the intellect), so that by the mere cutting off of some association fibres the intellect may suffer; and we must also not lose sight of the fact that the patients on whom the observations are made are hospital patients, and therefore as a rule with little or no education. Lesions which interfere with the cerebral zone of speech, either on its sensory or motor side, will cause in such persons an impairment of ability to carry out mental processes to a greater degree than in those of a higher order of intelligence. The mere fact of the speech defect

increases the difficulty of determining the integrity of the mental processes. The question is : **Can the aphasic do any abstract thinking ?**

DÉJÈRINE, in his replies to MARIE, maintained the classical, or at least the usually accepted views, regarding aphasia, holding with reference to sensory aphasia that the long accepted theory of centres for sensorial images cannot be successfully attacked, and that the diminution of intelligence sometimes exhibited by aphasics is dependent upon disruption or disturbance of the cerebral mechanism of speech rather than the aphasia upon the intellectual loss or deficit.

He stoutly maintained that Broca's convolution plays an important part as a speech centre, explaining the cases in which it is involved and aphasia does not result by the compensation action of the opposite hemisphere ; and cases of Broca's aphasia without lesion of Broca's convolution by the fact that the motor speech zone includes other parts, as the anterior insula and the foot of the second frontal gyrus. He adhered to his theory of subcortical motor aphasia due to lesion of the fibres entering and leaving Broca's convolution. He held that the existence of the real or the apparent sensory aphasia in motor aphasics is usually only temporary, and in any case is not to be explained in the way that Marie suggests. Anarthria or disarthria, according to Déjèrine, is due to lesion of the motor projection fibres, and is different from cortical or subcortical motor aphasia. He contended also that the cases with numerous or extensive lesions described by Marie are cases of total aphasia, the lesions involving all or a large part of the speech zone ; also that Marie failed to recognise cases in which Wernicke's zone and the lenticula are not involved and yet Broca's syndrome is present. Déjèrine believed that a purely unilateral lesion of the lenticula does not produce anarthria.

The following case of DÉJÈRINE confirms the classical Broca centre :

At a meeting of the Société Clinique de Médicine Mentale of Paris held on July 19th, 1909, M. MARCEL BRIAND and M. BRISSOT exhibited the brain of a case of motor aphasia of considerable interest, as the patient had been under observation for a number of years, and her clinical history had been published by Déjèrine in 1898. A report of the communication will be found in the *Revue de Psychiatrie* for August, 1909. In 1896, at the age of twenty-seven years, an apparently healthy young woman suddenly was seized with a stroke of paralysis and fell to the ground, remaining unconscious for ten hours. On recovering consciousness, she was found hemiplegic on the right side and to have lost all power of speech. Before the stroke she had been able to speak four languages, French, German, Italian, and Spanish, but from that moment and afterwards she was unable to pronounce anything more than the two simple words, " Oh non." A slight degree of word-blindness, which was remarked, disappeared after a few months. The patient came under the observation of Professor Déjèrine at the Salpètrière, who considered the case very striking, the intelligence being of a very high order and other cerebral functions being to all appearance intact. Her condition remained practically unchanged for ten years. Re-examination by M. Briand, in May, 1908, showed the existence of a spastic right hemiplegia—with exaggerated reflexes on that side. Spontaneous speech was *nil*, except for " Oh non," used correctly and in its proper sense. The patient was unable to repeat words on request. With the letters of the alphabet before her, she was able to spell out any word in any of her four languages, either spontaneously or to order. There was not the slightest trace of word-deafness in any of these languages. Writing was perfectly performed with the left hand, spontaneously and to dictation, and copying was accurate. There was neither mind-blindness nor mind-deafness ; no astereognosis or apraxia. There was no indication whatever of intellectual defect ; the patient was well aware of her surroundings, of events in her life ; memory, attention, and judgment were unimpaired. The case appeared to be one of pure motor aphasia. On May 15th, 1909, death occurred from renal causes and a necropsy was secured. The whole of the posterior end of the third left frontal convolution was completely destroyed by an old area of softening. In addition, on the right side, another area of softening involved the inferior parietal convolution and the anterior and superior part of the

angular gyrus. This cavity was roughly two centimetres in diameter and two and a half centimetres in depth, yet it had given rise to no symptoms of sensory aphasia. In view of the contention of some members of the Parisian school that Broca's convolution has nothing to do with the production of motor aphasia, the above case is interesting.

MOUTIER declares that neither Broca nor anyone else has produced a single case of aphasia dependent upon the isolated destruction of the third left frontal convolution, while, on the other hand, there are many cases on record in which the destruction of this convolution was not accompanied by aphasia, and he quotes the remarkable cases of BURCKHARDT ("Zeitschrift für Psychiatrie," 1891), who extirpated three convolutions in demented persons without the operation being followed by any affection of speech. He states that at Bicêtre there have been three cases of destruction of Broca's convolution without aphasia. Moutier regards the whole conception of cerebral localisation as having collapsed with the theory of Broca.

DUPUY (*Lancet*, 1914) does not believe that the quadrilateral space Marie mapped out contains the centre of the speech faculty, for he also found it destroyed when no aphasia existed. He believes these centres are centres of inhibition.

Just as others find a difficulty in accepting Broca's centre, so **S. IVORY** (*Science*, March 1st, 1912) declares it unfortunate "that we cannot say that word-deafness is invariably due to a lesion of the left superior temporal gyrus. Authentic cases have been recorded in which there has been no affection of this convolution." And he confesses that the localisation of this condition, even as a clinical phenomenon, **rests upon only two cases** which have been checked by careful post-mortem examination. Ivory, however, believes only in a motor, sensory, and associational localisation, but not in a *psychic* localisation.

MORTON PRINCE (*Journal of Nervous and Mental Disease*, June, 1910) sums up the present position of aphasia by saying: "Whatever the outcome of the re-investigation of this question shall prove to be, it is evident that **the beautifully diagrammatic concepts** of the function of language with which our text-books were illustrated, and of the aphasic disturbances of this function in one or other of its many forms as produced by some particularly localised lesion, **have been relegated to the scrap-heap of the phantasies of science.**"

Further particulars of the speech centre and aphasia will be found in succeeding chapters.

CHAPTER XX

HISTORY OF MODERN EXPERIMENTAL BRAIN PHYSIOLOGY

The Discovery of Brain Centres for Motion and Sensation

JOHN HUGHLINGS JACKSON (1834-1911)

In 1861 Broca had tried to localise a mental power—that of speech. In the same year, Hughlings Jackson advanced the theory of localisation of "physical movements" ("Clinical and Pathological Researches," 1861). From a study of the form of epilepsy (1864), now known as **Jacksonian epilepsy** in distinction from the ordinary epilepsy, he furnished cogent reasons for believing that certain convolutions near, and functionally related to, the corpus striatum had a direct motor significance. By irritation or "discharging lesions" of these convolutions, localised or general unilateral convulsions of the opposite side of the body were induced, beginning generally in the thumb or index finger, or in both.

Jackson had, however, been anticipated in a measure more than a century before by A. v. HALLER (1708-1777) and his pupil, J. G. ZINN (1717-1759), who stated that on removing parts of the cortical substance of an animal's brain, convulsive movements occur in its extremities. C. E. ECKHARD (1822-1903), in 1867, made independently a similar observation.

Jackson believed that the whole of the frontal lobes are chiefly motor in their functions, a view held by THEODOR MEYNERT (1833-1892) and others, who regarded the anterior part of the brain to be destined for motor and the posterior for sensory functions.

Jackson did not believe in localisation of "mental" functions. "For my part," he said, "I think there are not in the cortex cerebri any abruptly demarcated centres for any kind of representation"; and he took consciousness and mind to be synonymous, for "if all consciousness is lost, all mind is lost." (*Journal of Mental Science*, 1887.)

Jackson's view that local convulsions are produced by local lesions was passed over in silence until DAVID FERRIER (1843-) called attention to them in support of his own views.

EDUARD HITZIG (1838-1907), of Halle.

We have seen that the doctrine of Gall, that each part of the brain presided over some mental faculty, stimulated Flourens to a series of experiments which appeared to disprove the localisation theory. These experiments in turn were disputed when, in 1870, facts were discovered in Germany which form the basis of our present knowledge of brain action.

In 1870, Hitzig, together with his colleague G. T. FRITSCH (1838-91), of Berlin University, undertook some experiments on the brains of dogs to determine whether localisation of function was possible. These epoch-making experiments (Archiv

für Anatomie, Physiologie, etc., 1870, and Hitzig's work, "Untersuchungen über das Gehirn," 1874), began the modern era of investigation into this subject.

Hitzig and Fritsch discovered that the stimulation of circumscribed portions of the brain-surface of a living dog produced movements of definite groups of muscles. To cause these movements certain parts of the brain had to be irritated by electricity, other parts being irresponsive.

Hitzig and Fritsch found that a portion of the convexity of the cerebral hemispheres of the dog is motor, that is, it reacts by muscular movements to the direct application of a *galvanic* current, while the other portion is inexcitable to this stimulus. On exciting with weak currents the resulting contractions are limited to certain groups of muscles on the opposite side of the body; with stronger currents the reaction spreads to more muscles, not only on the opposite, but also on the same side of the body. They gave the name of *centres* to those areas of the cerebral cortex which, when excited with a weak current, induce reaction in a limited group of muscles on the opposite side. They found they could distinguish in this manner **five "motor centres":** one for the muscles of the neck, another for the extension and abduction of the fore-limb, another for the bending and rotation of the same limb, another for the hind-limb, and lastly one for the face; the irritation of the one side of the brain always causing movements in the other side of the body. All these centres in the dog are situated **round the crucial sulcus.**

The Viennese anatomist, LUDWIG TÜRCK (1810-1868), had already noted that the motor nerve-fibres terminate in that part of the brain which is called the region of the central convolutions.

Hitzig and Fritsch then proceeded, for confirmation, to the destruction of these same areas, when these same groups of muscles became impaired.

In the opinion of Hitzig, these disturbances of motion were due to destruction of the physical basis of the animal's **control** over its limbs; but, in the opinion of another investigator—MORIZ SCHIFF (1823-1896)—they were rather due to tactile anæsthesia.

Hitzig ("Centralblatt für die medizinischen Wissenschaften," 1874) also found that the removal of certain convolutions in the posterior lobes of the dog produced **blindness of the opposite eye,** combined with a paralytic dilation of the pupil; stimulation of the same area producing contraction of the pupil.

B. PANIZZA (1785-1867), in 1855, ascertained that the lesions of one posterior portion of the dog's hemispheres produced blindness on the opposite eye; thus anticipating Hitzig's observation by twenty years.

FERRIER localised the centre for vision, in 1875, in the angular gyrus; where MUNK, in 1877, located "psychical blindness," when the animal can see, but no longer recognises the object which it sees. If the occipital lobe is destroyed as well, the blindness is not only psychical, but absolute and permanent, *i.e.*, there is cortical blindness.

These experiments, since that time repeated in almost every physiological laboratory in Europe and tried upon various animals, established the fact that there is in the brain a certain part which directs voluntary movements. Before Hitzig began his work, the corpus striatum was regarded as the great motor centre, and the optic thalamus as the chief centre for sensation. From his time onward, these basal structures were regarded as subsidiary centres.

Hitzig and Fritsch, from the facts they had observed, drew the conclusion that **the principle announced by Flourens of the unity of the brain was demonstrably false.** "We must rather admit," they said, "that certainly several **psychical** functions, and probably all, are shown to have their point of entrance into matter or of origin from it at circumscribed centres of the cerebral cortex." These centres are therefore not purely "motor," as many physiologists believed, and still believe, but "psycho-motor." But if they are **psycho-motor,** they establish one of the first principles of Gall's doctrine, the plurality of the functions of the brain, and we should have expected some acknowledgment from Hitzig. But what does he say?

" I know nothing of Gall's doctrine from my own experience. It is enough for me that Leuret is said to have demonstrated as a consequence of Gall's own statements that the rabbit would have to be a more destructive animal than the wolf, and the donkey immensely more musical than the nightingale " (" Zeitschrift für Ethnologie," 1873).

Thus once more has Gall's doctrine been demolished, not on direct evidence, but on a ludicrous second-hand statement.

Hitzig was opposed by HERMANN NOTHNAGEL (1841-1905), who did not believe in the localisation of mental functions.

THOMAS LAYCOCK (1812-1876),

Physician in Ordinary to Queen Victoria for Scotland, Professor of Medicine and Lecturer on Medical Psychology and Mental Diseases in the University of Edinburgh, must be mentioned here, because of the many distinguished students of his that afterwards rose to fame, some of whom took up this special department of experimental physiology. Among his students were James Crichton Browne, Hughlings Jackson, David Ferrier, Lauder Brunton, MacKendrick, William Rutherford, Stirling, and Thomas Clouston. Laycock extended the doctrine of reflex action to the brain, and claimed priority in the use of the phrase " unconscious cerebration " (originated in 1838). Edinburgh University is indebted to him for introducing the teaching of Medical Psychology and Mental Diseases in 1857. In his work on " Mind and Brain " (1860), **he accorded merit to the phrenological system** as " founded on natural principle," and taking cognisance of the relations of consciousness to the nervous system, while its classification is more complete than that of any previous metaphysical one. " I am inclined," he said, " to adopt that classification [psychological classification by Gall and Spurzheim] as the best arrangement that could be adopted until our physiological analysis of mental phenomena has had a more scientific development. Great skill may be attained by persons specially endowed (as the majority of practical phrenologists are) with the faculty of physiognomical diagnosis. . . . The results of observation are sometimes so striking as to present all the apparent certitude of a science. . . . That a minute cranioscopy founded on the European type is applicable to all races of men may well be doubted ; but all agree in admitting the great divisional regions of phrenology." This unusually favourable view of phrenology by a physician of his standing need not surprise us, because of his intimate friendship with SIR JOHN FORBES (1787-1861), another great physician who tried his best to get his profession to take up a reasonable attitude towards the subject.

In view of the succeeding history, the reader should also take note of Laycock's observation with reference to the discovery of motor centres (*Journal of Mental Science*, 1876) that " the localisations of Gall, to which Dr. Carpenter still strongly objects, as well as those of Hitzig, Ferrier, and others—all which tend to confirm Gall's view—constitute the most available anatomy of the Reason and Will, considered as the intellect and power."

Sir **JAMES CRICHTON BROWNE** (1840-),

one of the pupils of Laycock, is the man whose intervention was the source of much of the progress which has been made in this department of research. We have cited among the early phrenologists Dr. W. A. F. Browne (1805-1885), Commissioner in Lunacy for Scotland. Now, his son, Sir James Crichton Browne, F.R.S., before he became Lord Chancellor's Visitor in Lunacy, but was still Dr. Crichton Browne, Medical Superintendent of the West Riding Lunatic Asylum in Yorkshire, was as

ardent a **phrenologist** as his father. He has since changed his views, but that does not alter history.

He wrote in the *Journal of Mental Science*, 1861 :

"To the illustrious founders of phrenological science psychology owes much ; for those who have had the greatest opportunities of observation have almost invariably come to the conclusion that, without an acceptance of the general principles of phrenology, mental disease can neither be understood, nor described, nor treated.

"Phrenology has been despised by many and opposed by the learned in the most illogical and dishonest manner, and yet it still exists, and now begins to take up its proper position among the sciences. Its great doctrines are now openly or tacitly acknowledged by the great majority of medical and by several metaphysical writers, and many have earned fame by giving them to the world without confessing their derivation."

He also wrote to the Editor of the *British Medical Journal*, November 16th, 1861, in reply to a paragraph welcoming the decision of the Newgate authorities not to allow a cast of the convict Cogan's head to be made after execution :

"Now, sir, it has been observed that the human mind has usually opposed a passive and instinctive resistance or vis inertia to the progress of new ideas, even when of the most simple and palpable description ; and it has also been remarked that where the new doctrine treats of matters not lying on the surface, and when it appears to clash with established views on points in which the feelings are apt to be interested, an active, passionate and vehement opposition may be looked for. But it had been hoped that the diffusion of knowledge at the present day, and liberal and enlightened opinions on scientific subjects, and also the length of time during which phrenology has been before the public, would have secured for it a more calm and fair examination than it at first received or even now receives.

"The paragraph quoted above was, therefore, read with considerable surprise and much regret, for it unmistakably shows that the Newgate authorities are animated by feelings tyrannical and unfair towards phrenology, and that the Newgate surgeon is actuated in the present instance by sentiments anything but enlarged and philosophical. It is surely unjust that a whole doctrine should be rejected, and its patient students stigmatised as quacks and promulgators of 'vagaries,' by men who have never looked at a brain or skull with a view to discovering the relation they might bear to mental manifestations. It is not at all material to the question before us whether phrenology be true or false. Whether true or false, it appeals to facts and to nature, and no logical opponent would attempt to prevent its disciples from accumulating observations, which will militate against themselves if phrenology be false, and which will go further to refute it in such a case than the *a priori* arguments with which it is frequently met. The interference of the Newgate authorities must be regarded with apprehension, for why should not pathological 'vagaries' be extinguished by putting a stop to 'post-mortem examinations' ?

"I know not by whom the application for Cogan's head was made. Very probably by some of those charlatans and quacks who prostitute science, but who, at the same time, often collect valuable materials to be used by its legitimate followers. I cannot help thinking that a cast of the convict's head might have been interesting and useful, even apart from its phrenological significance, and I regret that it was not procured."

Sir James Crichton Browne is a very learned man who was then, as he is now, doing his utmost to promote the progress of medical science. Seeing that Hitzig had proved the most fundamental principle of Gall's doctrine—the multiplicity of centres in the brain—the denial of which had for fifty years obstructed the advance of our knowledge of brain functions, **he invited a young friend and former fellow-student** (of Dr. Laycock, Professor of Medicine of Edinburgh University)—DAVID

FERRIER (1843-), who then was engaged in quite a different department, being Lecturer on Toxicology (1872-1889) in succession to Dr. Guy in King's College, London—**to come to Wakefield and repeat Hitzig's experiments** on the brains of animals and to confirm—or possibly to contradict—phrenology.

Sir **DAVID FERRIER** (1843-)

Crichton Browne placed at the disposal of Ferrier the resources of the Pathological Laboratory of the West Riding Asylum, with a liberal supply of pigeons, fowls, guinea-pigs, rabbits, cats, and dogs for experimental purposes. The West Riding Lunatic Asylum Reports, vol. iii., 1873, contain the first result of Ferrier's researches, embodied afterwards in "The Functions of the Brain," London, 1876. He used the faradic current in his experiments, finding the galvanic (used by Hitzig) not the most appropriate stimulus for the purpose.

Whereas succeeding experimenters saw only motor centres in the brain, Ferrier is keen to point out their **phrenological** significance. Thus he said :

"It will be seen that the movements recorded in the above experiments as resulting from excitation of the individual centres are purposive or expressional in character, and such as we should, from psychological analysis, attribute to ideation and volition if we saw them performed by others. The clutching or striking movement of a cat's paw is not a simple muscular contraction, but is a complex and combined action of numerous muscles all directed to one end. Of course, we have no other guide than our own consciousness to the interpretation of the actions of the lower animals, but as in ourselves or others we attribute such apparently purposive complex movements to ideation and volitional impulse, we may conclude that the cortical centres are not merely motor but **voluntary motor,** and concerned with the outward manifestation of intelligence." He then asks the question : "Are the ideational centres situated in the same regions as the corresponding motor centres ; or does a high development of certain motor centres indicate only, but without localisation, a corresponding development of the ideational centres which manifest themselves outwardly through these ? Would, for instance, a high differentiation for the centres of the hand indicate a high degree of manual dexterity [the phrenological organ], or at least the capacity of acquiring such, and the possession of those mental powers more immediately associated with such dexterity ?

"These speculations are suggested by the now tolerably well established fact of loss of speech following destructive lesions of the lower frontal convolutions in the neighbourhood of the island of Reil. . . . It is a significant fact that the centres for the mouth and tongue in cats and dogs are localised in regions corresponding in geographical position, and which, both anatomically and physiologically, I should be inclined to regard as the homologues of the lower frontal convolution and island of Reil in man. The question, then, is, do lesions in this neighbourhood destroy the organic centres of the memory of words, or do they only interrupt the channels whereby these are manifested outwardly as articulate speech ? The fact that the speechless patient is likewise unable to write, *i.e.*, in the sense of expressing himself by written symbols, even though the hand may retain the power of tracing these, would seem to indicate that it is not the mere channel for the articulate expression of ideas that is interrupted, but that the very centres of word-memory are destroyed. . . . The speechless man is not wordless ; his defect is that he cannot revive words *voluntarily*. . . . Hence I should incline to the opinion that the organic centres of **word memory** [the name Gall gave it] are situated in the same convolutions as the centres which preside over the muscles concerned in articulation."

Ferrier did not mention Gall or his doctrine, except once, when he said : "To Dr. Gall let us pay the tribute that in his analysis he followed strictly inductive methods, and made many observations of enduring value." Nor do I think he has much knowledge of Gall's teaching.

But Sir James Crichton Browne evidently reminded him of his indebtedness to

the earlier investigator at the British Association Meeting in 1873, when he said: "I think that the labours of Gall and Spurzheim ought not to be overlooked in a discussion on the localisation of functions of the brain—a principle which they distinctly enunciated. It was a curious fact that Dr. Ferrier located the memory of words in the very part indicated by the phrenologists as the organ of language."

Whatever Sir James Crichton Browne had in his mind when he suggested to Ferrier to undertake the investigation, considering Ferrier was then not a neurologist, but Lecturer on Forensic Medicine, **Ferrier himself had no other desire but to record what he had observed.** Indeed, his own version of what gave him the impetus to undertake the inquiry is that he wished to put to experimental proof the views entertained by Hughlings Jackson. Certainly in his later utterances Ferrier lays greater stress on the motor and sensory localisation than on the psychical; but no one acquainted with Gall's work can read Ferrier's without recognising that, at all events at first, the mental functions were to him more important than the physical. Take only the title of his lecture at the Anthropological Institute in 1887: "How far recent investigations on the functional topography of the brain could be brought into relation with craniological and anthropological researches with a view to establish the foundation of a scientific phrenology"; **a lecture to which I had the honour of replying two years later,** when Ferrier, Horsley and a number of other experimenters were present.

I showed then that Ferrier acknowledged Gall's fundamental principles, almost verbally:

(1) "That the brain is the organ of the mind is a universally admitted axiom."

(2) "Other things being equal, there are grounds for believing that a high development of certain regions will be found associated with special faculties of which the regions in question are the essential basis."

(3) "Intelligence and mental power, as a whole, will largely depend on the relative balance or development of one part as compared with another."

(4) "The brain fills the cranial cavity like a hand in a glove, and is closely appressed to the interior of the skull cap."

(5) I showed that Ferrier confirmed Gall's theory of the pre-frontal lobes being the centres of the higher intellectual operations;—other parts of the brain being for the appetites and instincts:

After destruction of the frontal lobes, Ferrier says, "there is the aspect of uninterest and stupidity, the absence of that active curiosity which is normally manifested by monkeys, and the mental degradation which seems to depend on the loss of the faculty of attention and all that it implies in the sphere of intellectual operations.

"After removal or destruction by the cautery of the antero-frontal lobes, the animals retain their appetites and instincts, and are capable of exhibiting emotional feeling. They have lost, however, the faculty of attentive and intelligent observation."

(6) Stimulation of Gall's brain area which is supposed to dispose to anger, fighting, and destruction causes, according to Ferrier: "Opening of the mouth . . . associated with vocalisation and other signs of emotional expression, such as spitting and lashing the tail as if in rage."

(7) Stimulation of Gall's brain area of the emotion of fear, disposing to caution, causes the animal, according to Ferrier, to give "a quick start or bound, as if to escape from danger"; and after destruction of this area, the animal "paid no attention to threats or grimaces."

(8) With reference to the posterior area, which Gall identified with the social affections, and which in a morbid state gives rise to grief and depression, Ferrier says:

" In regard to the occipital lobes much has yet to be learned as to their specific function. Irritation of these lobes by the induced current gives rise to no outward manifestations, and the only effect I observed after extensive destruction of these lobes on both sides in a monkey was a remarkable state of depression with refusal of food such as one sees in cases of melancholia, sensation and voluntary motion being unaffected. The facts are such as to indicate a relation to the systemic sensations and the emotions founded upon them. This would agree with the results obtained by Schröder van der Kolk, who states that in melancholia with depression he has found the posterior part of the brain diseased. In the case before us melancholia was a prominent symptom, and considerable softening of the occipital lobe on the right side was found post-mortem." (Why Schröder van der Kolk, who only followed Gall ?)

(9) Of the phrenological organ of " alimentiveness " or " gustativeness," discovered by Dr. OTTO, of Copenhagen, and rediscovered by Ferrier, he says :

" The substrata of the feeling of hunger and appetite for food are the stomachic branches of the vagus and their cerebral centres." Stimulation of the area in question " caused movements of the tongue . . . characteristic of tasting."

(10) Even of Gall's sexual centre in the cerebellum, which has been denied by every other experimenter, Ferrier shows toleration, for he says :

" The sexual appetite may be morbidly excited by pathological irritation of the cerebral centres," as instanced " by the satyriasis and nymphomania occasionally observed in connection with disease of the middle lobe of the cerebellum."

These and other facts were pointed out by me in 1889. Whether as an effect of the discussion that took place, and the subsequent correspondence, or in consequence of the articles which appeared in scientific journals, I cannot say, but the fact remains that since that time " mental " centres have been tabooed, and we have heard only of **centres for motion and sensation.** Ferrier did not set out to prove phrenology, that is evident ; he merely undertook an investigation which seemed to him might produce some valuable results, but he undoubtedly regarded the movements he elicited as expressions of the mental state of the animal. He honestly believed that his centres were *psycho*-motor and *psycho*-sensory, and he described them accordingly ; but his description fell on deaf ears. To have admitted in those days " psychical " areas would have been equivalent to admitting a status for phrenology, for that doctrine was not yet quite dead ; indeed, several of the old scientific advocates of phrenology were still alive, though they kept silent. A revival of that doctrine could on no account be tolerated, however modified in substance and form, not only because the subject had fallen into the hands of quacks, but because so many scientific authorities had committed themselves definitely against the theory of localisation of mental function, and could not go back on their word. Unfortunately this **" new " phrenology,** as it was called by the opponents of the old, did not achieve much more permanent results than its predecessors, as will be seen in the course of our history.

Ferrier was not accepted on the Continent either as a new or a true light. Hitzig, Munk, and Benedikt criticised him severely. LANGE spoke of " his crude and unmethodical repetitions of Hitzig's experiments." And they all accused him of mapping out the *whole* brain, except a small area, the pre-frontal lobes, which are hardly noticeable in animals, so that **no room was left for purely mental operations.** As Hitzig said : " According to Ferrier, almost the whole hemispheres must be motor, and no room is left for sensory, perceptive, or reasoning functions."

In Britain, however, his researches were greeted with enthusiasm, and leading articles in medical journals were written prophesying wonderful developments for

these discoveries. **It was confidently anticipated that they would solve man's moral and spiritual mysteries,** and that the nature and causes of insanity would speedily be laid bare. These hopes have not been realised.

Only SIR MICHAEL FOSTER (1836-1907), Professor of Physiology in Cambridge University, ventured to criticise the results of these investigations by Ferrier, Fritsch and Hitzig. At a meeting of the British Association in 1897, he said :

" That progress has left much to be desired. On the one hand the experimental inquiries, even when they were carried out with the safeguard of adequate psychical analysis of the phenomena which presented themselves, and this was not always the case, sounded a very uncertain note, at least when they dealt with other than simple motor effects. They were, moreover, not infrequently in discord with clinical experience. It is risking too much to trust too implicitly to the apparent teaching of the results arrived at ; something appears wanting to give these their full validity, to explain their full and certain meaning by showing their connection with what is known in other ways and by other methods."

Ferrier mapped out the hemispheres of the brain into no fewer than fifteen kinds of centres. He was not long in bringing the evidence of human pathology to bear upon them (" Localisation of Cerebral Disease," London, 1878). It is this that must redound to his greatest credit. In France, it was JEAN MARIE CHARCOT (1825-1893) and PITRES who confirmed by clinical evidence the accuracy of the localisation of the motor area (1877).

Ferrier's standpoint was well expressed in his address to the " Congress of American Physicians and Surgeons " in 1888 (" Transactions," vol. i.) :

" Though our knowledge of the functions of the brain and of the principles of diagnosis of cerebral disease has made enormous strides of late years, and has rendered possible the brilliant surgical achievements of which we have heard this evening, **we must not imagine that we really know much about the brain after all.** Though we can point to the portion of the brain concerned with the movements of the foot, the head, the mouth, etc., to that portion of the brain with which we see, or hear, or feel, and determine with a fair degree of accuracy the seat and kind of disease which invades the cerebral cortex, yet there are portions of the cortex which are to us still practically a *terra incognita*—and even with respect to the regions which I have alluded to, there are still considerable differences of opinion, which though not materially affecting the diagnosis of cerebral disease, are yet of no little importance in relation to a true conception of the mechanism of brain function. For **behind those sensory and motor centres there lie also all those functions which constitute mental phenomena,** a true correlation of which, with their material substrata, is even of greater importance, both theoretically and practically, than the mere determination of their physiological significance, and the effects of irritative or destructive lesions. The sympathies between the different parts of the nervous system are so numerous, and so intricate, that it is often impossible to determine between the effects which are the necessary consequences of a particular injury and those which result from sympathy. If we add to these the difficulties arising from the impossibility of deciding how much of the effect is attributable to the shock given to the whole animal system by the very severe wounds of other parts, and how much is due to the mutilation of the brain itself, our hopes of success will be very moderate. And while we know so little of the functions of the primitive mental faculties, as still to be disputing their number and nature, it seems to us little short of absurd to expect to discover which of them has disappeared."

As to Ferrier's statement of the sympathies existing between the different parts of the nervous system, which render it difficult to determine the effects of irritation or destructive lesions, it is identical with that made by Gall exactly eighty years earlier :

" In order that experiments of this kind should be able to throw light on the

functions of each of the cerebral parts, it would require a concurrence of many conditions, impossible to be fulfilled. It would first require that we should be enabled to restrain all the effect of the lesion to that portion only on which the experiment is performed; for what can we conclude if the irritability or inflammation affects other parts? . . . Where is the anatomist or physiologist who knows with precision all the origin, the extent, the ramifications, and connections of a particular brain part? . . . This being established, how can we prevent the *reciprocal influence* of all these parts, especially when they are irritated, injured, lacerated or destroyed?"

Ferrier's other statement that we do not know what are the primitive mental powers, their number and nature, is also identical with Gall, who said:

"It would also have been necessary that the mutilators should be divested of every metaphysical prejudice; that they should have a detailed knowledge of the fundamental powers. . . . They are unquestionably ignorant of the character of each primitive power which may be manifested by the mind. On seeing a certain number of manifestations, they cannot tell to what primitive powers they belong, nor how many are still wanting to complete the manifestations of the full catalogue of primitive faculties."

Gall concluded:

"The physiologists do not pretend that they can cut out particular organs from the brain without impairing the functions of other organs. It is impossible therefore to compare particular manifestations lost with particular parts cut out. . . . I consider, therefore, that this method is fundamentally defective, unphilosophical, and unproductive, when relied on for discovering the primitive faculties connected with particular parts of the brain."

Ferrier's experiments were followed by LUIGI LUCIANI (1842-1919) and AUGUST TAMBURINI (1848-1919) in 1878.

HERMANN MUNK (1839-)

The work of Munk ("Über die Funktionen der Grosshirnrinde," Berlin, 1881) added to the discoveries of Ferrier by establishing that **sensations as well as motion can be located.** He located the sense of sight in the occipital lobes and enlarged Ferrier's area for hearing in the temporal lobes. He discovered also the area for "psychical blindness" in the gyrus angularis, *i.e.*, the inability of the animal after destruction of this area to form those visual images or ideas which give it the meaning, or interpretation, as it were, of the visual impressions.

If the gyrus angularis be removed from both hemispheres of the brain, when the animal has recovered from the inflammatory reaction, it will still move about freely, guiding itself by sight even under difficult circumstances. But it does not recognise by sight the dish from which it has been accustomed to take food or water, the companions with whom it has formerly played, the man who has been its keeper, *the threatening hand or whip*, the *burning coal held before its face.* (This is Gall's area of "fear" and "caution.") It still retains its general intelligence and makes constant and diligent investigation into the objects by which it is surrounded. As time passes, it gradually learns to recognise again all those visual objects, the period required being from three to five weeks. This recovery consists in learning anew the meaning of visual impressions.

ALBERT ADAMKIEWICZ (1850-), "Die Pathologie der Hirncompression," 1883, showed that these sensory spheres are not only for sight and hearing, but also for the movements necessary for these senses: the sight area moving the eye, and the area for hearing moving the ear.

Sir **VICTOR HORSLEY** (1857-1916)

began his experiments, together with Dr. BEEVOR, in 1885. **He restricted Ferrier's motor area to the two central convolutions.**

The cerebral region especially concerned in the motor functions of the leg, trunk, arm and head is the one lying about the great central fissure—the fissure of Rolando ; more precisely still, it embraces the gyrus centralis anterior, the gyrus centralis posterior, and the prolongation of the two on the median surface of the brain in the lobulus paracentralis.

Horsley has shown that the motor and sensory localisations established in monkeys are applicable to man, and he achieved renown by his surgical operations on the brain for circumscribed lesions.

Sir **EDWARD SCHÄFER** (1850-)

then Professor of Physiology in University College, London, now University of Edinburgh, as a result of experiments conducted in conjunction with SÄNGER-BROWN, opposed the observations of Ferrier, Munk, and others.

Ferrier had located the auditory centre in the superior temporal convolution. Munk had stated that when a certain part (area B) of the temporal lobe was destroyed on both sides in dogs, it produced a disturbance of hearing which he termed *psychical deafness*, its characteristic being that, although the animal hears, *i.e.*, has auditory sensations, it has lost the perception and memory of the auditory images perceived in its previous life. LUCIANI and TAMBURINI (1879) and with SEPPILLI (1885) found the auditory centre to extend beyond the confines of the temporal lobe, towards the parietal and occipital regions, and towards the Hippocampus and Cornu Ammonis.

Now, Schäfer and Sänger-Brown were unable to produce deafness by destruction of the temporal lobes in either dogs or monkeys.

Schäfer disagreed also with Ferrier as to the pre-frontal lobes being the intellectual area.

In order to avoid the shock, consequent upon a bilateral removal of an extensive part of the hemispheres, which is apt to be temporarily followed by a condition of apathy and apparent idiocy, whether the operations be in the frontal or other regions, Schäfer adopted a modification of the mode of operating, whereby he did not actually remove the portions of the brain, but severed their connections with the rest of the mantle and the brain-stem. In several instances in which he thus severed the pre-frontal lobes in monkeys there were no appreciable symptoms. From these experiments he could not support the view that the pre-frontal lobes were especially the seat of intelligent action.

At the International Congress of Experimental Psychology, held in London, 1892, Schäfer challenged the results of the earlier experiments made upon monkeys by Ferrier. In conjunction with Horsley, Schäfer found, after bilateral removal of the pre-frontal lobes, that at first the animals appeared apathetic, but that this condition passed off after two or three days. He also regarded the experiments of Hitzig and Goltz upon dogs as doubtful, inasmuch as antiseptics were not used, and from the small size of the pre-frontal lobes in these animals and their juxtaposition to the psycho-motor and kinæsthetic area the symptoms might possibly have been due to an extension of the injury to that region.

He **regarded the occipital lobes as the brain-area for intellectual operations,** because the sight-centre is the chief avenue of sensation.

C. S. SHERRINGTON and OTTO GRÜNBAUM (LAYTON)

(*British Medical Journal*, 1901) **restricted still further the motor area** and admitted only the ascending frontal (anterior central) convolution as such. **No movement whatever was obtained from excitation of the ascending parietal convolution** (posterior central), the convolution which Horsley still included. They said :

" We have examined nineteen hemispheres, but have never found the motor area extend to the free surface of the post-central convolution."

Thus Sherrington and Grünbaum limited to a relatively narrow strip what had previously been considered a widespread motor territory, a strip which approximately corresponds with Gall's area of " mimicry " (imitation), which he found large in actors.

The order in which the motor areas were arranged from below upwards are (1) face and head ; (2) neck ; (3) shoulder ; (4) arm ; (5) upper part of trunk ; (6) lower part of trunk ; and (7) lower limb.

These localisations were found to agree with those made by C. and O. VOGT (*Journal für Psychiatrie*, 1897), who experimented on apes, and by F. KRAUSE, who is reported to have experimented on man. It was subsequently found that the two convolutions—the anterior and posterior central—are also histologically distinct ; the former being agranular, and the latter granular in the brains of mammals.

Now, it is interesting to observe that although the *posterior* central convolution was thus proved to have nothing to do with the motor area, yet H. C. BASTIAN (1837-1915) and VICTOR HORSLEY (" Brain," vol. iii.) had previously declared that they had seen it atrophied in " congenital absence of one hand " ; so had JOSEPH WIGLESWORTH (*Journal of Mental Science*, 1886) in case of an " Old Amputation of the left Upper Arm " ; and A. W. CAMPBELL (" Histological Studies on the Localisation of Cerebral Functions," Cambridge, 1905) also claimed to have observed histological changes in the posterior central convolution in three cases of amputation of a leg and in three cases of amputation of an arm.

Other cases are : GOWERS (" Brain," 1878, p. 381) in congenital defect of left arm ; CHUQUET (" Bull. de la Soc. Anat.," 1876, p. 618) in amputation of left arm six years before death ; BOYER saw both anterior and posterior central convolutions on the left side atrophied in amputation of left arm thirty-one years before death ; LANDOUZY (" Bull. de la Soc. Anat.," 1877, p. 330) found the left post-central convolution atrophied in injury to right leg which rendered it useless ; OUDIN (" Revue Mens.," 1878, p. 190) found the left anterior and posterior central convolutions atrophied on *both* sides in *infantile paralysis* (!) of right leg.

On the other hand, CHARCOT (Soc. de Biol., 1878) denied the possibility of these observations.

Finally **HORSLEY himself cast doubt on the remaining motor area** (*British Medical Journal*, 1909), when he stated that :

" The movements return after complete destruction of the motor area. . . . It is now perfectly clear that so-called volitional movements are not alone generated from the brain through the motor area or præcentral gyrus, but must also be subserved by other parts."

MUNK claimed (1890) to have found on excision of the anterior central convolution in twelve monkeys that only the posterior central convolution was excitable. ROTHMANN (" Archiv f. Anatomie," 1907) found the same. If this result is correct, it would contradict Sherrington's observation.

F. L. GOLTZ (1834-1902),

of Strassburg University ("Pflüger's Archiv," 1876-1881, and "Verrichtungen des Grosshirns," 1881), extirpated parts of the brain of 51 dogs by washing away the substance of the cerebrum by streams of water sent through orifices broken at selected places in the skull, and observed that, when the injury of the brain is not of too great an extent, the animal recovers perfectly without the formation of new centres. **He thereupon disputed the localisation theory, the supporters of which he called the "new phrenologists."** He rejected the doctrine that each part of the brain can do the work of the other parts, but otherwise he reverted to the theory of Flourens. His conclusions may be summarised as follows :

No impairment of intelligence follows the loss of a large amount of cortical substance from one side of the brain ; but loss of any considerable amount of substance from both sides—whether in the frontal, posterior, or temporal lobes—produces a permanent impairment of all the functions, which corresponds in a general way to the amount of the loss. For example, a dog which has been trained to give his paw on command loses the power to do so in consequence of such loss of brain substance, and never regains it. **It is not possible, by extirpating any amount of the substance of the cortex on either side or on both sides, to produce a permanent laming of any muscle of the body, or a total loss of sensibility in any of its parts.** It is, however, possible, according to Goltz, by repeated removal of the cerebral substance on both sides, gradually to reduce an animal to a condition of almost complete idiocy—to an elaborate eating, drinking, and walking "reflex machine." No part of the cortex of the brain, then, can be called the "exclusive" organ or centre of intelligence or feeling ; but the psychical functions of sensation, volition, ideation, and thought are connected with all its parts. The quantity of the cerebral substance removed determines the *amount* of the general impairment of the mental powers, instead of the locality from which the removal is made defining the *quality* of mental impairment.

In 1884 Goltz, with the authority due to extensive personal observations, criticised the too narrow and literal prevailing conception of the sensory and motor centres, and announced that injury of both frontal and occipital regions in dogs produced **changes of character.** This was confirmed by H. DE BOYER ("Études Cliniques sur les Lesions Corticales," Paris, 1879) and GROSGLÜK ("Archiv für Anatomie und Physiologie," 1895), and in the human subject by LEONORE WELT by means of a series of cases of cerebral tumour. BECHTEREV further showed that lesions of the parietal and temporal lobes have an influence on character ; so that now the whole brain appeared to be, in addition to its other functions, an instrument for the manifestation of character dispositions.

Goltz observed that dogs, after great lesions to the *fore brain*, show an increased impulse to move about, and assume an excited, angry, and aggressive character ; and dogs which have received great injury to the *hind brain* become quiet, soft, and harmless, even when they have previously been vicious. He held that the destruction of the anterior part of the brain destroys the inhibiting power over the outflow of energy into the muscles. On the other hand, the posterior portion being more connected with the organs of the senses, when destroyed the excitations pass into the motor apparatus and inhibit it in its activity. Destruction of the occipital lobes, in his view, produces **poverty of feelings,** which roughly confirms Gall's view of these lobes containing the centres for the tender feelings of attachment (to parent, child, and friend, etc.).

Both Goltz and Munk unite with Flourens in thinking that the higher mental manifestations are not limited to definite cerebral tracts, *i.e.*, that the most important cerebral functions, the actions from which we conclude intelligence, feeling,

passion, and natural impulse, cannot depend on definite sections of the cerebrum. Both Goltz and Munk, however, are vague in their psychological terms. There is a difference between intelligence and intellect; intelligence is not localisable, intellect is.

Munk said: "Intelligence has its seat in all the cerebral convolutions, and not in any special one, because it is the result of all the presentations derived from sensible perceptions." Exactly what Gall said. (See p. 240.)

Goltz wrote in 1879: "From my experiments I have arrived at the conclusion that every section of the cortex of the brain shares the function from which come willing, perception, representation, and thought. Every section, independently of the others, is connected with all the voluntary muscles, and stands also in connection with all the sensory nerves of the body." This is also exactly as Gall explained. Willing, perception, etc., cannot be localised, because they are abstract terms belonging to every faculty of the mind. (See pp. 240-3 and 382.)

Goltz's observations were not left unchallenged, and he did not shrink from the demand to make good his assertions.

He took up basket and dog, and journeyed from Strassburg to London. Here, in 1881, he came before the Physiological Section of the International Medical Congress, opened his basket, and, taking out the dog, placed him over against the almost equally celebrated monkey of Ferrier. The dog walked, ran, saw, heard, tasted, and smelt; this was as his master desired, yet he should not have behaved so, for he had lost almost all the centres for these respective functions. Large territories in both hemispheres were gone. He was clearly weak-minded, but, on the whole, he was not the kind of dog believed in by the advocates of motor and sensory localisation. Professor Yeo even went so far as to say before the Section: "I candidly admit that, should the entire area of the so-called motor centres prove to be destroyed in this case, Professor Goltz has succeeded in completely changing my views on cerebral localisation."

After the dog there was a monkey. Ferrier introduced him. He had lost the motor zone in the left hemisphere seven months previously. Of him Ferrier said: "As to any independent volitional action of the right arm and leg we have not seen a single indication since the operation was made. The animal is, in every other respect, perfectly well, and as to its tactile sensibility there is not the slightest sign of impairment." It is pleasing to know that, as the dog had been faithful to his master, so the monkey was true to his friend: he displayed the proper amount of paralysis on the opposite side of the body.

We know now that destruction of a particular part of the motor area does not produce "paralysis" of the limb involved, but only paresis or a certain awkwardness, and that after some time this paresis or awkwardness disappears. It was said that the corresponding or homologous area in the other hemisphere has taken up the lost function, but CARVILLE, DURET, EUGÈNE DUPUY ("Examen de quelques points de la physiologie du cerveau," Paris, 1873), and HERMANN ("Pflüger's Archiv," 1875), have found that destruction of that homologous centre causes paresis or awkwardness in the opposite limb, while the limb on the same side regains its power. Dr. OTTO SOLTNER has also come to the conclusion ("Centralblatt," 1875) that "the extirpation of the grey matter causes loss of motor power neither at the time nor after."

LOWER CENTRES versus CORTICAL CENTRES

Another explanation of the phenomenon is that these movements have their seat in other and lower centres than the cortex, but that in lesions willed and newly-acquired movements would always be lost.

E. F. A. VULPIAN (1826-1881) maintained that it is not the brain-cells which are stimulated by electricity, but the fibres which spring from the cells. The cells are stimulated by the " will," and the area is therefore not " motor " but " psycho-motor " in character. On the other hand, EUGÈNE DUPUY said that this could not be true, for he was able to teach dogs, in whom the centres for the movements of the foreleg and paw had been removed, the performance of tricks involving the use of these limbs.

HITZIG (" Untersuchungen über das Gehirn," Berlin, 1874) failed to see how we can settle the question whether the motions are produced by stimulation of the cells of the grey matter, or by stimulation of the conducting fibres. In no part of the brain can the cells be isolated from the fibres ; even in the cortical surface of the hemispheres there are still numerous fibres amongst the cells.

FERRIER (" Functions of the Brain," 1876) said : " It would be a matter of indifference as regards the great question of differentiation of function in the cerebral cortex if it should appear that it is **not the grey matter** of the cortical regions which is really excitable, but the cone of subjacent medullary fibres distributed to them."

FRANÇOIS-FRANCE and PITRES (1878-9) established the fact that, generally speaking, the white matter is less excitable than the grey.

CARVILLE and DURET, ONIMUS, DUPUY, and others showed experimentally that the **electric currents applied to the cortex spread,** more or less in proportion to their intensity, both superficially and deeply, **beyond the area between the electrodes.** They concluded that the motor reactions aroused by electrical excitation of the cortex are not sufficient proof either of its excitability or of functional localisation, since they may be interpreted as the effect of the spread of current toward the basal ganglia, pons and bulb, where there are nerve elements that are readily excitable.

MORIZ BENEDIKT also held that only the lower centres are affected, and that the cortex of the brain contains no motor centres at all.

ALBERTONI and MICHIELI of Padua (" Archivio," 1876 and 1878) repeated Hitzig's and Ferrier's experiments on the grey matter of the brain, and came to the conclusion that these certainly contain centres of voluntary motion, which, however, only act mediately through the nervous ganglia **at the base of the brain,** which are the true motor centres. They were able to collect pathological evidence pointing to the same inference, and from which it appeared that disease of the cortical grey matter produces imperfect and transitory paralyses, accompanied by spasms and twitching of the muscles whose motor centres are affected, while disease of the basal ganglia results in complete paralysis.

MUNK (" Ueber die Funktionen der Grosshirninde, " 1881) considered the motor area to be sensory (Fühlsphäre), and regarded this region as the mechanism for storing up the **memories for movements.** In his opinion, no part of the cortex should be termed the motor area, since by implication the representation therein of those sensations and sensory disturbances which of necessity precede every muscular action is left out of sight.

HUGHLINGS JACKSON regarded the motor area as sensory-motor, or a combined mechanism for the record and execution of afferent and efferent nerve impulses.

BASTIAN described it as the " kinæsthetic " area ("Brain," 1887), and as " a purely sensory area " (*British Medical Journal*, 1909) ; in other words, as an area for the sensory appreciation of muscular movements.

HORSLEY (*British Medical Journal*, 1909), as we have already seen, came to the conclusion that " so-called volitional movements are not alone generated from the brain through the ' motor ' area, but must also be subserved by other parts, for **the movements return after complete destruction of the motor area."**

From this evidence it does appear that the so-called motor centres are not necessary for the functional activity of the parts which they are said to govern. This view was plainly expressed at the Washington Session of the United States Academy of Science, 1874, by BROWN-SEQUARD (1817-1894), who there said :

" It is perfectly well known that cutting away a large portion of the brain does not produce the least alteration of voluntary movement anywhere. Suppose the part of the brain, say the anterior lobe, being excited by galvanism, produces a movement in the anterior limb; now suppose that part is cut away, then the anterior limb should be paralysed, for its voluntary movement is gone. Admitting that the other half of the brain should supply the place of the missing part, let us take away that also; then certainly there should be a paralysis of the anterior limbs. But there is not. This should be sufficient to invalidate the conclusions of Dr. Ferrier. But there are abundant pathological facts of this nature proving the fact beyond question. And there are the cases of recovery from paralysis. There is no such localisation of power as Dr. Ferrier has assumed. If galvanism be applied to the severed leg of the frog, the leg will jump, although there is no brain power in question."

To this I might add the observation that in asylums for the insane, where men die after the cortex of their brain has become completely disorganised, paralyses are rare; and that in hospitals, where neurologists observe cases of paralysis, mental symptoms are the exception.

EXPERIMENTAL RESULTS AND MENTAL FUNCTIONS

Surely the reasoning is bad which argues that, because a given *movement* is excited by stimulation of a particular brain area in an animal, anæsthetised or at least strapped down, this movement is of the same character as when the animal is free to exercise its mentality and controlling apparatus. At best the experimenter can discover only the mechanical machinery, of which the mind of the animal makes use. The mind remains still undiscovered.

Then, as regards the brain centres for *sensation*, the new phrenology does not tell us why it is, for example, when two men go through an art gallery, one may hurry through it, while the other looks carefully at the paintings. They both receive the same impressions, but in one there is some mental effect which enhances his enjoyment, which in the other is lacking.

Because the localisation of motor centres has proved to some extent a failure psychologists have at once jumped to the conclusion that localisation of mental function is also not possible. Thus G. J. LADD (1842-), Professor at Yale University, in his famous text-book on " Physiological Psychology " (1890), has said :

" A large number of so-called centres, covering an increased amount of the cortical surface, have been pointed out by Ferrier and others on the cerebral hemispheres of the monkey. Fully half of this number, however, cannot be regarded as having anything like a demonstrable character; and much fault has justly been found with many operators upon the brains both of monkeys and of dogs for their lack of précision in experiment and haste in drawing conclusions.

" Experiments in extirpation also show that considerable areas of the cortical substance may be removed without perceptibly impairing any of the motor or sensory functions of the animal. Indeed, even when the loss of the cortical substance, thus artificially produced, extends over almost an entire hemisphere, or over a large portion of both hemispheres, the operation may not result in the *permanent* and *complete* loss of any specific function, motor or sensory. So true is this that one eminent observer, Goltz, has maintained, on the basis of many experiments in extirpation, that it is chiefly the quantity of the cerebral substance destroyed, in large measure, irrespective of the locality, which determines the nature and extent of the resulting psychical disturbances.

" This fact is in itself undeniably unfavourable to any theory which would map out the entire cortical surface into so-called *centres* or *areas*, to be considered as separate organs of particular psychical processes."

Ladd proceeded to give examples of injuries and destruction of the brain which

had been recorded to produce no physical or mental effect; but the question does not occur to him, What is the use of the brain?

So-called "physiological psychology" had a temporary success, when it was thought that the brain had practically no other than the motor and sensory functions, and that psychical phenomena could be interpreted in terms of these functions. Faculties, capacities, and dispositions were contemptuously denied. Mind, to physiological psychologists, was not an organisation, but a series of modes of motion, of which no two observers gave a like report.

Physiological psychology endeavoured to determine the varying importance of the different parts of the brain so far as they receive centripetal projection paths coming from the different sense organs, centrifugal projection paths along which the different voluntary impulses are transmitted to the muscles, and commissural and association paths which bring the separate fields of action into close connection. The highest and most complex psychical functions are not localised in these cortical fields, but are conditioned by the associative elements, so far as these co-operate in making the brain into a single organ. The individual acts of the mind result from the different combinations of the intellectual functions of the separate cortical areas.

We shall show in a succeeding chapter that brain tumours produce mental symptoms which vary according to the locality; for example, frontal tumours are followed by disturbances of the intellect. But so infatuated are some of the neurologists by the results of vivisection experiments, that they can see motor changes but no mental changes. Thus L. G. PFEIFFER (1805-1877), *Archiv für Psychiatrie*, vol. xlvii,, denied "mental changes in cases of brain tumours" from his observation of eighty-six cases. His conclusions were as follows:

(1) There is not the slightest reason to believe that the frontal lobes are especially concerned with intellectual functions.

(2) The only localisation that could be made out was that of neurological symptoms.

(3) Lesions of Flechsig's association centres produce no specific psychical disturbances.

(4) Altogether, localisation of psychical functions and attributes is impossible.

The conclusions drawn from the results of experiments on animals have proved unsatisfactory. This is admitted by Ferrier himself, who said:

"There is, perhaps, no subject in physiology of greater importance and more general interest than the functions of the brain, and there are few which present to experimental investigation conditions of greater intricacy and complexity. No one who has attentively studied the results of the labours of the numerous investigators in this field of research can help being struck by the want of harmony, and even positive contradictions, among the conclusions which apparently the same experiments and the same facts have led to in different hands. And when the seemingly well-established facts of experimentation on the brains of the lower animals are compared with those of clinical observations and morbid anatomy in man, the discord between them is frequently so great as to lead many to the opinion that physiological investigation on the lower animals is little calculated to throw light on the functions of the human brain."

Exactly so! But did not the much-abused Gall say the same thing? How many animals have been experimented on since his time, and still we are unable to throw light on the mental functions of the brain! Compare Ferrier's statement with that of Gall! He said:

"It is a subject of constant observation that, in order to discover the functions of the different parts of the body, anatomists and physiologists have always been

rather disposed to employ manual means than to accumulate a large number of physiological and pathological facts . . . to draw slowly and successively the proper deductions from them, and not to announce their discoveries but with a wise reserve. This method, at present the favourite one with our physiological investigators, gains the approbation of most men by its promptitude and its apparent results. But it has also been constantly observed that what has appeared to have been proved by one mutilator either did not succeed with another, or that the second found in the same experiments all the evidence necessary to refute the conclusions of the former."

The reader is also referred to Gall's remarks on the experiments of Flourens (Chapter XVIII.).

How contradictory the results of experimental observations sometimes are may be seen from the following.

Take the *visual centre*. FERRIER originally located it in the angular gyrus. MUNK proved it to be in the occipital lobe, which Ferrier subsequently acknowledged as correct. Yet LOEB ("Pflüger's Archiv," vol. xxxiv.), who had destroyed the entire visual sphere, found, contrary to Munk, that no marked disturbances of sight were produced even by the most extensive lesion of this area, and that disturbances of sight may follow lesions in other than the occipital lobes, especially in the frontal lobes; a conclusion with which LUCIANI, TAMBURINI, and GOLTZ agreed. BERNHARD GUDDEN (1824-1886), at a meeting of the German Medico-Psychological Society ("Neurologisches Centralblatt," 1885), said that he had extirpated the whole occipital lobe in young rabbits and found that they could still see very well. He had also removed the so-called motor spheres in cats, and after a few hours they showed no motor disturbance. He referred to the great differences of opinion about the results of experiments on the grey matter of the brain, and said that he had little faith in the charts in which different centres were put down as on a map.

Yet brain surgeons will tell us of their wonderful results in localising lesions with the help of these charts. There I can speak from personal experience. Where both mental symptoms as well as motor or sensory symptoms have guided me, the operation advised was a success. Where motor or sensory symptoms were the only guide, I have seen the most eminent brain surgeons in consultation disagree as to the locality of the lesion; and I have witnessed several cases of trephining which left the lesion still undiscovered.

Again, SCHÄFER disputed the centre of hearing, for the reason that the monkey whose temporal lobes were destroyed must have been deaf before the operation, as all his and Prof. BROWN'S experiments on a large number of monkeys left their hearing unimpaired. (Royal Society's "Proceedings," December 22nd, 1887.)

EUGÈNE DUPUY read a paper before the Neurological Society of London ("Brain," 1892), in which he said:

"Already great differences exist between those who teach the doctrine of 'localisation of functions' on the interpretation of the nature of the very function of the cortex. It is not necessary to mention before this Association the hypothesis of Hitzig and of Nothnagel, who consider the Rolandic region as the centre of muscular sense or muscular consciousness; of Bastian, who separates muscular sense from the other compounds which go to form his 'kinæsthesis'; of Schiff, who believes that it is some kind of sensitive region in connection with tactile sensation, said by him to travel through the posterior spinal columns; nor the doctrines of Ferrier, who considers the Rolandic region as entirely motor—a doctrine which is identical with the one taught by Hughlings Jackson (the original founder of the doctrine); nor of Charcot, who holds that the 'motor centres' are the substrata of motor action as distinguished from sensation and sensory centres; nor Munk's psychic theory of sensory spheres representing images of the different

species of sensations, common and special, and which react in a psychic manner 'metaphysiologically,' if I may so express it. There are also a number of theories, chiefly evolved by the Italians, which are modifications of those given above."

MORTON PRINCE, in the *Journal of Nervous and Mental Disease,* June, 1910, maintained both theoretically and practically, that **for an intellectual function there can be no cortical localisation**:

"The present doctrine of cerebral localisation regarded as a mapping of the brain into areas within which lesions give rise to particular groups of symptoms is one of the triumphs of neurology which cannot be valued too highly. Regarded as a localisation of the psycho-physiological functions represented by these symptoms within narrowly circumscribed areas, it is in large part naïve to a degree which will excite the smiles of future neurologists. A rising change of mental attitude shows that in some of its assumed narrow localisations or functions it bids fair to be classed with the phrenology of Gall. . . . While incontestable evidence proves that hemianopsia results from lesion of the apex of the occipital lobe, there is still wanting the evidence that shows that we are justified in localising a psychical function—that of the formation of visual images—in this area, much less that of localising here the more complex function of visual perception and memories. . . . What I have said of the localisation of the visual functions applies, I believe, with still more force to the localisation of language."

Against Morton Prince, who fears the phrenology of Gall, we can quote Prof. ALBERT ADAMKIEWICZ (1850-), of Vienna, who does not admit motor or sensory centres in the cortex but believes in "psychic areas" (Seelenfelder), and is thus upholding the theory of the localisation of mental functions.

PAUL FLECHSIG (1847-), of Leipsic, regarded the motor centres as purely motor, and not "psycho-motor," as Hitzig and Ferrier do. In his opinion, "the height of the forehead is no measure of the intellectual disposition in a man, for the height depends partly on the development of the motor area and the latter on the size of the body." Every line of this sentence is wrong. The motor area does not depend on the size of the body, and the height of the forehead is no measure of the extent of the frontal lobes. We must measure the length, width, and take into account the vaulting as well. The like mistake was made some years ago by the *Athenæum* in an article on "Retreating Foreheads and their Relation to the Intellect." Thirdly, the motor area has no connection with the height of the forehead: the fissure of Rolando, around which the motor centres are grouped, is much further to the back.

Many physiologists still cling to antiquated metaphysical ideas. They still hold the long-exploded view that all knowledge is derived from sensation and that therefore the sensory centres, especially those of sight in the **occipital lobes,** are the centres for the intellectual operations—this, for example, is Schäfer's view; quite ignoring the fact that the occipital region preponderates in the lower races and the monkey species, almost in the same proportion as the frontal region preponderates in civilised man (see Elliot Smith and Brodmann), and that the latter is structurally the most perfect; and ignoring also that animals and savages have keener and in many respects more perfect senses than civilised man, and should therefore, if this view were correct, be his superior in knowledge and understanding.

Thus in one of our modern text-books by a well-known Scotch neurologist we find it stated:

"All knowledge is derived through the exercise of the senses. The man who can see best is the man who understands most, and who therefore knows what to look for.

"Now it has been calculated that of all the stimuli from the outside world which

reach the brain, nine-tenths come from the organs of sight, so that the blind are dependent on the remaining one-tenth for the scenery of their mental world."

According to this view, all knowledge would be a knowledge of sensations. The different talents for music, poetry, mathematics, etc., should all be simple modifications of one or more of the five senses. It would lead us to assume that men are born with equal original mental capacity; opportunities and education determining the difference of subsequent development. If all our ideas come from the senses, how can we explain Milton, who was blind at an early age, yet what imagination can be stronger and more brilliant? Laura Bridgman, the blind deaf-and-dumb woman, was remarkably intelligent, and her sister in that misfortune, Helen Keller, has become an accomplished authoress. **It is not the perfection of the senses which gives intelligence to the brain, but it is the perfection of the brain which determines the employment of the senses.** External objects act very differently on different men according to their innate mental powers.

Why should the sensory region be just the intellectual region? The **feelings and passions** can be aroused just the same, and much quicker, as the result of the objective perception gained through the medium of the eye. Not only does the sensation of sight arouse emotion, but it differs according to the emotion we are already in. If all knowledge is derived from sensation and movement only, why does the receipt of a telegram strike one person differently from another? All these motor and sensory functions are alike in human beings, but we differ psychically. The physiologists ignore psychology, yet psychologists base their speculations on the results of physiology.

It is not true that all knowledge comes through the senses. Does not the recollection of an insult make us tremble with anger?—the recollection of a loved one bring a glow of affection? These are stimuli from within. Moreover, the philosophical theory that there is nothing in the human consciousness beside transformed sensations is obliged to deny to man a religious nature.

The experiments which have been made upon the brains of living animals by means of electricity are not of a nature to reveal anything concerning the mental functions of the brain.

The manner in which such experiments are conducted renders success in this direction altogether impossible. A monkey, dog, cat, or other dumb animal is by the application of chloroform reduced to a state of apparent insensibility, and thereby rendered incapable of manifesting any kind of emotion. After a part of the skull has been cut away, electricity is applied to a definite region of the brain thus laid bare, and a particular limb or a group of muscles is seen to contract or move; a certain other part of the brain is irritated and other muscles are seen to contract; the phenomena being of a purely physical character without a single vestige of thought or feeling; just as seen in a puppet, where "you pull the string and the figure moves."

The electric current cannot reveal a centre of ideation; and in the opinion of many experts, as we have shown, it is bound to travel beyond the cortical to the subcortical region, and possibly to the ganglia at the base of the brain.

"The various cortical centres are so interwoven that no stimulus which the physiological experimenters can use will be sufficiently fine in its nature and exact in its application to be limited to the excitation only of the function of the particular region. The most nicely applied and carefully guarded electric stimulus in such case must inevitably work beyond its desired limits and affect neighbouring structures, and it is natural then to suppose that the structure most sure to be affected by the diffused stimulus will be the structure most intimately connected with it physiologically, that is to say, the subordinate, if not subcortical, actual motor area. That may well be a sufficient reason why the physiological experimenter cannot stimulate a thought or volition only, and why the attempt to do so must almost

certainly be the excitation of a crude movement." (Henry Maudsley, "The Cerebral Cortex and its Work," "Mind," 1890.)

When these discoveries were first announced, they were proclaimed as of such importance and received with such acclamation as if the whole mystery of the mind had been unfolded. Not that I wish to minimise the value of the results achieved, regarded as motor and sensory centres pure and simple. Indeed, all honour is due to these physiologists as to every scientific investigator, whatever his achievements! I am only raising a protest against extravagant claims, in order to arrive at the truth. Every impartial observer must agree with me that it is fantastic to expect a solution of the working of the human brain—even of the ordinary man, not to speak of great philosophers, scientists, poets, and artists—from the electrical stimulation or destruction of bits of cerebral tissue of a monkey, dog, or cat. We have seen that not even as regards the motor and sensory centres is there that uniformity of opinion which one might expect from strictly scientific experiments. When we read the explanations of the mental mechanism of man, and the localisation of mental functions in the brain, physiologists contradict one another in a still more amazing manner.

Even approximately they do not know yet where the intellect is located in the brain. FERRIER, in harmony with a host of observers from Gall onwards, declared the frontal lobes to be the centres for the highest intellectual processes; but **MUNK** ("Allg. Zeitschrift f. Psychiatrie," 1884) asserted that dogs, whose frontal lobes had been extirpated and were observed "for years," showed not the slightest disturbance of intelligence, and, at the Meeting of Neurologists and Alienists held at Baden in 1883, he declared that he found that **the removal of one frontal lobe rendered the animal unable to bend the back sideways,** and that **the removal of both lobes made it incapable of arching the back upwards.** He therefore concluded that the function of the frontal lobes, which are the highest in structural organisation of all parts of the cortex, was nothing more important than **the innervation of the muscles of the back.**

We have read a great deal of abuse of the old phrenologists, and quoted abundantly from it. But if Munk is to be taken literally, are we not entitled to reply in the same strain? Are the only uses of the cerebrum to make the miserable race of man walk forward or backward or turn the head from side to side, and are these shoulder-shrugging, tail-wagging, toe-twitching, tongue-darting, eye-winking, ear-flapping, and leg-swinging centres all that is needed for the manifestation of that wonderful gift of creation—mind? According to the new phrenology based on vivisection, it does seem so. **What has the new phrenology done to aid us in the analysis of human thought and emotion?**

Stimulation of a centre by electricity, even if the animal were not anæsthetised, would not reveal a thought or feeling. As somebody once put it: "Supposing my brain organ for sympathy, if such exists, were electrically excited, I should not display benevolent feeling but would have fits like a brute." We cannot even prove that the centre is *psycho*-motor, for it has not been made out what is the particular emotion that would move, for example, the leg centre only. Many varying emotions might move that centre, and we have no evidence that it is connected with other centres.

The motor centres will not explain the diversity of mental powers, but the mental powers will explain the use of the motor centres.

The lion is not courageous and audacious because he has strong claws and teeth, the boar because he has tusks, and the bull because he has horns; these tools are there because, for the execution of certain innate dispositions, they are indispensable. A young bullock will often run his head against objects before his horns have grown.

Man, on the other hand, uses his intelligence as his chief weapon, but has lost most instruments of brute force.

Granted that each structurally differentiated part has a special function, **no part can be destroyed without affecting to some extent the functions of the entire brain.** This was admitted by Gall, the foremost advocate of the localisation theory. Moreover, it is not in all cases clear precisely what convolutions or parts of convolutions of the brain of man correspond to those in animals ; nor is the psychical life of man and animal the same.

The experimenter does not know beforehand what mental power the part destroyed manifested, and he cannot therefore judge its suppression.

The animals in whom certain parts of the convolutions are destroyed are not placed in circumstances calculated to show whether they are or are not capable of manifesting any propensity which might be connected with the injured part ; and, even if they are kept alive afterwards, no physiologist has yet attempted to observe whether the animal is still able to manifest all its propensities, sentiments, and intellectual powers. And if he wanted to observe them, we are not yet in agreement as to what are the elementary dispositions to look for.

The experimenters still cling to such general properties of the mind as memory, volition, judgment, which are properties of the entire brain and impossible to localise.

I maintain, therefore, that **the experimenters have failed to discover the location of a single fundamental faculty** owing to the insufficiency of their methods. Because of this failure, they have inconsiderately committed themselves against the localisation of mental functions, disregarding entirely the overwhelming number of facts which can be gathered from clinical observation. (See Vol. II. of this work.)

Also, those who admit localisation to be possible have confined their observation to the **intellectual functions alone,** forgetting that the animal brain must have other functions as well. Motor and sensory centres have been admitted, intellectual as well, but there is no room left for those primary affections and propensities—the instincts of animals. There is no reference in any text-book on the brain to the fact that they exist at all. Physiologists would be rather puzzled if they were asked to locate them.

Nay, more ! We have not got much further, notwithstanding a hundred years of experiments on animals, than that we *think* with the brain. That we also "feel" with our brains has not yet been realised. That is to say, that besides observing, remembering, and reasoning, we also manifest love and hate, fear and courage, pride and modesty, cheerfulness and anger, through our brains. The experimenters on animals have failed to raise any such feelings at the point of their scalpel, and therefore they deny any relation between them and the brain. But physicians who attend to living humanity have observed that **a slight injury to one part of the brain can affect a man's character and conduct** in one particular manner, and leave him in all other respects a normal man. It will be shown in Vol. II. of this work that a blow to one particular region of the head may change the cheerful, optimistic man to a depressed and melancholic one, while injury of another part may cause a hitherto peaceful man to become quarrelsome and violent, and a wound to another spot may cause a highly religious man to become a totally opposite character ; and yet in all these cases the intellect, that is to say memory and reason, may remain quite unaffected. The evidence that will be submitted to the unprejudiced student of psychology and brain functions is not that of isolated cases, but that of hundreds and hundreds of cases, incontrovertible in fact. Also with regard to the intellect, the metaphysical divisions will be ignored, and it will be demonstrated by observation alone that the general faculty of memory cannot be lost by destruction of parts

of the brain, but that circumscribed lesions can and do cause loss of memory for "numbers," "dates," "localities," etc.; that the powers of observation *in certain particulars* may be lost, and the power of judgment in *certain directions* may become faulty, while in all other respects the man remains as before, or suffers only a slight weakening in consequence of the disruption which has taken place.

Man has a much larger and much more complicated brain than the lower animals, although he has not anything like the same amount of muscular energy and power which many of them possess.

A glance at the facts of comparative anatomy should suffice to make it evident that the cerebral cortex attains an enormous extent in man as compared with other vertebrates, including the apes. It is in the highest degree improbable that all this increased development of the cortex corresponds simply to a greater refinement of human sensibility or movement, and therefore to a multiplication of sensory and motor centres. Indeed, as regards the senses and agility of movement, man is the inferior of animals. On the other hand, it is legitimate and almost necessary to attribute the absolute and relative vastness of the human cortex to the intellectual superiority of man, which is beyond all dispute immense. The complexity of the nervous elements and anatomical connections in the cerebral cortex of man is to be interpreted, not as the cause of slight physiological differences, but as the reason for the perfection to which the human species has brought abstract thought, memory, imagination, and other mental powers are not manifested by other mammals in the same degree, and the refinement, the emotions and instincts of animals. All this was pointed out by Gall, but ignored by the established teachers, who mould the opinions of future generations. It is, however, repeated with eloquence and assurance gained from experience by EUGENIO TANZI, Professor of Psychiatry in Florence, in his "Text-book of Mental Diseases," 1909.

All the motor and sensory centres will not explain the variety of mental powers and the different degrees in which men are endowed with the same powers.

Motor and sensory centres will not explain why one man is more ambitious, or more proud, selfish, or more sympathetic than another; or, again, why some men place their happiness in the possession of riches, and others in a philosophy which elevates them above the human kind. Nor will they explain why a son, who has inherited somewhat exclusively the qualities of his father, should be found so frequently to fail with his failures, sin with his sins, excel with his virtues, and, speaking generally, to go through life in much the same kind of fashion.

All the motor and sensory centres will not explain why one vast intellect, like Newton's, fathoms the profundities of science, while the mind of another man scarcely gropes its way through the daily occurrences of life; why one individual spends his life in an ardent chase of wealth, which he stops not to enjoy, while another scatters in wasteful prodigality the legacy of his sires, and perishes in want from a mere incapacity to retain. All the motor and sensory centres will not explain the difference of the constitution of the brain of a poetical genius, as compared, say, with a mathematical genius; or why a youth who in all respects is an idiot should yet possess a remarkable memory for dates, or numbers, or localities, and be capable of practically all the emotions. Finally, **all the motor and sensory centres do not help, even in the remotest way, to explain the facts of insanity.**

As that influential Edinburgh journal, the *Scotsman*, said when Ferrier first announced his researches: "How shall we by such means fathom the intellectual and moral life of man? How shall we by such crude experiments make manifest the existence of an intellect that is capable of tracing the action of gravitation throughout the boundless regions of space; or trace the cause or origin of those moral feelings which make up so much of the sweet and bitter of human life?"

Some savage nations have as much motor power and often more delicate senses than Europeans. It would be from them that we ought to expect the most profound

philosophy and the feeblest instincts if this new phrenology were true. Those who have observed the defective brains of idiots must be aware that they are often without any corresponding motor or sensory defect. And in lunatic asylums we see destruction of the brain leading to various forms of insanity, but very rarely, unless there be spinal disease as well, to loss of motion and sensation.

The fact is too much has been made of the experimental investigation into the functions of the brain. I am not against it—laboratory work is often indispensable. I repeat that all I want is to protest against its **exaggerated** estimation, by which all those who are engaged in it and who explain the mysteries of life and disease by physical, mechanical, and chemical laws are hailed as scientists, and none other are considered to deserve that name. Sober-minded men have come to see that this method of investigation has reached its limit, and that even its supposed assistance in operations for certain forms of epilepsy has not met with that success which had been anticipated.

That celebrated surgeon M. ALLEN STARR (" Journal of the American Medical Association," 1907), considered that sufficient time has now elapsed to enable us to estimate the value of brain surgery for the relief of tumours, epilepsy, and abscess with considerable accuracy. It is only in localised Jacksonian epilepsy (about two per cent. of all cases) that operation is indicated, and in only about twenty per cent. of these is it successful. He published a table of 1,100 cases of cerebral tumours which showed that only seven per cent. were " probably removable."

Yet previously Allen Starr was as enthusiastic as all the others. He said :

" The old phrenology was wrong in its theory, wrong in its facts, wrong in its interpretations of mental processes, and never led to the slightest practical result. The new phrenology is scientific in its methods, in its observations, and in its analysis, and is convincing in its conclusions. And who can now set a limit to the benefit it has brought to mankind by its practical application to the saving of human lives ? Our knowledge of the brain is by no means complete, for there are large regions, on this African map, of undiscovered country. Fortunately several Stanleys are on the way."

SIR CHARLES BELL(1774-1842), a century ago, in his essay on the "Circulation of the Blood," 1819, p. 25, pointed out that experiments on animals should be conducted without any preconceived notions :

" I have endeavoured to discover the truth by the examination of the structure, and the observation of the phenomena of life, without torturing living animals. It is too common a belief that, in physiology, experiments on living animals is the best and surest way of pursuing an inquiry, although it be certain that the supposed issue of experiments is as much affected by the preconception as the process of reasoning can be. . . . It is but a poor manner of acquiring fame, to multiply experiments on brutes, and take the chance of discovery. . . . At all events, it is our duty to prepare for experiments upon living animals by the closest previous application of our reason, so that we may narrow the question, and make it certain that advantage shall be gained by the experiment."

We try to learn the mind and character of man and the structure and functions of the brain from the results of irritation and mutilation of animals ; but the vast material always at our disposal in **the large number of asylums all over the world is barred even to expert physicians.** " No admission except to residents " is the rule. If they were thrown open to a visiting staff, as hospitals are, we should be enabled to examine the mentality of these patients in a systematic manner, and, after death, view their brains macroscopically and microscopically. Physiologists should take a more comprehensive view, and, in particular, not neglect the facts of clinical medicine and human pathology. I hold with TANZI (op. cit.) :

" As the study of experimental localisations would appear to have reached its limit, physiologists, in common with clinicians and those who investigate the question from other standpoints, have now no reason to refuse space for a psychical zone, the existence of which forces itself upon us, even apart from the testimony of experimental researches."

Let me also quote from Professor CHARLES RICHET'S speech at the Congress of Psychology, 1889 :

" Of course, we may disguise our ignorance under the imposing weight of fact, of autopsy, of experiment. But, vulgarly speaking, this is merely throwing dust in our eyes ; for the professor who cites the works of Charcot, of Flechsig, of Goltz, of Ferrier, of Luciani, of Fritsch, of Hitzig, and of many other savants, must admit that, in spite of all these authorities, he has not made much advance. . . . And thus our rich bibliography is but a delusive treasure ; this abundance conceals profound poverty. **The physiology of the brain is still enshrouded in mystery,** is still as completely concealed from us as was the function of respiration before Lavoisier. Cerebral physiology awaits some discovery of genius which will throw light on this problem, as mysterious to-day as it was two thousand years ago, viz., the relation between the structure of the brain and thought, which is the functioning of the brain."

INTELLECTUAL PROCESSES AS LOCATED BY EXPERIMENTAL PHYSIOLOGISTS

The diversity of views of physiologists becomes at once apparent when they have to deal with a practical problem. Now nothing can be more important or more fundamental than the knowledge of the localisation of the intellectual processes in the brain.

I. We have seen already that some physiologists are against all localisation. They consider **the entire brain** to be involved in all intellectual processes.

Thus H. MUNK said : " Intelligence has its seat everywhere in the cerebrum, and nowhere in particular ; for it is the abstraction and the resultant of all ideas springing out of sensuous perceptions." (" Functionen der Grosshirnrinde," Berlin, 1881, p. 73.)

Dr. YELLOWLEES (*Journal of Mental Science*, 1898) said they all believed that the brain acted as a whole, and that it was very difficult to differentiate one part from another in regard to mental and intellectual processes.

Professor STIEDA is convinced that there is absolutely no correlationship between the surface form of the brain and the mental life of the individual, and that all attempts to solve the functions of the brain in this direction are futile.

MEYNERT followed Munk and said, " Intelligence is localised everywhere in the cerebral cortex, and nowhere in particular." Again, as Gall has pointed out, no distinction is drawn between intellect and intelligence.

II. On the other hand, a large number of investigators consider **the frontal lobes,** or, more exactly speaking, the pre-frontal region, the seat of the higher intellectual operations.

The best defence of this view, after Gall, was made by Sir DAVID FERRIER :

" We have, however, other evidences which go to show that the frontal regions of the brain (which are much larger in man than in other animals) are associated with higher intellectual functions. What is the physiological explanation of this function we are at present unable to say. So far the facts of experiment and of disease favour the views of phrenologists, namely, that with the development of the anterior part of the brain there is a corresponding development of the higher intellectual powers ; but investigation is still needed in order to thoroughly explain this fact in physiological terms." (Manchester Science Lectures, 1875.)

" When the animals have their pre-frontal lobes diseased or largely removed,

they are capable of exhibiting emotional feeling. The sensory faculties, sight, hearing, touch, taste, and smell remain unimpaired. The powers of voluntary motion are retained in their integrity, and there is little to indicate the presence of such an extensive lesion; and yet, notwithstanding this apparent absence of physiological symptoms, I could perceive a very decided alteration in the animal's character and behaviour, though it is difficult to state in precise terms the nature of the change. The animals operated on were selected on account of their intelligent character. After the operation, though they might seem, to one who had not compared their present with their past, fairly up to the average of monkey intelligence, they had undergone a considerable psychological alteration. Instead of, as before, being actively interested in their surroundings, and curiously prying into all that came within the field of their observation, they remained apathetic or dull, or dozed off to sleep, responding only to the sensations or impressions of the moment, or varying their listlessness with restless or purposeless wanderings to and fro. While not actually deprived of intelligence, they had lost to all appearance the faculty of attention and intelligent observation." ("Cerebral Diseases," p. 37.)

"Lesion of the frontal convolutions is of itself sufficient to account for a state of dementia. Experimentally I have found that destruction of the frontal regions of the brain of the monkey induces a condition resembling dementia." (West Riding Lunatic Asylum Medical Reports, 1874.)

In 1874, HITZIG assigned abstract thought to the frontal lobes. He pointed, very rightly, to their increasing development in the mammalian scale, the abundance of medullated fibres at the anterior poles of the brain, and the ruin which progressive paralysis—that implacable destroyer of the intellect—produces pre-eminently in the cortex of this region.

According to BIANCHI, 1894, the animals lose much more—namely, the power of inhibiting movements initiated by other regions of the nervous axis, that of recalling the images of previous sensations in commemorative form, and, lastly, the power of associating these images in abstract synthesis. He observed the same symptomatology in the human subject in cases of tumour affecting the anterior portion of the brain.

C. v. MONAKOW ("Gehirn Pathologie," p. 492) said: "Lesions of any extent at all are never observed to occur in this region without causing the most serious intellectual defects."

This does not exhaust the evidence in favour of the frontal lobes; but as we have to deal with their function more minutely in Vol. II., the above quotations will suffice for the present.

A very decided statement against this supposed function of the frontal lobes was made by SCHÄFER, who claimed that after destruction of the pre-frontal area "the animals have in no instance shown the dullness and apathy previously noticed, but have appeared as *bright and intelligent* after recovering from anæsthesia as before the operation. These experiments do not therefore support the view that the pre-frontal lobes are especially the seat of intelligent attention."

SCIAMANNA, in 1905, showed two monkeys from whom he had removed the pre-frontal lobes the year before. The animals showed no appreciable change in their behaviour. They showed a lively interest in a mirror placed before them; they were greedy for fruit and sugar (hunger and taste centres are not in the frontal but in the temporal lobes); were on good terms with their attendant and people they knew (affection centre, according to Gall, is in the occipital lobe); were disturbed by threats and noises and tried to escape (fear centre in parietal lobe). After killing both monkeys it was found that the frontal lobes had been *incompletely* destroyed.

LEONORA WELT (1888) found in only twelve out of fifty-nine lesions of the frontal lobes any mental disturbance or change of character. Has it not been said that the whole brain can be destroyed without any mental change?

MUNK, as we have already mentioned, found after destruction of the frontal area in dogs paralysis of the trunk muscles, and he termed the frontal region the sensory sphere of the trunk.

WUNDT opposed Hitzig's localisation of the intellect in the frontal lobes ; yet he himself ascribed to the pre-frontal region the faculty of *apperception*, that is, the power of selection of the ideas or mental images to be the subject of thought or attention at a given moment.

LADD (" Physiological Psychology," 1890) said :

" It is enough at present to say that the experimental and pathological evidence does not warrant us in assigning such pre-eminence to the frontal lobes. Extensive lesions may occur in these lobes with little or no diminution of so-called general intelligence."

Quite correct ! " General intelligence " may remain unaffected, since it is the property of the entire brain, but not so the intellect proper. Destruction of the brain without mental symptoms is simply due to negligent and ignorant observation. (See Chapter XXVIII.)

III. Other investigators found in the great size of the **parietal lobes** of the brain a reason for locating in them the intellectual functions.

NIC. RÜDINGER (1832-1896) " Beiträge zur Anatomie und Embryologie " (1882), who had the opportunity of studying the brains of quite a number of distinguished men (amongst whom were Bischoff of Bonn, Döllinger of Munich, Tiedemann of Heidelberg, and Liebig of Munich), asserted that the higher the mental endowment of an individual the greater is the relative extent of the **upper** part of the parietal lobe. Opposed to him is E. A. SPITZKA (1851-1914), who dissected the brains of several eminent Americans, and noticed the *frontal*, not the parietal, lobes to be the most highly developed. (" Transactions of the American Philosophical Society," 1907.)

Prof. D. J. CUNNINGHAM (1850-1909), " British Association Proceedings " (1901), said in answer to Rüdinger :

" There was absolutely no foundation for this sweeping assertion. When the evolutionary development of the parietal part of the cerebral cortex was studied, exactly the reverse condition became manifest. It was the **lower** part of the parietal lobe which in man, both in its early development and in its after-growth, exhibited the greatest relative increase. Additional interest was attached to this observation by the fact that recently several independent observers had fixed upon this region as one in which they believed that a marked exuberance of cortical growth might be noted in people of undoubted genius."

GUSTAV RETZIUS (1842-1919) found considerable development of the parietal lobe in the brains of the astronomer Hugo Gyldens (" Biologische Untersuchungen," 1898) and the mathematician Sophie Kovalevsky (1900).

D. P. v. HANSEMANN ("Zeitschrift f. Psych. u. Phys. der Sinnesorgane," 1899) described a similar condition in the brain of Helmholtz ; GUSZMAN ("Anatomischer Anzeiger," 1901) in the brain of Rudolf Lenz, the musician ; and G. MINGAZZINI in the skull of Raphael.

FLECHSIG (" Neurologisches Centralblatt," 1898) also looks on the lower parietal region as the most important.

V. M. BECHTEREV (1857-) and R. WEINBERG have published an anatomical study of the brain of the celebrated Russian chemist Mendeleeff (Leipsic, 1909). They found evidence of his creative imagination in an extensive and highly convoluted left parietal region, and accounted for the absence of musical faculty by the entire temporal lobes being small and simple. Flechsig found in Beethoven and Sebastian Bach, not the temporal, but the parietal, region most highly developed.

MOTT'S observations of brains of insane show (*see* " Handbook of Physiology," by W. D. Halliburton, 1915) that the frontal region is important for intellectual operations, though not so important as the parietal association area behind the

Rolandic area ; the greater the intellectual development, the larger and more convoluted does the parietal region become.

IV. HORSLEY stated that a condition of idiocy was more readily produced in the ape by removing extensive regions of the **temporal** lobes on both sides than by cutting off the pre-frontal region completely by an incision ; and Schäfer at the time agreed with him. Horsley's experiment suggests a wrong interpretation of the phenomena observed. For GOLTZ, who removed the whole *posterior half* of the hemispheres of dogs who were lively and active before the operation, found, as we have already mentioned, that these animals became quiet and apathetic, and that their intellect was inhibited ; that is to say, he produced a mental condition akin to melancholia in man. But that is no proof of the intellect being related to the posterior half of the brain ; for, as will be shown, excitation of the posterior area seems to have an inhibiting influence on the anterior, probably through the vasomotor nerves.

V. Another series of investigators located the intellect in the **occipital** lobes of the brain. Wm. B. CARPENTER (1813-1885) was the first to express this view. Later, in 1874, BASTIAN (1837-1915) strongly insisted " that the posterior lobes of the brain have more to do with the intellect than the anterior." HUGHLINGS JACKSON (1834-1911),in 1892, not only concurred with Bastian " that the posterior lobes are the most important parts of the brain for intellectual purposes," but, agreeing in this, he went a step further and declared that " disease of the right posterior lobe produces greater mental defect than disease of the left does."

BASTIAN must have changed his views in later years, for in his work on " Paralyses," p. 250, referring to lesions of the frontal lobes, he said : " It has often been difficult precisely to define the nature of the change which has been brought about ; but a dull apathetic condition seems to have been most frequently noticed, together with irritability, vacillation, a diminished power of attention, and *a lowering of the moral nature.*"

W. CROCHLEY CLAPHAM (*Journal of Mental Science*, 1898) was also in favour of the occipital lobes for intellectual operations.

He said : " It would be ' flogging a dead horse ' at the present day to offer arguments against the exploded phrenology of Gall and Spurzheim, which has long been discredited by scientific men. They were in favour of the frontal lobes, but all the evidence—biological, ethnological, developmental, clinical, and pathological —is in favour of the occipital lobes."

Most curious are the later views of Sir VICTOR HORSLEY, who said : " Dog, monkey, and man have large occipital lobes. Emotional disturbance commences in the frontal lobes of the brain ; intellectual disturbance commences in the occipital lobes. In a complete intellectual operation the whole brain energises."

S. SERGI, Jr. (1909) brought out the fact that the development of the frontal lobe is not in ratio with the degree of intellectual development, and that the highest races are characterised by predominating development of the parietal and occipital lobes.

SCHÄFER, as has been shown, also favoured the occipital lobes, on the ground that they are the " sensory " region and all knowledge is derived from sensation. (!) Indeed, a physiological text-book, used in a great number of medical schools, repeats the words of Hughlings Jackson (*British Medical Journal*, 1894), that experimental physiology lends no support to the view that the frontal brain is the organ of the intellectual faculties, as the sensory centres (and sensations are the materials for intellect) are situated behind or within and not in front of the Rolandic area.

According to this view, as we have already explained, all the different talents are simple modifications of one or more of the five senses. But this view is wrong, not only psychologically, but also physiologically; for the different senses are located in different regions of the brain, and not all in one area. Only the sense of sight is supposed to be located in the occipital lobes. Besides, we must distinguish in the act of vision between the mere perception of an object and an intelligent knowledge thereof as to its nature and qualities. The centre of visual sensation is not necessarily the centre of perception. Perception is a complex act and consists not only of the visual impression, but of the impression of solidity, form, size, and position, which vision alone would never give without the aid of the other senses. Perception, then, cannot take place in the occipital lobes. It must take place in higher centres, which WUNDT, in agreement with Gall, locates in the frontal lobes, and calls the centres of "apperception."

Some physiologists have declared—for instance, Sir BENJAMIN BRODIE (1783-1862)—that the **posterior lobes are wanting in animals,** which as regards intelligence are placed below man, but this is not the case. We have already mentioned that most animals—the elephant, the seal, the dolphin, the ape, etc.—have the cerebellum as much covered by the posterior lobes as man. The error has its source in the position of the head, which is more or less horizontal in most animals and vertical in quadrumana and man. The error is due also to the relation of the constituent parts of the brain being determined by anatomists after its removal from the cranial cavity, and with its base resting on a flat surface, such as a plate. By a procedure of this kind a very incorrect estimate is formed, for great displacements of parts ensue, especially in the lower mammals. As Sir WILLIAM TURNER pointed out (Royal Society, Edinburgh, Proceedings, 1865-1866): The medulla, instead of being more or less oblique, is placed horizontally, and causes the cerebellum to be tilted upwards. The arched form of the base is almost entirely destroyed. The displacement is still greater if, at the same time, the membranes are removed. The observations should be made without removing the brain from the cavity of the skull. By removing carefully with the bone forceps the posterior part of the skull a view may be obtained of the cerebellum and cerebrum as they lie *in situ*. Owing to the transparency of the dura mater in many of the lower mammals, the relation of the structures to each other may be studied, either with or without removal of the membranes.

In man, the olfactory nerves are covered by the anterior lobes of the brain; in quadrupeds, they lie in front of them entirely. The olfactory nerves of man are separated from his brain; in the greatest number of quadrupeda they are united to the anterior convolutions. But are the anterior lobes therefore wanting in quadrupeds? Then why should the occipital lobes be wanting because they do not cover the cerebellum?

If the theory of the posterior lobes were correct, we should find a large posterior region in the more intellectual races, but this is not the case. We shall show further on that the reverse is the case, the anterior lobes being well developed where intellectual ability is marked.

Now, the reader has his choice of the organ of the intellect: in the frontal, upper parietal, lower parietal, temporal, or occipital lobes, or the entire brain. So exact is modern "science"! It would seem as if each experimenter set out with a preconceived notion, and discovered what he *expected* to find. Leading articles in the medical and lay journals of the seventies were hailing victorious vivisection which would ultimately win anatomical solutions of man's moral and spiritual mysteries; but it is ridiculous to go to the scalpel for an adequate account of a mother's love. She loves, not her brain. Her love is not a function or secretion, although it requires a brain, and, in my opinion, a special part of the brain, to manifest itself. Because these experimenters failed with their electrical stimulations, their ablutions and cauterisations of brains of rabbits, dogs, monkeys, and other animals to discover a centre for affection, veneration, or fear, or anger, their verdict is: they are non-existent; Gall was a mere quack, unworthy of serious

consideration. Gall's name is rarely mentioned in a text-book, unless it be to show his ignorance. He did the easiest and simplest thing possible: he looked at the heads of his fellow-men to see what part of the head is prominently developed in men of undoubted intellect, and what part is defective in the mentally deficient. Had he confined himself to this method, criticism would be justified; but he sought for proof of his observations in clinical cases whenever he had the opportunity. No "scientist" would lower himself to observe what is so commonplace, so we go on dissecting and vivisecting, and get no further. It is by **clinical observation** alone that we shall get any results; experiments may afterwards confirm or disprove our observations, but they should not precede the investigation. That is my conviction after a thorough study of the subject.

This chapter, more than any other, shows the limitations of science. Specialists and experimenters, self-imprisoned within the walls of their laboratory, in their eager desire for exact knowledge and plain demonstrable facts, are apt to lose the outlook over the whole field of life from its windows, and do not get an adequate breadth of view including all spheres of thought. It is for this reason that I have embodied in this treatise all the work done in science and philosophy from the earliest records to the present day.

CHAPTER XXI

HISTORY OF THE DISCOVERY OF THE MINUTE STRUCTURE OF THE BRAIN

THE surface of the human cerebrum is thrown into a series of tortuous folds or convolutions separated by slits or fissures, and both combine to give it an appearance of great complexity. These convolutions were long considered to present no definite arrangement, but to be thrown together in meaningless disorder. During the latter half, or rather more, of the last century it has, however, been shown by the many eminent men who have given their attention to this subject that the pattern which is assumed by the convolutions, while showing many subsidiary differences, not only in different races and different individuals, but also in the two hemispheres of the same person, is yet arranged on a consistent and uniform plan in every human brain, and that any decided deviation from the plan results in an imperfect performance of the cerebral function.

The physicians in Gall's time were surprisingly ignorant of the anatomy of the hemispheres. **Gall was the first to show their convolutional arrangement,** in place of the brain pulp of PROCHASKA; even his successors could see no order, and confined themselves to describing the seat of a lesion roughly as being in the anterior, middle, or posterior lobes. It remained for LEURET and GRATIOLET to demonstrate clearly that there was an orderly plan in the convolutions of the brain which could be traced from the inferior mammals, through the ape up to man. Both these anatomists were opponents of Gall's doctrine.

FRANÇOIS LEURET (1797-1851), of the Asylum of Bicêtre, in his "Anatomie Comparée du Système Nerveux," 1839, demolished Gall's doctrine (said Maudsley); but the chief argument, I can find, is that according to Leuret, "the sheep has the most perfect brain in the animal kingdom, excepting the elephant and the ape." Leuret protested also against the propaganda in favour of Gall's doctrine by his colleague G. M. A. FERRUS (1784-1861) and his publication of clinical cases in its confirmation. He was also against J. B. M. PARCHAPPE (1800-1866), who claimed to have observed *wasting of the grey matter of the brain in chronic dementia*, on the ground that Parchappe had omitted to measure the amount of substance wasted, and had omitted to make comparison with a normal brain.

PIERRE GRATIOLET (1815-1885), French naturalist and anthropologist, appointed Professor of Anatomy in Paris (1863), wrote in 1854 his "Mémoire sur les Plis Cérébraux de l'Homme et des Primates." He held that "*size of brain has scarcely any direct significance* in individuals or races," and that "the doctrine of specialisation of function is false in application and principle." Broca combated this opinion. But Gratiolet admitted that *the different senses must have their organs in the brain*, and, like his predecessors of the Middle Ages, sought for a *central point* where the impressions conveyed by the senses are united, and for this sensorium commune he suggested the *centrum ovale*. He said:

"It is legitimate to assume that there are as many distinct regions in the cerebral hemispheres as there are different organs of sensation at the periphery of the body. Thus we have the brain of the eye, the ear, and so on; and in each of these brains it would be easy to locate a memory and an imagination. But where are we to

locate *general intelligence?* If there were several organs, several brains, of what use would they be to one another? How, for instance, could the brain of the ear assist the brain of the eye? The anatomical conditions of these associations and of this synergy lies perhaps in the numerous commissures which, since they unite all the convolutions of a hemisphere in the most perfect manner, determine the fundamental unity of the brain. Is the intellect simultaneously in the centrum ovale and the layers of the cortex, or is it seated in the latter exclusively? I doubt whether in the physiology of the intellect it is possible to neglect the centrum ovale with safety. Admitting, however, that the intellect has the whole brain for its organ, is it not activated at all points of the brain in the same way?"

The researches of these great observers, and especially of their successors, ECKER, BROCA, and GROMIER, by mapping out for us the morphology of the external surface of the brain, removed the chief anatomical obstacle, and made it possible for us to describe accurately the precise location of any lesion. The scholarly work of **ALEXANDER ECKER** (1816-1887), Professor of Anatomy in the Univerity of Freiburg in Switzerland, on "The Convolutions of the Human Brain," 1869, and that of **GROMIER,** entitled "A Study upon Cerebral Convolutions in Man and Monkey," did much to lead men out of the labyrinth, which draughtsmen represented very much as they would a dishful of macaroni. But if there is an orderly arrangement of the convolutions, the fact points to an orderly arrangement in the psychical functions. This is the view taken by Ecker in the work mentioned. He gave due credit to Gall's doctrine and committed himself to it without reserve. He wrote:

"That the cortex of the cerebrum, the undoubted material substratum of our mental operations, is not a single organ, which is brought into play as a whole in the exercise of each and every psychical function, but consists rather of a multitude of organs, each of which is subservient to definite mental processes, is a conviction which forces itself upon us almost with the necessity of a claim of reason. The hypothesis set up in opposition to it, of a single organ for carrying out the multiplicity of psychical functions, would present about an equivalent point of view to that of 'vital force," which has received its *coup de grâce.* If, however, as we conceive to be an undoubted fact, certain portions of the cortex of the cerebrum subserve definite mental processes, the possibility is at once conceded that we shall some day arrive at a complete organography of the surface of the brain—**a science of the localisation of the psychical functions.** Such a science, that is, a knowledge of the psychological organs of the brain, in all their relations, is certainly one of the most important problems for the anatomy and physiology of the next century, the solution of which will work no small transformation in psychology."

Previously to Ecker, in 1866, Sir **WILLIAM TURNER** (1832-1916), F.R.S., observed in "The Convolutions of the Human Cerebrum Topographically Considered," that:

"The precise morphological investigations of the last few years into the cerebral convolutions have led to the revival in Paris of discussions in which the doctrine of Gall and his disciples—that the brain is not one, but consists of many organs—has been supported by many new arguments, and the opinion has been expressed that the primary convolutions, at least, are, both morphologically and physiologically, distinct organs."

Later, in the "West Riding Lunatic Asylum Medical Reports," Sir William Turner acknowledged that "the primary psychical functions, and probably all of them, are related to circumscribed centres of the cortex of the cerebrum."

So long as Flourens' theory of the unity of the brain prevailed, the microscopical structure of the different convolutions was regarded as uniform; but with the discovery of the speech centre, and still more so after the discovery of the motor

centres, in the early seventies, interest in the minute anatomy of the brain was aroused, and this led to a new science—brain histology—with a host of eminent investigators: Lockhart Clarke, Bevan-Lewis, Meynert, Betz, Ramon y Cajal, Nissl, Golgi, Deiters, Donders, Weigert, Kölliker, Edinger, Waldeyer, Campbell, Bolton, Elliot Smith, Mott, Oskar Vogt and his pupils Déjèrine and Brodmann. Their researches have demonstrated that the cortex, far from being of a velvety, equal structure throughout, as GEORGE HENRY LEWES (1817-1878), in his criticism of Gall's doctrine, still described it, shows the most distinct differences in all its parts, either in the number of strata, or in the quality and number of the cellular elements of which these strata are formed. Not only so, but the boundary line between one cortical type and another is very often abrupt and distinct.

By the employment of refined histological methods it has been shown that the grey matter in the cortex of the hemispheres and in other parts of the brain is the seat of an enormous number of nerve cells, and that those in the cortex present many variations in form and size. Further, that these nerve cells give origin to nerve axial fibres, through which areas in the cortex become connected, directly or indirectly, either with other areas in the same hemisphere or with parts at the base of the brain, and the spinal cord.

With the microscope, **C. G. EHRENBERG** (1795-1876) made in 1833 the first discovery of a nerve cell in a spinal ganglion. Four years later, **J. E. PURKINJE** (1787-1869), of Breslau and Prague, the discoverer of the germinal vesicle in the egg of higher animals, demonstrated that the grey matter of the cerebrum and cerebellum is made up of nerve cells and their fibres, and discovered among other things the pear-shaped ganglionic cells in the cerebellum, named after him. In 1846, the "neuroglia," the network in which the cells are embedded, was discovered by **RUDOLPH VIRCHOW** (1821-1902), of Berlin, pupil of Johannes Müller. In 1850, **A. V. WALLER** (1816-1870) discovered the "Law of Wallerian Degeneration," which showed that the nerve fibres are simply prolongations of the cells from which they receive their nourishment. In 1856, **HERMANN WELCKER** (1822-1897), of Halle, introduced the microtome for brain sections. In 1863 followed the classical researches of **OTTO DEITERS** (1834-1863), published in his "Untersuchungen über Gehirn und Rückenmark" (Brunswick), distinguishing between the nerve processes. In 1864, **J. A. LOCKHART CLARKE** (1817-1880) showed that there is in each part of the grey cortex a specific architectonic plan, according to which the brain cells are placed. In 1874, **P. F. BETZ** (1819-1894), was the first to show that the *motor area* of the brain contained a limited number of cells larger and more voluminous than any other part of the cortex. This was confirmed by **Wm. BEVAN-LEWIS** ("Proceedings of the Royal Society," 1878), who showed that the anterior central convolution contained giant pyramidal cells in groups.

JOS. GERLACH (1820-1896), of Erlangen, in 1848, maintained that the cells and fibres constituted a continuous tissue, in which each part is uninterruptedly connected with every other. This was disproved by **CAMILLO GOLGI** (1844-1914), professor at Pavia, who made also improvements in technical methods and research and proved the nerve cell to be a comparatively independent unit ("Sulla fina anatomia degli organi centrali del sistema nervosa," 1883). **W. WALDEYER** (1836-) professor in Berlin University, in 1891, was the first to use the term "neurone" for the brain cell. He, as well as **ALBERT v. KÖLLIKER** (1817-1905) and **RAMON Y CAJAL,** the eminent Spanish histologist, of Madrid, "Les nouvelles idées sur la structure du Système Nerveux," Paris (1895), and others greatly extended the knowledge of the minute anatomy of the brain.

The **neurone,** the elementary unit of the nervous system, is formed of a nucleus and prolongations which sometimes are of considerable length and differ morphologically and functionally. Some of these prolongations, possessing a structure

closely resembling that of cellular protoplasm—*the protoplasmic processes*—are, generally speaking, numerous, relatively short, and ramify in the ganglionic mass in which the cell body lies. They subdivide repeatedly like the branches of a tree and from this feature—forming arborisations—they are called *dendrites*. Another and thinner process, almost if not always single, is clearly seen to spring from the cell body, and splits up sooner or later into fine fibres, which in their turn may undergo further subdivision. This is the nerve process, neurite, axion, or *axis-cylinder process*. Although the neurones have one structural plan and are all provided with a cell body, dendrites, and an axion, nevertheless these organs differ immensely one from another in length, richness of ramifications, and in a thousand other morphological particulars.

The neurone—with its differentiated processes, its definitely organised reticulum and definitely arranged granules of various nature, its nucleus and nuclear network and chromatic filaments—is the most complex unit of the human body, and each neurone is more intricate in structure than the whole cerebrum was supposed to be in Gall's time. There are millions of these neurones in the cerebral grey matter, and these are not planted fortuitously, but they are definitely arranged, and, according to the current hypothesis, each neurone is a separate organisation. Altogether, **the histological study of the brain is now absorbing more attention than the naked eye anatomy.** Microscopy has replaced macroscopy.

J. SHAW BOLTON distinguished five primary laminæ or layers in the cortex of the brain, as follows :

1. The outer fibre lamina or superficial layer ;
2. The outer cell lamina or pyramidal layer ;
3. The middle cell lamina or granule layer, which is almost wanting in the cortex of the ascending frontal convolution, whereas in the occipital region it is of great depth and is even duplicated ;
4. The inner fibre lamina, which in certain regions contains such bodies as the Betz cells and the solitary cells of Meynert ;
5. The inner cell lamina or polymorphic layer.

Bolton's contributions to the **pathology of insanity** are of inestimable value ; and so also are those of Sir **FREDERICK MOTT,** who is also distinguished as a psychologist. Already, in 1883, BEVAN-LEWIS (*British Medical Journal*, 1883) had pointed out the directions in which studies in cerebral localisation might advance our knowledge of insanity. He held that the localisation of cerebral function was the outcome of the great principle of evolution carried to its logical issue ; that the alienist should rivet his attention upon the changes undergone by the material substrata of the mind ; that he should strictly and closely study the objective manifestation of mental activity ; that he should learn to examine the various limited lesions of the cortex as to area, depth, localised atrophy, relative bulk of convolutions, and tracts of ascending and descending degeneration.

But if the various cortical regions are characterised by an individuality of structure, by which it is easy to identify them, it is **an additional proof of the plurality of mental functions,** first formulated by Gall. Histology has also confirmed his view of the structure of the grey matter of the brain, the fibrous processes of the cells, and the fibrous structure of the white matter ; and confirmed his view of the grey matter being, amongst other things, nutritive in function, and the nerve fibres conductors. We should therefore have expected a revival of Gall's doctrine adapted to our modern knowledge, but once condemned, always condemned ; and histologists preferred, like the vivisectors, to construct their own, a " new " phrenology, forgetting that just as thought cannot be lifted from the brain with a dissecting-knife, so the mysteries of psychic phenomena cannot be resolved by examinations of brain sections under the microscope. When we examine with the

most scrupulous minuteness all the properties of the "neurone," no sentiment can be perceived slumbering in its meshes, no half-formed ideas starting from its processes.

Histologists have tried to discover the uses of the different parts of the brain; but unaided examination of structure has never yet been sufficient to reveal the functions of an organ. We might dissect the optic nerve till the crack of doom, without being enabled, by that means alone, to demonstrate that its use is to convey visual impressions from the eye to the mind. It is by observing the concomitance of the faculty of vision with the existence and development of the nerve, and the effect of its diseases in destroying sight, that we arrive at the discovery of its function. Having once made the discovery, anatomy steps in to confirm its truth, by showing its consistency with the relations of the nerve to the eye on the one side and the brain on the other. It is the same with the nerve of hearing, with the nerves of sensation and motion, and, indeed, with every part of our bodily structure. We might dissect them all for centuries, apart from observation of living phenomena, without being thereby enabled to discover their uses. Even the structure of a muscle, plainly as it speaks *after* we perceive its function, does not, of itself, suffice to teach us that its office is to contract. It is by observation of the actual concomitance of contraction and structure that we first ascertain the fact. Dissection may prove the compatibility of function and structure, after the function is revealed by observation, or disprove an alleged function, by showing its incompatibility with well ascertained structure.

The greatest physiologists, on various occasions, have laid stress on the inadequacy of anatomy, even the most delicate microscopic anatomy, to elucidate the modality of the functions. This was one of the ideas dear to FRANÇOIS MAGENDIE (1783-1855), and especially to his pupil CLAUDE BERNARD (1813-1878), who never tired of repeating that histology can do nothing, or next to nothing, for physiology, and that the knowledge of a form in nowise implies the knowledge of a function. Even if we are able to describe minutely the form of a cell and the complicated network of the different granules which constitute it, we shall not have got much further towards knowing its proper function. It was limited in its usefulness, yet medical men believed that microscopical anatomy, normal or pathological, would make everything plain.

It was natural that histological examination should be applied to the brains of the insane, but without any theory to guide us we cannot learn much from it for the present. Its only use has been in amentia and dementia, which are conditions which may affect the whole brain; and in the latter the brains are so disorganised that one cannot seize upon any one circumscribed lesion. It is only in cases when an intercurrent disease carries off the patient prematurely that one can expect post-mortem evidence that will be of demonstrative value.

It was **CARL WERNICKE** (1848-1905) who first invented a microscopical phrenology. In his opinion **the various layers of cells have different functions.** On the *top floor*, *i.e.*, in the most external layer, he located "bodily consciousness"; on a *lower floor*, *i.e.*, in a deeper layer, that of the "external world," and in *the basement*, *i.e.*, quite down, that of "personality." EMIL KRAEPELIN was of the same opinion. The psychological error of Wernicke and Kraepelin in assuming a general abstraction of higher and lower psychical activity was well criticised by L. EDINGER (1855-1918), who, in his "Vorlesungen über den Bau der Nervösen Central-Organe," Leipsic, expressed Gall's view that in place of these general abstractions:

"We are accustomed to distinguish the mental capacities of a man, not as a whole, which would not be possible to estimate as a total, but we generally estimate him by some distinguishing characteristic, which procured for him renown, position,

etc.; such qualities may well depend on the development of single cortex areas, without being noticeable in the total general structure of the convolutions or the weight of the entire brain."

More curious still is EVANS ("Brain," vol. xvi.), who localised different functions in the granular, infra-granular, and supra-granular strata of brain cells, and saw in each of these layers of the occipital cortex the seat of the perceptions of one of the fundamental colours.

J. SHAW BOLTON held that the outer cell laminæ of the cortex subserve the associative, psychic, or educative functions of the cerebrum, in contradistinction to the inner layers, in which are localised the organic and instinctive functions. By years of patient micrometric measurements of the depth of the several cell layers in the cortex, he has arrived at the conclusion that the physical explanation of mental defects and disease is to be found in imperfection of neuronic development on the one hand and in neuronic degeneration on the other. He finds that a definite relationship exists between the depth of the **pre-frontal** cortex and the degree of amentia and dementia. He considered it proved (*Journal of Mental Science*, April, 1905) that:

"The great anterior centre of association of Flechsig in the pre-frontal region is under-developed on the one hand in all grades of primary mental deficiency, and on the other hand undergoes primary atrophy *pari passu* with the development of dementia. This region of the cerebrum is therefore concerned with the performance of the highest co-ordinating and associational processes of the mind. . . . *The pre-frontal cortex is the last region of the cortex cerebri to develop;* it possesses the highest associational functions, and is the first to undergo retrogression. The pyramidal layer in this region is under-developed in the various grades of amentia; it varies somewhat in depth in normal individuals, and it undergoes retrogression in the various grades of dementia."

Again, different observers cannot agree. **A. W. CAMPBELL** opposed Bolton. In Campbell's opinion (*Journal of Mental Science*, October, 1904): "The pre-frontal area is not of much importance. . . . Its destruction gives rise to no effect at all." In his investigations on the localisation of cerebral function, he came to the conclusion that the importance of the pre-frontal region was exaggerated; that on histological grounds—inferiority of nerve cell and fibre supply—it could not be held to share the functional importance of the better developed frontal cortex placed further back; and he expressly declared that "although it may have a future in front of it, at present its evolution, both structural and functional, is incomplete."

BOLTON, however, has combated these views, basing his reason also on the results of minute histological investigation. He has shown, as has been mentioned above, that **the pre-frontal is the last region of the cerebrum to be evolved, and the first to undergo dissolution in mental decadence.** He has apparently demonstrated that it is the chief focus of sub-evolution and dissolution of the cerebrum occurring in amentia and dementia; conditions, the characteristics of which are decrease, instability, and loss of voluntary control over the processes of cerebral association.

That there is no uniformity among histologists, even with reference to fundamental questions, is shown by **K. BRODMANN,** in his work on "Vergleichende Lokalisationslehre der Gehirnrinde," Leipsic, 1909. It may be sufficient to point out that each observer has given his own nomenclature and interpretation, and that the number of layers of cells described varies from five to nine. According to Brodmann, six is the correct number of cell-strata in the cortex of men and mammals.

BRODMANN made the magnificent discovery that throughout the mammalian

series there occurs **in definite localities of the cortex the same characteristic structural formation,** so that we can define homologous areas in the different animals, varying only in extent. From the primitive unstriated cortex a morphologically differentiated striated cortex is developed, which on transverse section shows a number of distinct regions of peculiar structure varying *firstly* as regards thickness, *secondly* as to the appearance of the cells in the various layers, and *thirdly* in quality. The cortex contains, therefore, a multiplicity of organs, of differentiated structural complexes, which we are led to assume from the analogy of other organs to have separate functions, so that the work hitherto performed by the whole brain is now split up and localised, the more precisely the higher the animal in creation. This process of division of labour is still going on.

Although these structurally differentiated areas are common to man and animals, there is yet an insurmountable bridge between man and even the highest apes, and HUXLEY'S statement that the orang-outang is nearer man than the lower ape in brain formation is not correct. For man, unlike any mammal, is a "brain animal," that is to say, he is distinguished by the mass of brain above all other distinctions. According to HENNEBERG and WAGNER, the area of a hemisphere of the brain measures 110·000 mm., whereas a hemisphere of the orang-outang measures only 50·000 mm., and that of a lower ape like the macacus measures 30·000 mm. But it is not only as regards the quantity of brain that man differs enormously from the nearest mammal, the higher ape, but also as regards the thickness of the grey matter, its inner structure and its topographical differentiation. In these respects, too, the orang-outang is nearer the lower ape than he is to man. O. VOGT distinguished 100 myelo-architectonic areas in the whole cortex, of which 50 are in the frontal lobes alone, whereas TH. MAUSS ("Journal of Psychology and Neurology," 1908), distinguished thirty-two corresponding areas in the lower monkeys and forty in the orang.

G. ELLIOT SMITH, Professor of Anatomy in the University of Manchester, and K. BRODMANN discovered twenty-four distinct areas on the **surface** of each hemisphere of the brain, having identical anatomical structure in man and mammals. These areas are :

Frontal Region.

1. Area præ-frontalis ;
2. ,, fronto-polaris ;
3. ,, frontalis granularis ;
4. ,, frontalis intermedia ;
5. ,, orbitalis ;
6. ,, triangularis ;
7. ,, opercularis ;
8. ,, frontalis media.

Temporal Region.

1. Area ecto-rhinalis ;
2. ,, occipito-temporalis ;
3. ,, temporo-polaris ;
4. ,, temporalis inferior ;
5. ,, temporalis media ;
6. ,, temporalis superior ;
7. ,, para-insularis ;
8. ,, temporalis transversa interna ;
9. ,, temporalis transversa externa.

Parietal Region.

1. Area præ-parietalis ;
2. ,, parietalis superior ;
3. ,, supra-marginalis ;
4. ,, angularis.

Occipital Region.

1. Area striata ;
2. ,, occipitalis ;
3. ,, præ-occipitalis.

This topographical differentiation of areas is the first and most important step towards localisation. We have seen that earlier histologists made localisations too, not according to areas, but according to the various layers of the cortex, and the appearance of their cells ; thus attributing specific motor function to the giant pyramidal cells, which Brodmann shows is not correct, and by designating the different strata of cells with terms describing physiological or psychical functions,

such as "sensory," "perceptive," "association," "projection," "commemorative," and "psychical" strata. "Such and similar terms," says Brodmann, "which one meets on every step, especially in modern psychiatrical-neurological literature, have no foundation; they are **pure fiction,** and serve no other purpose than to create confusion."

After this statement, and considering the valuable work done by Brodmann, it surprises one to find that he is absolutely against the theory of localisation of *mental* function; indeed, that he sides with FLOURENS, that "for every psychical action the whole brain is at work, and that whatever psychical process is lost is made up again by the remainder of the brain." However, he gives himself a loophole of escape from an otherwise untenable position by admitting the possibility that complex psychical states may be connected as a "resultant" with certain definite areas, having, so to say, a "predilection" for them, but they are never the product of a morphological or physiological centre.

I fail to see that it matters whether certain complex psychical functions have a "predilection" for a "circumscribed and histologically distinct" part of the cortex, or whether they are the "resultant" of numerous minor processes all over the brain, or whether all the elements of a complex psychical function are to be found associated with that particular centre or organ. Certainly, they are not the "product" of that organ, as Gall has made perfectly clear; that would be reverting to the purest materialism. The "mind" is not a product of the brain; but it is in some way associated with it, and the same can be said of its elements. What that relation really is no one is yet in a position to say; but that need not hinder us from recording our observations of certain functions being abnormally performed or inhibited in certain definite lesions of the brain. If we assume mind to be some sort of force, we can understand it producing different results according to the structure of a particular brain area. (See Chapter XXXIX.)

It is sufficient for our purpose that **Elliot Smith and Brodmann have made out just such structurally differentiated areas in the brain as must exist if localisation of mental function is to be possible,** that they admit that cells and cell groups are localised, and that certain symptoms are produced by definite lesions. This is something definite and undeniable.

FLECHSIG'S ASSOCIATION CENTRES

THEODOR MEYNERT (1833-1892) is claimed as the discoverer of what is called the **projection systems** of the brain (1886), and not J. B. LUYS (1828-1897), whose book he translated into German, but as we have already explained (Chapter XI.), Gall was the originator of them. This is admitted by FLECHSIG.

Meynert has described three such systems:

The *first* projection system consists of fibres which lead to and from the cortex cerebri; they pass in a *radiate* direction through the corona radiata, some traversing the basal ganglia, others forming connections with the cells of the central grey matter. In addition, there are *commissural* fibres of the corpus callosum and the anterior commissure, which are supposed to connect the two hemispheres; and connecting or *associating* fibres, which connect different areas of the same side with one another.

The *second* projection system consists of fibres of great variation in length, which run in a longitudinal direction downwards to the central grey tube. Some of these fibres end in this central grey matter, while others pass to the level of the lowest spinal nerves.

The *third* projection system consists of the sensory and motor peripheral nerves.

In the medullary centre we have, therefore, three systems of nerve fibres: Projection fibre, Commissural fibre, and Association fibre systems.

Like Gall, Meynert ("Sitzungsberichte der Wiener Akademie," vol. lx.) declared: "The paths of the sensory nerves run more towards the occipital, and those of motor nerves toward the frontal region of the cerebrum." Like Gall, he traced the motor nerve fibres from the anterior lobes of the brain to the anterior roots of the spinal cord. Like Gall, he claimed the intellect as related to the entire fore-brain, the seat of the mechanism for association and induction.

PAUL FLECHSIG (1847-) in "Gehirn und Seele," Leipsic, 1896, contends that Meynert ought to be grateful because Gall's careful anatomical investigations had prepared the way for his work:

"To Gall is due the merit to have proved by careful anatomical investigations that the white brain substance consists of various systems of conducting fibres and thus to have prepared the way for the views of the present day, especially for Meynert's projection systems."

This is how Meynert acknowledges his indebtedness to Gall ("Vierteljahrschrift für Psychiatrie," 1867, p. 77):

"Much more hopeful can we be some day to understand the functions of the brain, which must of necessity lead to the creation of an **organology of the brain surface.** We need not be afraid of it, because of **Gall's swindle,** for if two engage upon the same thing, it need not turn out the same, especially when we recognise the **frivolous ambition** of the man, who, according to Burdach's striking characterisation, 'did not want to be within the bond of science, or a link in its chain, but wanted solely to float on the surface,' as compared with our own exact, careful, scientific, psychological method."

Again, we find an eminent scientific authority relying on a second-hand judgment of Gall, and not taking the trouble to formulate his own opinion by direct investigation. And, again, the second-hand libellous criticism comes from a man who had good cause to be grateful to Gall, whose work he appropriated. This is what Gall, the man with the "frivolous ambition," who "wanted to float on the surface," wrote:

"**I have never wished to be talked about.** Whenever any one will convince me of the falsity of my discoveries, I shall be the first to announce it to the public. **Truth is my object.** I place it above all personal considerations. May all my adversaries follow my example. . . . I regret, and always have regretted, that I dare not flatter myself that my undertaking will ever be continued in all its details, or that my exertions will be appreciated. Whoever is not impelled by an innate instinct of observation; whoever finds it hard to sacrifice his opinions, and the views he has derived from his earlier studies; whoever thinks more of making his fortune than of exploring the treasures of nature; whoever is not fortified by inexhaustible patience against the interpretations of envy, jealousy, hypocrisy, ignorance, apathy, and indifference; whoever thinks too highly of the force and correctness of his reasoning to submit it to the test of experience, a thousand times repeated, will never do much towards perfecting the physiology of the brain. Yet these are the only means by which my discoveries can be verified, corrected, or refuted."

Meynert was also opposed to Gall's localisation theory because *memory* is the common property of all cortical cells and fibres; which is exactly what Gall said.

Meynert based his doctrine on C. F. BURDACH, who, in "The Structure and Life of the Brain," 1826, tried to demonstrate the unity of brain and mind.

Gall had shown that **the convolutions of the brain do not develop all at the same time,** but gradually from infancy to adolescence. FLECHSIG was credited with this discovery, because he was able to confirm Gall's discovery by demonstrating

the process of myelination of the nerve fibres. Human embryology as regards the development of the brain was first studied by Gall, but in his time he could study it only macroscopically and without the aid of chemicals and staining agents. It was Meynert who suggested a re-investigation with the help of a new method, that of observing the order of myelination of the various tracts of nerve fibres and the precise time at which each reaches maturity. This was done by Flechsig.

Flechsig studied the human brain in both the fœtus and the infant, paying special attention to the maturation of the conducting organs—the nerve fibres. On completion of their development the nerve fibres are clothed with a special substance, *myelin*, which on account of its special chemical constitution is easily demonstrated by specific reactions and elective staining. Now, the principal paths of sensation and motion, that is to say, the nerve paths which, proceeding from the periphery, reach the cortex, or leave this and extend to the motor organs—the so-called **projection paths** of sensation and motion—attain their maturity much sooner than those which unite different parts of the cortex with each other—the **association paths.** The fibres lying in the depth of the cortex likewise follow this law ; so that in certain periods of development there are cortical areas containing mature fibres in relation with subcortical fasciculi of mature fibres, and other areas in which they are still entirely absent.

While the lower level of the brain appeared to be completely developed at birth, Flechsig found that the child, more especially when prematurely born, enters the world with altogether immature hemispheres, the fibres of which are almost entirely devoid of myeline sheaths, and therefore essentially different from those of the adult. While the lowest level of the brain is fully matured at the time of birth, only few nerve paths are found to exist in the hemispheres of the infant ; and such as are there are exclusively intended for connecting sentient parts of the interior of the body and some external organs with the cortex. One sensory path after another advances from the surface of the body towards the cortex ; the first in order being the olfactory sense, which is of so much importance for the proper selection of food ; and the last being the sense of hearing.

It is only after these sensorial paths have been completely built up that a new development is seen to commence in an inverse direction. Some of them begin to advance towards the lowest level of the brain, the spinal cord, and the origin of the motor nerves ; and thus one internal sensorial plane after another becomes supplied with conducting paths carrying volitional impulses to the muscles of the peripheral sense organs. First of all in this respect comes the sense of touch, the area of which is in the upper frontal and anterior parietal region.

The first zones to mature, then, are the centres of sensation and motion, the projection centres ; the others, of late development, are centres of association, the seats of mnemonic images and of their combinations. In these centres it is also possible to recognise special periods at which maturation occurs.

Flechsig named the great sensory centre which receives the impulses associated with touch, pain, temperature, muscular sense, etc., the region of general body sensation or the *somatic* area (Körperfühlsphäre).

He distinguished four association centres :

1. The frontal brain proper ;
2. A large portion of the temporal lobes ;
3. A considerable area in the posterior parietal region ;
4. The island of Reil.

We have thus four large and well-defined areas in the human brain which are not directly concerned with sensorial impressions from without or within, nor with motor impulses, but the activity of which is entirely directed inwards. Anatomically these areas have been found to possess a definite peculiarity, which clearly points to their mental nature, inasmuch as they remain immature and completely

devoid of myeline for several months after birth, in opposition to the sensorial centres which have then already arrived at maturity.

It is only after the internal architecture of these latter has been completely finished that a new movement is seen to spring up in the mental centres ; for new innumerable fibres begin to advance from the sensorial into the mental areas, and conducting paths proceeding from the former enter into communication with each other, and terminate close together in the cortex. These mental centres are, therefore, mechanisms, which co-ordinate the action of the different internal and external senses, so as to become higher units, and associate sensorial impressions of different kinds, so as to become carriers of the act of thinking.

The existence of "association centres," as defined by Flechsig, has been the subject of animated discussion. Ramon y Cajal, Edinger, and Hitzig declared themselves in favour of the hypothesis ; while Déjèrine, von Monakow, Siemerling, O. Vogt, and others pronounced the distinction altogether impracticable. There are no cortical areas, say these authorities, to which projection fibres cannot be traced ; just as there are, by general admission, none which are not supplied with association fibres.

Flechsig ("Gehirn und Seele," Leipsic, 1896) **practically adopts Gall's doctrine.** All the fault he can find is in the terminology of the organs, such as "friendship," "benevolence," "wit," "firmness," etc. Yet, on p. 29, he speaks of the "amative propensity," of the "feeling of hunger and thirst," the "emotion of fear," which give impulses awakening memories connected with them as if by the touch of a magic rod.

On p. 31 he says : "Besides these propensities giving impulses, there are inhibitive feelings (the moral sentiments), so that these animal impulses may be eminently moral. When alcohol or disease affects the inhibitory centre of the intellect or the moral sentiments, then the low propensities, such as 'anger,' 'rage,' and 'fear' manifest themselves prominently. A healthy frontal association centre is necessary for the control of the sensual impulses."

Another sentence from Flechsig, in agreement with Gall, is : "The result of the action of physical impulses upon the cortex is a struggle between sensory impulses and reason. As soon as the power of the mental centres is paralysed, the impulses are deprived of the mental control, and passion reigns unbridled."

Just as Gall posited different centres but claimed that they work together in complicated mental operations, so Flechsig says his centres for such purposes act together :

"In the most complicated mental operations all mental centres are likely to be acting together ; they are connected with one another by an untold number of conducting nerve fibres. By far the largest portion of the medullary matter of the brain consists of millions of conducting paths, extending, it is estimated, over many thousands of miles, and connecting, first, the different sensorial centres amongst each other ; secondly, the sensorial with the mental centres ; and, thirdly, the mental centres amongst each other. It is only by the aid of such mechanism that unity of cerebral operations can be brought about."

Speaking of "moral insanity" (p. 32), he says a special characteristic of it is, besides the total absence of the social instincts, of "attachment" and "sympathy," an increased activity of the propensities. Just as in lesion of the intellectual association centre, such persons react easily and immoderately to slight stimulation of the propensities.

On p. 92 he says : "The 'inanition' psychoses are due partly to transitory inhibition and excitation of larger or smaller areas of the cortex."

He claims, like Gall, for each centre the general attributes of memory, judgment, etc.

On p. 102 there occurs yet another paragraph which might have been written by Gall: "Genius depends not on degeneration but on a progression, that is, **an abnormally large development of a circumscribed brain area** as compared with the rest." Thus he even adopts the "bump" theory, and gives a practical example of it in locating the organ of "music" in the parietal ossification centres from study of the skulls of Beethoven and Sebastian Bach. Needless to say, the localisation is wrong. There is not the slightest evidence for it.

WILHELM HIS (1831-1904), professor of anatomy in the University of Leipsic, distinguished as an embryologist and anthropologist, called the attention of Flechsig to his observation that both Beethoven and Bach had highly developed parietal **protuberances.** These enormous "bumps"—to use the term employed by the opponents of Gall—in two such eminent composers, FLECHSIG suggests, would justify us in looking in the subjacent gyrus supra-marginalis for one of the essential factors of musical ability. Critics found fault with Gall's procedure, but here we have an exact repetition of it. Moreover, notwithstanding his hundreds of observations, and the thousands of repetitions by his followers, he was charged with arriving too hastily at conclusions. But Flechsig made a deduction based on two examples only. Again, what is Flechsig's observation, but that of a development of a "centre of ossification." And was it not said that the shape of the skull depended more on the strength of the muscles attached to it by reason of the traction and pressure they exercised upon the cranium, than on the development of the brain? Was it not contended that the inequalities of the skull bar us from judging of the development of the brain? Yet if these statements be correct they must hold equally good in this case. Is this the "new phrenology" which Flechsig would substitute for the old? Gall verified his observations made on the skull by post-mortem examinations of brains. Where are Flechsig's cases in support of this localisation? Cases do exist which prove the localisation of musical ability, but the loss of it—so-called amusia—was observed by Kast, Oppenheim, Hochwart and others, not in the supra-marginal gyrus, but in destruction of the anterior extremity of the superior temporal convolution.

If we look at Bach's skull, of which I have a photograph, we shall find that the parietal bone is only of normal or average development, and this corresponds with his character, according to Gall's theory, which was that of a prudent, circumspect man, who bore with any amount of injury and insult rather than give up his position, which might have plunged him into poverty. He acted through the emotion of fear modified by his highly developed intellect. (See Spitta's "Biography of Bach.")

Beethoven apparently did have large parietal eminences, and assuming Gall's theory to be correct, he should have been a melancholic, and this he was. Already as a youth he was often morose and given to preferring solitude, being distrustful of man. As he grew older, this became more emphasised, and one can quote no better testimony in support of the theory that an excessively developed parietal area bears some connection with the melancholic state than Beethoven's own words, as conveyed in his last will. He there says: "For me there cannot be any recreation in the company of men. I must live an exile. If I get near company a burning anxiety overtakes me. Moral power alone has uplifted me in my misery. To it do I owe, in addition to my art, the fact that I have not ended my life by committing suicide." (See Schindler's "Biography of Beethoven.") For further evidence see Chapter XXX.

SECTION IV

HISTORY OF MODERN PHILOSOPHY AND THE PROGRESS OF SCIENCE

CHAPTER XXII

HISTORY OF FRENCH AND ENGLISH PHILOSOPHY IN THE XIXth CENTURY

French Philosophy

M. F. MAINE DE BIRAN (1766-1824),

author of the Prize Essays "On the Influence of Habit upon the Faculties of Thinking" (1800) and "The Mutual Relation of Man's Moral and Physical Constitution" (1807), maintained that **the affective life is independent of our will,** though our will depends upon it. Many things take place in the soul which never come within the range of consciousness. Our humour changes, our attention flags, our self-confidence disappears or returns without our knowing how. This continual change of the states of consciousness—"the ever-revolving wheel of existence"—is the principal obstacle to the introspective method.

THÉODORE JOUFFROY (1796-1842),

the translator of the works of Reid and author of "Mélanges Philosophiques" (1833), may be called the last, and perhaps the most ardent, **follower of the doctrine of the inner sense and of the introspective method,** a doctrine and a method which were natural to a mind like Jouffroy's, entirely closed to external objects, and absorbed in its own "ego."

Man must be viewed and studied as a compound of two elements: a *bodily whole* and a *person*. The former is a natural production, under the influence of necessary laws and material impulses; the personality of human nature possesses that *power* by which all our internal faculties and energies are called into full activity and vigour, for the fulfilment of certain ends and purposes of our existence. This division necessarily makes human life appear under two distinct aspects: as an impersonal and a personal existence; each displaying a separate class of faculties and powers. These Jouffroy arranged thus: The *personal faculty* is that which directs the eye of the mind inwardly, takes cognisance of its ideas, classifies and divides them, and then brings them out in open day by an exercise of that which we denominate liberty or will. Then we have *primitive inclinations*, which are a collection of instincts, and constitutional tendencies and sympathies, which irresistibly impel us in certain directions. The *locomotive power* embraces the energetic movements of the body, through the influence of certain nerves and muscular actions. The *expressive faculty* is that of depicting our thoughts, ideas, sentiments

and feelings to others, through means of signs and representations. *Sensibility* is a kind of passive power, indicative of our susceptibility of being agreeably or disagreeably affected by internal passions of desire, love, hatred, revenge, and the like. The *intellectual faculties* comprise all the more lofty principles and powers of thought, such as are connected with abstract reasoning on all branches of human speculation and knowledge.

AUGUSTE COMTE (1798-1857),

the celebrated French philosopher, was **one of the distinguished members of the Paris Phrenological Society.** He is known to us as the founder of "Positive Philosophy" (1830-42) and for having **formulated the "law of the three stages" in the evolution of thought.** He is also one of the founders of "sociology," which was to comprise all the sciences of the intercourse and interaction of men. Comte was convinced that religion is a social necessity, and, to apply the place of the theological religions which he pronounced to be doomed, he invented a new religion—**the religion of Humanity.**

For Comte metaphysics must be entirely eliminated; observation and experiment must be the basis of all knowledge. Wishing to reduce all science to objective knowledge founded on facts, he repudiated the introspective method in favour of external observation. The day of intuitions, *a priori* conceptions, entities, innate ideas is past. If a problem cannot be solved, it is to be let alone. Psychology is only a branch of physiology, and the latter a division of biology. In his opinion, mental processes can only be explained by means of the biological phenomena which attend them, and **the best way to the solution of the problem lay in the doctrine of Gall.**

Human knowledge has passed through three stages: one of faith or theology, the supernatural; one of conceptions or metaphysics, the abstract; and one of observation or positive science. The theological stage ascribes phenomena to supposed personal power, the metaphysical stage to abstract natural forces, and the positive stage of a science explains phenomena by their laws.

"From the study of the development of human intelligence, and through all times, the discovery arises of a great fundamental law, to which it is necessarily subject, and which has a solid foundation of proof, both in the facts of our organisation and in our historical experience. The law is this: that each of our leading conceptions, each branch of our knowledge, passes successively through three different theoretical conditions—the theological or fictitious, the metaphysical or abstract, and the scientific or positive. In other words, the human mind, by its nature, employs in its progress three methods of philosophising, the character of which is essentially different, or even radically opposed, viz., the theological method, the metaphysical, and the positive. Hence arise three philosophies, or general systems of conceptions on the aggregate of phenomena, each of which excludes the others. The first is the necessary point of departure of the human understanding, and the third is its fixed and definite state; the second is merely a state of transition."

The supernatural is the first development. Man views the operations of nature through a religious medium; he "sees God in clouds, and hears Him in the wind." He peoples the hills and the valleys, the woods and the rippling streams, with genii and spiritual beings; and everything he cannot really comprehend he endeavours to account for by the agencies of supernatural powers. The history of astronomy affords many striking illustrations of this tendency of the mind. This infantile age of our race passes away, and ushers in another—the metaphysical—which deals in abstract conceptions and real mental entities. Here we meet with the numerous theories of the origin of the world, broached by the Pythagoreans and all the Eastern nations; in which light, numbers, harmonies, unities, and similar general conceptions of abstract powers or agencies, play a distinguished part. These, though but the feeble gropings of mental weakness and imbecility, gradually lay the

foundation for more solid acquirements. A scientific method emerges out of this pristine haziness; and this method is the **positive,** which embraces nothing but **facts,** which are traced to certain general principles, called **laws of nature.**

What science has to do is to obtain *facts,* and classify them according to certain rules or principles arising from the succession and similitude of things around us. There are five fundamental branches of knowledge in the positive sciences. *First,* **astronomy,** which displays the highest generalisation of the laws of matter and motion. Everything here is on a gigantic scale; and the movements of the heavenly bodies exercise a visible influence over terrestrial phenomena. *Secondly,* in **mechanical** combinations, and when we descend to material objects and agencies in our own globe, we perceive less order and regularity in their action than in the first science. Their results are more complex and diversified. *Thirdly,* the science of **chemistry** is replete with physical movements and powers of an extraordinary kind; and it terminates where *life,* in its simplest form, commences. The *fourth* science is **biology,** which comprehends all above unorganised matter; from the lowest vegetable production to man, the highest and most perfect of organised beings. The *fifth* and last science is **sociology,** or the philosophy of human nature. Here we find numerous questions of great complexity and uncertainty; chiefly arising from physiological and mental laws but very imperfectly understood.

Sociology originated with **G. B. VICO** (1668-1774), of Naples, and his work "New Science" (1725). The Marquis de **CONDORCET** (1743-1794), half a century later, independently applied the same general ideas, and inspired Comte. Sociology was finally established through the "Principles of Sociology" (1876) by **HERBERT SPENCER** (1820-1903), a century after Condorcet.

HENRY THOMAS BUCKLE (1821-1862), an English contemporary of Comte, also planned to evolve a social science inductively through a study of history, but with the help of economics and statistics. In his "History of Civilisation" (1857-61), he emphasised the influence of environment on mankind, and attempted to show how climate, food, soil, and the general aspects of nature were the dominant influences in early societies.

ADOLPHE QUETELET (1796-1874), Director of the Royal Observatory at Brussels, a voluminous writer on many topics of physical science and principles of morals, to ascertain their bearing upon questions of social philosophy, also exercised a decisive influence upon our modern science of statistics by his calculation of probabilities, through which he was led to the conclusion that medical art exercised very little influence upon mortality. His principal treatises were: "Sur l'Homme et le développement de ses Facultés" (1835) and "Du Système Social et des Lois qui le régissent" (Paris, 1848).

Sir **FRANCIS GALTON** (1822-1911) introduced the statistical study of biological variation and inheritance in his work on "Natural Inheritance" (1889); now carried on so successfully by KARL PEARSON (see "Biometrika").

Comte's large work, "Positive Philosophy," was translated in a condensed form by **HARRIET MARTINEAU** (1802-1876), herself a close student of Gall's doctrine (see her "Letters on the Laws of Man's Nature" to GEORGE ATKINSON, London, 1851). Comte, from the outset, acknowledged Gall as his authority and expressed his appreciation of Gall and his philosophy—the only philosophy that was worthy of Comte's admiration—and gave him credit for his efforts to make psychology a cerebral science. These are his words:

"In entering on this great subject, I find it specially incumbent to render due justice to **my principal guide.** From the first origin of true biological science Gall attempted to bring the higher and more difficult problems within its range, and thus effectually to shatter the last link which chained natural philosophy to metaphysical and theological systems. And this bold project he realised to a degree beyond all

that the most competent thinkers of his time had imagined possible. In a time when the attributes of human nature were narrowed down by all existing schools to mere intelligence, Gall boldly upheld in his own way the positive doctrine of the preponderance of the heart over the intellect, a truth indicated by the common instinct of mankind, but unknown as yet to science. He dissipated, on the one hand, the nebulous mental unity of psychologists and ideologists, by demonstrating the plurality of intellectual and moral organs. And, on the other hand, he removed the old biological error of attributing the higher functions to any but the cerebral apparatus. To appreciate the importance and the difficulty of this latter service we must remember that the passions were still referred to the vegetal viscera, not merely by Bichât, who never had the time to examine the subject with sufficient care, but even by Cabanis, who devoted much attention to it. At a time when naturalists by common consent were devoting their whole attention to dead animals, Gall took living actions, which he observed so admirably, as the foundation of his principal analysis of propensities and faculties."

Comte pointed out as the two fundamental bases of Gall's doctrine "the innateness of the fundamental dispositions" and "the plurality of the distinct and fundamental faculties," having previously stated that "no function can be studied but with relation to the organ which fulfils it." He acknowledged that Gall endeavoured to prove by "all the methods that physiology admits—from direct observation, experiment, pathological analysis, the comparative method, and popular good sense"—the stability of this much of his doctrine that "the brain is no longer an organ but an apparatus of organs," and that "the proper object of physiological psychology then consists in determining the cerebral organ appropriate to each clearly-marked simple disposition, affective or intellectual; or reciprocally, which is more difficult, what function is fulfilled by any portion of the mass of the brain which exhibits the anatomical conditions of a distinct organ." He then explained that Gall did not distribute the passions in the organs of vegetative life, the heart, liver, etc., but to the brain, the seat also of the intellectual faculties. Comte then dealt with the objection to Gall's doctrine, of the necessity of human actions, and said: "It is only in mania, when disease interferes with the natural action of the faculties, that fatality, or what is popularly called irresponsibility, exists," and that "it is therefore a great mistake to accuse cerebral physiology of disowning the influence of education or legislation, because it fixes the limits of their power."

But while Comte rendered due justice to the philosophical and biological parts of Gall's work, he confused his physiological discoveries by making it appear that Gall had first analysed the human faculties and then tried to discover their connection with the brain; whereas Gall had first collected his facts regarding the connection between the organic state of parts of the brain and certain fundamental attributes of the mind, and then drew his deductions from them.

Moreover, Comte made it appear that Gall's collection of physiological and pathological facts was merely a didactic artifice to justify his analysis of the human faculties; whereas, in fact, Gall did not pretend to have discovered or enumerated all the mental powers, and avowed furthermore his inability to indicate in all cases the fundamental forces; even those which he deemed fundamental he admitted might be found to be complex.

Comte strove to discover the fundamental faculties by a study of the human progress as a whole, that is, by a study of sociology. This is done also at the present day by numerous writers on "social psychology." Comte then proceeded to localise the various fundamental qualities in different parts of the brain, in a totally unscientific manner, namely, by a process of speculative reasoning and without producing a single fact in support of such localisation. In his opinion, physiology and pathology are incompetent to solve the problem of localisation of function. He represented ("Positivist Catechism," 1852) the brain as appropriated to three orders

of functions: the preponderating portion of it, and more especially the posterior region, being given to feeling; the anterior portion to intellect; the central portion to activity. The feelings, again, he divided into two classes: the personal and the social. So far there is no serious difference between Gall and Comte. Even the arrangement of the faculties Comte made after what he calls the "idea" of Gall, forgetting that it was his "observation," not his idea. They are so arranged that their succession presents a developed series, being higher in quality and inferior in force according as we proceed from back to front. Comte thus appropriated the anterior extremity of the affective region to the social feelings, reserving the larger portion to the personal instincts; the hinder portion always belonging to the less noble propensity. The benevolent inclinations he placed in proximity to the intellectual organs.

Comte's classification is as follows:

1. Personal instincts } forming together the "heart."
2. Social instincts }
3. The intellect (counsel).
4. The character (execution).

The personal instincts are divided into:

1. The **instinct of preservation** (*a*) of the individual; (*b*) of the race.
2. The **instinct of improvement.**

The **nutritive instinct** leads to the preservation of the individual; it is a strictly universal instinct, no animal supporting life without it. "There can be little doubt," says Comte, "as to where this instinct should be placed. The nutritive instinct should occupy the lowest position in the brain, as near as possible to the motor apparatus, and to the vegetal viscera. I would place it, therefore, in the median portion of the cerebellum, leaving the remainder of this large region to the reproductive instinct." By such a process of reasoning, as Comte here applies, the most difficult problems that science has to deal with could be disposed of within a short space of time.

There are two instincts for the preservation of the race: the **sexual** and the **maternal.**

The instincts of improvement are also two: the **military** and the **industrial** instincts; the one for the destruction of obstacles, the other for the construction of instruments.

Comte places the military behind the industrial instinct in the posterior cerebral region.

We have now to consider two intermediary affections:

1. **Pride,** or the love of power; and
2. **Vanity,** or the love of approbation,

the one aiming at personal ascendancy by force, the other by opinion. As regards the localisation: "The more personal of the two should be placed below the other; that is to say, by the side of the industrial organ; the other and more social being situated above that organ." Comte evidently had a high idea of the artistic designs, for he arranges his localisations to please both the eye and the understanding.

The higher propensities are three in number:

1. **Attachment;**
2. **Veneration;** and
3. **Goodness,** Universal Love, or Humanity.

The localisation of these three affections is just as arbitrary as the others. The highest median portion of the frontal division he assigns to Humanity; Veneration he places immediately behind it, and Attachment occupies a lateral position.

We have now to deal with the "speculative region." Comte says that with regard to the intellectual functions he differs from Gall almost as widely as Gall differed from his metaphysical predecessors. Here Gall was not helped by the study of the lower animals; hence he has gone astray. Here, again, Comte assumes that

Gall first constructed a system of faculties and then tried to localise them. Whereas Gall really made a number of observations respecting the brain, without any pretension as to an accurate analysis of the mental powers.

The first distinction in intellectual functions which Comte draws is that between the faculties of **conception** and the faculties of **expression.** The latter presupposes the first and is subordinate to it. In diseased states they are often separated, the one being exalted, the other lowered.

We have two sorts of conception, adjusted to each other, but still fundamentally distinct: one passive—**contemplation**: the other active—**meditation.** They both exist in a lesser degree in the animal kingdom.

Contemplation may be "synthetic," referring to objects; dealing with the *concrete* aspect of things. Or it may be "analytic," taking cognisance of events, and therefore *abstract* in nature.

The meditative function is decomposed into "induction" and "deduction"; two distinctions universally accepted.

The contemplative function he places in the lower portion of the frontal region, leaving the higher portion to meditation. Abstract observation he places in the median line, and concrete contemplation laterally to it; similarly deductive reasoning has a median location, and inductive logic a lateral position.

The fifth intellectual organ is **language,** under which Comte does not understand merely articulation of speech, but also cries and gestures. He places it in the middle of the anterior lateral margin of the frontal region, extending in the direction of the temple, midway between the eye and ear, its principal auxiliaries.

The faculties which constitute "character" proper are **Courage, Prudence,** and **Perseverance.** Courage in undertaking, prudence in execution, firmness in accomplishment. No practical success can be attained without the union of these three qualities. He places these three faculties between his organ of veneration and his industrial instinct, "there being no other places available."

This completes the analysis of "The Human Soul" into eighteen faculties as follows:

1. Nutritive instinct		
2. Sexual ,,		
3. Maternal ,,	Personal.	
4. Military ,,		
5. Industrial ,,		
6. Pride		
7. Vanity		
8. Attachment	Social.	
9. Veneration		
10. Benevolence		
11. Concrete Contemplation		
12. Abstract ,,		
13. Inductive Meditation	Intellect.	
14. Deductive ,,		
15. Language Expression		
16. Courage		
17. Prudence	Character.	
18. Perseverance		

It is a pity that Comte attempted to localise the faculties. In every other respect we ought to admire him for his courage in undertaking the solution of a problem which every other philosopher shrank from. It shows courage, too, to acknowledge his indebtedness to Gall in face of almost unanimous opposition.

In consequence of Comte's advocacy, French investigators are more favourably disposed towards Gall than those of any other nationality: at all events, Gall is rarely abused by them. Comte's school had many followers, and this has helped to sustain Gall's reputation. Indeed, a German alienist, Dr. P. NÄCKE, of Hubertusberg—a supporter of the *tabula rasa* theory—expressed his regret at the phrenological tendencies of French writers, giving quotations from Charcot, Magnan, Gilles de la

Tourette, Féré, Lacassagne, Laurent, Bordier, Manouvrier, Corre, Richet, De Bayer, Duret, and Grasset in support of his statement.

Comte substituted for the metaphysical idea of the immortality of the soul the positive idea of incorporation into the "Great Being." Men whose behaviour has been deserving do not wholly die; they continue their existence in others by virtue of the continuity of society. Man has, therefore, two kinds of existence. During the first he participates in social life as an individual. If he undergoes this trial honourably, that is, if he subordinates in himself egotism to altruism, he enters after his death into a second existence, the better part of him is incorporated into the spiritual life of Humanity. This form of immortality is free even from the laws of space and number. This leads naturally to the commemoration of the dead, of those benefactors who have made humanity what it now is. Thus is established the religion of humanity.

VICTOR COUSIN (1792-1867),

author of "Histoire de la Philosophie" (1841), is known as the principal representative of the **Eclectic School.** He originated no new system, but took from all the schools what he thought best.

H. A. TAINE (1828-1893),

philosopher and historian, wrote especially on art ("Les Philosophes Classiques du XIXme siècle," 1856). His chief merit in psychology is having turned to account the abnormal mental phenomena ("De l'Intelligence," 1870). The theory of the **relation of genius and insanity,** and that of the double ego or **multiple personality,** refer back to Taine. He accepted Flourens' doctrine of the unity of the brain.

TH. RIBOT (1839-1916),

is principally noteworthy for his analysis of mental phenomena, and for his ability in applying **pathological data.** His principal works are: "Les Maladies de la Mémoire" (1881); "Les Maladies de la Volonté" (1883); "Les Maladies de la Personalité" (1885); "La Psychologie de l'Attention" (1889); "La Psychologie des Sentiments" (1896); "Essay sur les Passions," etc. He established the "autonomous" theory of feeling in contrast with "intellectual" and "organic" theories. Feeling, emotion, sentiment, etc., is an original state, not dependent on presentation. It has its own independent revival, association, generalisation, and logic. It is not merely revived by an idea. "Like all general terms," Ribot says, "consciousness must be resolved into concrete data. Will, in general, does not exist, but volitions; and, in a like manner, there is no consciousness in general, but only states of consciousness. The latter are the reality." Values of all kinds are only constituents of states of consciousness, and have no reality apart from these states.

Ribot divides human sentiments into three principal groups:

(1) The affective states, properly speaking, that express our appetites, inclinations, and desires that are inherent to the psycho-physiological organism of man. These states characterise normal life, preoccupying consciousness feebly or to a medium intensity.

(2) Emotions characterised by abrupt and violent disturbance of the psychic equilibrium (fear, anger, amorous outbursts, etc.). These are reactions of the innate mechanism or manifestations of nature.

(3) Passions are creations of man. Animals, children and primitive men have impulses, outbursts, but not passions. The *first* characteristic trait of passion is the *idée fixe* that constitutes their nucleus. An *idée fixe* becomes a passion when it

excites sentiments and tendencies to act. The *second* characteristic of passions is their intensity (love, gambling, etc.), in which wishes manifest themselves as acts and show no tendency to satiation. In static passions (hatred, cupidity, cold ambition, etc.) the intensity exists in a state of tension, often under the form of arrest of motion. The *third* characteristic is their duration. Even the shortest passions are of far longer duration than are pure and simple emotions. The difference between passion and emotion is like the difference between the acute and chronic. As Kant said : " Emotion is like water that breaks through its dyke, while passion is like a torrent that eats into its bed more and more profoundly."

ALFRED BINET (1857-1911),

like Ribot, wrote on abnormal psychology : hypnotism, double consciousness (" Les altérations de la Personalité," 1891), etc. The most important work of his colleague, CHARLES FÉRÉ (1852-), is " Pathologie des Émotions," 1892.

PIERRE JANET (1859-)

—not to be mistaken for PAUL JANET (1823-1899), an authority on the history of philosophy—is another distinguished writer on morbid mental phenomena. His chief works are : " L'Automatisme Psychologique " (1889) ; " L'État Mentale des Hystériques " (1892) ; and " Passions et Caractères " (1898).

HENRI BERGSON (1859-),

is the latest and greatest of modern French philosophers. The central idea of his philosophy is that of **the eternal flux,** of the incessant becoming. Living things, conscious or unconscious, with souls or without souls, are in endless, irreversible movement, in which no repetition is possible. The universe is not a completed system of reality, of which it is only our knowledge that is imperfect, for the universe is itself becoming. Everything is movement, is change, is becoming. Inert matter filling space, space that underlies matter as a pure immobility, do not exist. Movement exists, immobility does not.

Conscious life is a continuous growth. It is not a succession of states but an unceasing becoming. A thing that lives is a thing that endures, not by remaining the same, but by changing unceasingly. The intellect may look backward and perceive a succession of " moments," but life looks forward. Life is action, adaptation, utilisation. The intellect has been formed to serve the purposes of the activity which we call life. Knowledge is for life, and not life for knowledge.

Just as the events which the historian chronicles are marked out by the guiding influence of some special interest, so the intellect follows the lines of interest of the activity it serves. It marks in the flow the lines along which our activity moves. It selects. The intellect views the reality as solid things because that view serves our ends. It is a real world that the intellect reveals to us, a reality that is not relative to our understanding ; it is reality itself, but it is limited.

Like the cinematograph, the intellect takes views across a moving scene, and these views are the things that present themselves to us as solid objects spread out in space, space that is unmovable, the reality in which things move. To grasp the reality it is necessary to restore the movement as the cinematograph does. The movement is life. The intellect is what gives to the world the aspect it bears to us. It gives us views of reality, views that are limitations of our apprehension, and that we mistake for limitations of reality.

We have the power of apprehending reality without the limitations that the intellect imposes ; in the **intuition** of life we see reality as it is. Intuition is not a

special endowment of certain highly gifted minds, enabling them to see what is hidden from ordinary intelligence. It is a power of knowledge that we may imagine to exist in everything that lives, even in plants, for it is simply consciousness of life. It exists for us because consciousness is wider than intellect, because consciousness is identical with life. The intellect is formed out of the consciousness that is identical with life.

Bergson holds **evolution** to have taken place on three different lines : the line of automatism, exhibited in plants ; the line of instinct, exhibited pre-eminently in the hymenoptera ; the line of intelligence, exhibited in the vertebrates, and carried to its highest in man. At the basis of these modes of evolution, as at the basis of each particular living individual, is a general life force or impulse, urging the organisation to deal more effectively with the brute matter of environment. He holds (" Évolution Créatrice," 1907) that instinct is a sort of direct or " sympathetic " knowledge on the part of the animal, being in contrast with the " logical " form of knowledge seen in the intelligence. The view still commonly held that intelligence develops from instinct, or at least that there is some community between the last two, he regards as radically false and disproved by the facts of evolution. Instinct and intelligence, although sharply distinguished from one another, yet exist together in our consciousness in a very close and intimate union. For instinct is akin to that power of direct insight that we have called intuition. It is this power which philosophy must make use of for the solution of the intellectual puzzle. By so doing, and only by so doing, can we have a real metaphysic, a knowledge of things in themselves, a science that is beyond and before the sciences.

In man, where intelligence is supreme, instinct is practically lost as a guiding and directing activity. We find traces of it in the behaviour of infants and children and in natural dispositions, but the very word instinctive has come to denote the opposite of rational action and not the basis of it. The actions that we call instinctive in man are those that we seem to carry out without any interval of hesitation by a natural disposition without reflection or questioning, without interposing the perception of the relations or of the meaning of the actions, without the presentation to the mind of an end to be attained. They are not simple reactions to a stimulus, such as the vital functions of respiration, circulation, and the like ; they are actions that imply awareness and conscious purpose, but they are direct spontaneous actions evoked by the presence of physical objects or of emotions. Many actions that are in their origin intelligent we call instinctive by analogy when they have become habitual and are unconsciously performed. Consciousness means an active attention to the work that is being performed, and this active attention seems to be a necessary condition of intelligence. Instinct is unconscious, is intelligence become automatic, and intelligence is always tending to become instinct. We may know a thing by instinct more perfectly than we can ever know it by intelligence, but it is intelligence alone that gives us the knowledge of relations, and it is this knowledge that gives us command over the wide field of activity that we possess.

The intelligence of man is not merely a vague power of adaptation ; it is the capacity for fabrication, for making out of the inorganic, to some extent even out of the organic world, *instruments* for the satisfaction of his wants. The psychical capacity on which this power rests is man's power of detaching fixed things from the eternal flux. The tool that an insect uses is part of its bodily structure ; it is far more perfect for its purpose than any human tool, and with it is always the special instinct that prompts the animal to use it. It has perfect skill, but is restricted to a very narrow range.

The **function of the brain** is to transmit movement, and its great complexity is to give us choice of movement. In order to choose, consciousness must perceive, but perceptions to be of use must come from the objects round us, among which our action is to take place. We perceive in the world around us not the whole of reality, but only that part which interests us on account of the action our body,

having received the stimulus, is likely to perform. Perceptions are movements from objects outside the body, which the body selects. Those movements that do not interest us with regard to possible action are reflected back; those that concern us pass in and are consciously perceived. If the nerves that transmit the movements to the brain are divided, the movements cannot reach the brain, there will be no perception and no motion of the body.

Bergson is a frank **opponent of the doctrine of psycho-physical parallelism,** which he regards as in reality a metaphysical contention having no adequate experimental basis, however justifiable as a convenient working hypothesis. He ascribes to our inner life (mind or soul) an independent reality, and attributes the contradictory results of previous investigations to the misuse of such inadmissible categories as "unity," "multiplicity," etc., which have meaning only in regard to material things. Our intuitions regarding the soul cannot enter into the framework of everyday conceptions, classifications evolved for utilitarian and practical ends. The soul, he says, is not a thing but a movement, continuous, indivisible, neither one nor many. He regards positive thought as a faculty evoked by material necessities and, for speculative uses, initiated by a habit of breaking the free movement of life into a series of immobilised "states." **Bergson does not believe that the cerebral functions are the equivalent of the mental life.** He cites cases in support of his contention that the whole of our past is present *en bloc* in the mind of each of us. In conscious experience there is no perception without memory. As pure perception is wholly in the present, so pure memory is wholly in the past. The past is that which has ceased to act, it has not ceased to exist. It can be brought into consciousness from the unconscious.

The brain, as related to mind, he regards as a screen permitting to pass just those recollections which occasion requires. As related to the outer world it is, he says, the organ of sense, movement, and habit formation. He compares the brain, or, more generally, the body, to the point of a knife of which the soul or mind is the blade, or to the prow by means of which the vessel of life penetrates the billows of reality. In order to render conceivable the interaction of mind and body it is obviously necessary to conceive their natures as having something in common; the action of bare consciousness on bare matter seems quite out of the question. To meet this difficulty he suggests that mind may be conceived as in some sort extended, and even that matter may possess memory of a rudimentary kind. He regards life as a product of the entrance of soul or will into matter. The former, by attuning itself to the rhythm of material things, is, he believes, enabled to dominate them to a certain extent, and meanwhile to achieve for itself the definite individualism which it could not otherwise attain.

Free-will is not the liberty of choice that indeterminists have asserted and determinists have denied. Free-will is the very nature of our lives as individual wholes, the expression of the individuality of life. Our actions, even our free actions, follow from and depend upon our character, and our character is formed by circumstances, but is not external to us; it is ourself. But it is only at times that free action is called for. Our ordinary life is made up of actions that are largely automatic, of habits and conventions that form a crust around our free expression; it is only at moments of crisis or when we are touched with deep emotion that we seem to burst through this crust and our whole self decides our action.

ENGLISH PHILOSOPHY

DUGALD STEWART (1753-1828)

wrote a work on the "Philosophy of the Active and Moral Powers of the Mind" (1828). He employed the word Reason "to denote mainly the power by which we

distinguish truth from falsehood, and combine means for the attainment of our end." **He classified the "active powers"** into "instinctive or implanted propensities" and "rational and governing principles." The instinctive propensities he further classified into appetites, desires, and affections; the rational principles into self-love, and the "moral faculty." As regards the relation of these to understanding or reason, he said: "Our active propensities are the motives which induce us to exert our intellectual powers; and our intellectual powers are the instruments by which we attain the ends recommended to us by our active propensities." The activity of reason "presupposes some determination of our nature," which will make the attainment of the ends, towards which our activity of reason is directed, desirable. Not only so, but these active propensities also largely determine the direction and extent of the development of our intellectual powers; and therefore, "in accounting for the diversities of genius and of intellectual character among men, important lights may be derived from an examination of their active propensities."

Most people regard musical ability and a genius for poetry or painting, and even for mathematics, as gifts of nature, bestowed only on a few. Though they require application and experience, yet these talents are innate. Stewart, however, argued, like Johnson, that these powers "are gradually formed by particular habits of study or of business." Similarly he maintained attention to be a primitive faculty, but not so imagination; for, he informed us, "what we call the power of imagination is not the gift of nature, but the result of acquired habits aided by favourable circumstances."

The **appetites** are distinguished by three characteristics: their originating from states of the body, their periodical and occasional, rather than constant, occurrence, and their feeling accompaniment of "uneasiness," which is "strong or weak in proportion to the strength or weakness of the appetite." The main natural appetites are three: hunger, thirst, and sex. The corresponding impulses—and the same is true as regards the "desires"—are "directed towards their respective objects," not to any pleasure that arises from their gratification. "The object of hunger is not happiness, but food; the object of curiosity not happiness, but knowledge." Nevertheless, as a result of the experience of pleasure, the mere gratification of an appetite may become the end, and thus we may have the development of many acquired appetites.

The **desires** differ from the appetites in that they do not take their rise from states of the body, nor do they possess the characteristic of periodicity or occasional occurrences—that is, they are more or less permanent. Of "natural" desires, five can be clearly distinguished: curiosity, the desire of society (gregarious instinct), the desire of esteem, ambition, and emulation. The gregarious instinct is natural, not derived from any perceived advantage to ourselves; children show the instinct "long before the dawn of reason." Similarly the "desire of esteem" is an original principle of our nature, showing itself too early to allow us to resolve it into a sense of the advantages which arise from the good opinion of others. Ambition or the "desire of power" covers several original tendencies of our nature, with the pleasure of activity (constructiveness) and with the desire of property (acquisitiveness), which last, according to his view, is a derived, not an original, principle.

The **affections** are divided into benevolent and malevolent. Of the former, parental feeling is a typical example; of the latter, anger or resentment. Four of the benevolent affections are discussed in some detail: natural affection, friendship, patriotism, and pity. They are not all original and unanalysable principles of action, but they are all founded upon original and primary instinctive tendencies. According to Stewart, imagination is not involved at all in sympathy.

THOMAS BROWN (1778-1820),

successor to Dugald Stewart in the chair of Philosophy in Edinburgh University, in his "Lectures on the Philosophy of the Human Mind," published in 1822 after the author's death, renounced the doctrine of association of ideas, and instituted **suggestion** in its stead, which is made to account for all mental phenomena; that is, that certain things have the power of "suggesting" or "creating" certain states or conditions of mind.

One of the chief principles laid down by Brown was that there are no independent or distinct powers of the mind, apart from the mind itself. These faculties or powers are only certain indications of *states of mind*, and cannot be said to be conversant about the objects of our mental perceptions, but are really in themselves all that we do know or ever can know of the mind itself. Having renounced the classification of mental phenomena of his predecessors, he framed one for himself, which embraced only two grand divisions: external affections and internal affections. The external states of mind comprehend all our sensations of whatever kind; and the internal states are divided into two branches, the one intellectual and the other emotional. Under the intellectual affections or states we have *simple* and *relative suggestions*; and under emotional states we have all the *passions* and *desires*. He considered the functions of the external senses dependent on the nervous system, but the other mental operations were, in his opinion, independent of organisation.

Brown followed to some extent Gall's lines, as, for example, in denying that perception, conception, attention and memory were fundamental powers of the mind. This was the opinion of his biographer and commentator, the Rev. Dr. WELSH, who wrote: "His greatest merit will be seen to consist in the near approach that he has made to many doctrines of phrenology, without the aid of the instrument that phrenology presents."

Sir **WILLIAM HAMILTON** (1786-1856),

a disciple of the philosopher Reid, was appointed to the chair of Metaphysics and Logic in the University of Edinburgh in 1837, a post for which George Combe was the rival candidate. His "Lectures on Metaphysics" were published in 1858, and his "Lectures on Logic" in 1860.

Hamilton divided the phenomena of mind into cognitions, feelings, and conative phenomena—which include volitions and desires. We know only the relations of things. **Revelation,** he held, supplements the knowledge which our faculties are too weak wholly to apprehend. Inevitably, **he thought Gall's doctrine "implicit atheism—physical necessity—materialism."** He asserted that **Gall's localisations "were not discovered but invented"**; that **"in ignorance Gall was totally eclipsed by Spurzheim"**; that the skull and brain do not agree in conformation; that "the whole of their very smallest organs were over the region of the frontal sinus"; and so on. Of more general interest are the following astounding statements: "In man, the encephalon reaches its full size about the age of seven" and "the cerebellum, in relation to the brain proper, comes to its full proportion about three years of age." According to him, "the **African brain,** and in particular that of the Negro, was found **not inferior** to the average size of the European; and consequently the former is equally capable of civilisation as the latter."

There was a long acrimonious correspondence, starting in the year 1826, between him and George Combe.

JAMES MILL (1773-1836)

is the author of "Elements of Political Economy" (1821) and "Analysis of the Human Mind" (1829), which latter work is of interest to us here.

The power of **association of ideas,** and the art of giving things certain names, which constitutes the mechanism of speech, are two instruments which James Mill employed to account for almost every mental phenomenon. Association clusters and binds certain kinds of sensations and ideas into parcels of various dimensions, called *complex notions;* and these again, in a greater or lesser number, are made to run into tracts or paths, called *trains of thought.* Language enables us to communicate these complex notions and trains of thought to others of our kind; and here we have the whole framework of the "Analysis of the Human Mind." Sensations are ideas, which are copies or images of them; the power of sensations and ideas to cluster or run together; and the faculty of giving names to them; these are the elementary processes of the intellectual structure of man.

With these instruments the author entered into an analysis of various powers and faculties of the mind, such as *conception,* which is simply a general or abstract term for all mental phenomena whatever. *Imagination* is likewise a generic term for all *trains of thought.* All *abstractions* are purely concrete terms. *Memory* is not an original power or faculty: it is made up of two ingredients, the thing remembered and the idea of having seen it. The last ingredient is, however, analysed into three other component parts: my present remembering self; my past remembering self; and these being united by a certain train of consciousness, unite the two *selfs,* which form a compound we call personal identity. *Belief* or conviction is of three kinds: a belief in real existence, a belief in the testimony of others, and a belief in certain axioms or propositions of science.

The *active,* in contradistinction to the intellectual, powers of man, are accounted for in this manner. We have sensations of a pleasurable and sensations of a painful cast; these produce their images or copies, called *ideas;* and thus we have ideas of an agreeable or disagreeable kind. Desires and aversions arise in consequence of these; and these give rise in their turn to all the various passions, emotions, and feelings in the human breast. The *will* is only another term for desire.

The power of *reflection,* maintained by Locke and many other metaphysicians of distinction, Mill considers as identical with simple consciousness. "Reflection is nothing but consciousness; and consciousness is having the sensations and ideas."

JOHN STUART MILL (1806-1873)

son of James Mill, besides being a political economist like his father, was a philosopher of the Positivist School. He was a critic rather than a constructive thinker, and was one of the most powerful advocates in modern times of what is known as **utilitarianism,** the greatest happiness theory.

According to Mill, mind and matter belong to two distinct realms, and are incapable of being compared, and "mental phenomena do not admit of being deduced from the physiological laws of our nervous organisation." We are not surprised that he wrote (in 1841) to Comte, who had called his attention to **Gall's doctrine:** "I avow that I have for a long time regarded this doctrine in its present condition as **unworthy of occupying the attention of a genuine thinker,** an idea in which I persisted until I learnt by your third volume that you adhere to phrenology at least in the main principles."

This correspondence on Gall with Comte had, however, one practical effect, in that it led to Mill's proposition of **a general science of human nature under the title of "Ethology."**

His " Logic " (1843) is regarded as the most important contribution to philosophy since Hume.

By Mill the relations of sense and thought were conceived much as Hume and Locke conceived them. There was the outside thing or object which we only know as " the permanent possibility of sensation " ; there was the sense impression, which was lively, immediate, bearing in itself the evidence of its clearness and truth ; then there came the idea, or thought, or conception abstracted from sense-impressions, the result of associations set up among the intimations of sense. Thus, thought was a transformed sensation ; and sense-impressions, as acted upon by laws of association, explained all the furniture of the mind.

SAMUEL BAILY (1791-1870),

in his " Letters on the Philosophy of the Human Mind," London, 1855, had a fair criticism of the phrenological doctrine, of which, however, **he adopted the main principles.** He was more logician than psychologist.

GEORGE HENRY LEWES (1817-1878),

author of " History of Philosophy " (1845), and " Problems of Life and Mind " (1874-9), " The Physical Basis of Mind " (1877), etc., **was the first in England to give special importance to the physiological problems connected with psychology.** He was influenced in this direction largely by the popularity of phrenology in his day and by his companion MARY ANN EVANS (1819-1880), better known as " George Eliot," the celebrated novelist, who had been brought up in a **phrenological atmosphere** at Coventry by the Brays. Mr. CHARLES BRAY (1811-1884) was an ardent phrenologist, who had published several books on the subject, and Mrs. Bray (Caroline Hennell) wrote on hygiene.

From early womanhood, **George Eliot was personally acquainted with George Combe.** In October, 1852, she stayed with Mr. and Mrs. Combe in Edinburgh, and on other occasions both were guests in the house of a mutual friend. For her profound penetration and insight into the most intrinsic workings of human character, George Eliot was undoubtedly largely indebted to the phrenological philosophy of George Combe. In her letters there are numerous references to him and phrenology.

George Eliot induced Lewes to include " Gall " in his " History of Philosophy," and to deal with him fairly, which Lewes did ; but **he rejected Gall's doctrine, principally on the ground,** now proved to be untrue, **that the grey matter of the brain is of uniform structure,** and can therefore have only one function. Lewes said :

" The convolutions of the brain, which Gall has mapped out into several distinct compartments, each compartment being the organ of a distinct faculty, are in reality not more distinct than several folds of a piece of velvet ; and a little more reflection discloses the absurdity of supposing that one portion of this velvet should be endowed with different properties from every other portion, simply in virtue of its superficial position. **The tissue of which the convolutions consist is the same throughout its folds."**

Lewes objected also to Gall's ready acceptance of " the rude indications of observation," and gives as an example his location of the complex faculty of veneration in a particular convolution in man, which " by an unfortunate coincidence was found conspicuously prominent in sheep "—which was explained by Broussais—but still more unfortunately was discovered later by LEURET (" Anatomie Comparée,"

1839) to exist also in the brains of lions and tigers. More second-hand superficial criticism !

Lewes (influenced by Flourens) **was against all localisation,** not merely the phrenological one :

" I can never read without a smile the confident statements which credit certain nerve-cells with the power of transforming impressions into sensations, and other cells with the power of transforming these sensations into ideas, which assign volition to one centre, sensation to another, perception to a third, and emotion to a fourth."

What a contrast between Mill and Lewes ! Whereas Mill treats throughout of experience as though it meant the proceeds and results of *individual* acquaintance with cosmical facts, Lewes explains it in a larger sense as the inheritance of the whole human race. To the former, " mental phenomena do not admit of being deduced from the physiological laws of our nervous organisation," to the latter, " a neural process or an organic state is the physical correlate of a mental state." Mill never seemed entirely to understand the immense importance of evolution and development in mental science ; Lewes was never weary of impressing upon his readers the progressive influence exercised upon the human mind by such facts as the social medium in which men live, and the laws of heredity as explaining so-called mental forms and innate ideas.

Lewes laid stress on the collective experience of the individual and the collective experience of the race. " The biological conception," he said, " is defective in so far as it treats only of the individual organism, and only of the organism in its relation to the external medium. For animal psychology this would suffice ; for human psychology it is manifestly insufficient. Man is a social animal—the unit of a collective life—and to isolate him from society is almost as great a limitation of the scope of psychology as to isolate him from nature. To seek the whole data of our science in neural processes on the one hand, and revelations of introspection on the other, is to leave inexplicable the many and profound differences which distinguish man from the animals, and these differences can be shown to depend on the operation of the social factor, which transforms perceptions into conceptions, and sensations into sentiments."

ALEXANDER BAIN (1818-1903),

Professor of Moral Philosophy in the University of Aberdeen, author of " Senses and Intellect " (1855), " Emotions and Will " (1859), " On the Study of Character " (1861), " Moral and Mental Science " (1868), and " Mind and Body " (1873), is another philosopher who had a leaning towards phrenology, of the bearing of which on human character he made a thorough examination. **He is credited with having been the first to classify the feelings ; but, as his " Study of Character " shows, he based them on the phrenological analysis.** He recognised that the earlier philosophers (Descartes, Spinoza, etc.) had always placed the manifestations of the feelings and of the will in a subordinate position to the intellectual processes, whereas the phrenologists laid stress on the importance of the feelings, accordingly as they are the outcome of anger, of sympathy, of fear, or may be defined as æsthetic, ethical, intellectual, ideal, etc. He said :

" **Phrenology is the only science of human character** that has hitherto been elaborated in a manner proportioned to the subject." And again :

" All theorists previous to phrenology could not prove their principles by appeals to observed facts ; they could not show a relationship existing between cerebral organs and the functions of the elementary powers they had analysed in their own

consciousness. Phrenology not only showed herself capable of doing this, but she became the first and only science of character."

Bain proved the complexity of some of the phrenological faculties, and criticised the terminology ; but his criticism does not tell against either the localisation of function or the resort to study of the living head for evidence, but merely against the claim of some phrenologists that phrenology is *the* science of mind, and against the classification of the organs by Spurzheim and his school.

HERBERT SPENCER (1820-1903).

by profession an engineer, **was an ardent phrenologist in his young days,** not merely a theoretical one, but **a practical delineator.** Documents in my possession show him to have been a clever character-reader from the living head, and in my correspondence with him and our mutual friend, Dr. JOHN CHAPMAN (1822-1894), editor of the *Westminster Review,* the fact was not denied. I also published an article in that Review in 1895, at the suggestion of Dr. Chapman, entitled " Herbert Spencer as a Phrenologist." Spencer was also the inventor of an instrument—the cephalograph—for the measurement of living heads, a description and illustration of which he published in his " Autobiography," vol. i., Appendix H (London, 1904). Spencer wrote various essays on phrenology as a young man and offered them to the *Edinburgh Phrenological Journal,* but GEORGE COMBE, unsuspicious of the greatness to which this young writer would rise, rejected the contributions. They were subsequently published in Dr. ELLIOTSON'S paper, the *Zöist,* vol. i. and ii. ; but Spencer was indignant at Combe's refusal, and **was for ever afterwards hostile to phrenology** and the phrenologists, though he embodied all that he thought good in it in his own philosophical system. Spencer's essays in the main dealt with suggested improvements in the terminology of certain phrenological localisations based on his own observations of heads. In one respect Spencer was right. Neither George Combe nor any of his school took any notice of the progress of science and the bearing it had on their doctrine, and they admitted no correction. Hence phrenology stood still. I have already shown that they were equally unfair to Gall and left the world in ignorance of his writings. It need therefore occasion no wonder that this attitude and this want of adaptability to the results of new research and new ideas caused the more scientific and philosophical of their followers to turn from the subject and seek independent fields. Herbert Spencer was one of them.

Spencer took his revenge in " The Principles of Psychology " (1855), where he said " the crudity of their philosophy is such as may well make men, who to some extent agree with them, **refrain from avowal of their agreement,** more especially when they are met by so great an unwillingness to listen to any criticisms on the detailed scheme rashly promulgated as finally settled."

The harmony between Spencer's psychology and Combe's phrenology was noted by more than one observer. Thus Dr. JAMES HUNT (1833-1869) wrote in the *Anthropological Review,* 1867 :

" Mr. Spencer speaks of ' the unscientific reasonings of the phrenologists,' and yet there is, perhaps, **no modern writer on psychology who has so blindly accepted the fundamental principles of phrenology** as he has done. In one place he speaks of ' the discovery of the relation subsisting between the development of the nervous system and the degree of intelligence. Originally no such relation was known to exist.' . . . Mr. Spencer accepts all the chief principles of the phrenologists, often, however, without due acknowledgment, and at the same time sneers at the conduct of physiologists for not accepting the same as ' being in harmony with the controversies in general.' The only difference between the utterances of Dr. Gall and Mr. Spencer is that the one gives his opinion on the special localisation of the

faculties, as a man of science and observation, and the other as a dogmatic philosopher. Mr. Spencer says : ' Localisation of function is the law of all organisation whatever ; separateness of duty is universally accompanied with separateness of structure, and it would be marvellous were an exception to exist in the cerebral hemispheres.' Mr. Spencer, indeed, goes still further than Gall, or I believe any of his followers, in his application of the doctrines of phrenology to comparative anthropology. Thus Mr. Spencer writes : ' The corollary from the general argument that has been elaborated is, that the brain represents an infinitude of experiences received during the evolution of life in general, the most uniform and frequent of which have been successively bequeathed, principal and interest ; and have thus slowly amounted to that high intelligence which lies latent in the brain of the infant —which the infant in the course of its after-life exercises and usually strengthens or further applicates, and which, with minute additions, it again bequeaths to future generations. And thus it happens that the European comes to have from twenty to thirty cubic inches more brain than the Papuan. Thus it happens that faculties, as that of music, which scarcely exist in the inferior human races, become congenital in superior ones. Thus it happens that out of savages unable to count up to the number of their fingers, and speaking a language containing only nouns and verbs, come at length our Newtons and Shakespeares, etc.' "

In an article on " First Principles," M. AUGUSTE LAUGEL, editor of the *Revue des Deux Mondes*, described Herbert Spencer as a follower of Comte, and said that Comte's influence is easily recognisable. Spencer protested against this statement in a pamphlet, " Reasons for Dissenting from the Philosophy of Comte." Seeing that **both took Gall and his school as their authority** (Auguste Comte acknowledging the fact, but Mr. Spencer ignoring it), M. Laugel's error is easily explained.

Spencer claimed in his " Autobiography " to have been unacquainted with Comte's work. He asserted that he knew nothing more of him than that he was a French philosopher. Yet he was indebted to Comte—among other things—for the conception of sociology as a distinct science, founded on the basis of other sciences, and used the same title " Social Statics," and made the same endeavour to give a scientific basis to politics, as Comte had done twenty years before him.

We must not forget that at the time of the publication of " The Principles of Psychology," there was not a single philosopher or physiologist in favour of the plurality of functions of the brain except Gall's own followers. The two authorities whom Spencer mentions in his defence against the supposed similarities between his writings and those of Comte—Sir WILLIAM HAMILTON and FLOURENS—wrote the reverse of what he advocated. The former in his lectures on Metaphysics (p. 264) said : " No assistance is afforded to mental philosophy by the examination of the nervous system ; and doctrine or doctrines founded on the supposed parallelism of brain and mind are, as far as observation extends, wholly groundless." And Flourens, as we have seen, thought he had proved the *unity* of the brain by his experiments.

Another well-known authority, whom we have already quoted extensively as having a strong, though unacknowledged leaning towards Gall's doctrine, who also complained of Spencer's borrowing from the same sources, is Dr. HENRY MAUDSLEY. In his " Physiology of Mind," p. 133, he said :

" As Mr. Spencer does not on any occasion give references to or make quotations from authors who have preceded him, but works up their results systematically into his lucid exposition, those who gain all their knowledge of philosophy from the most recent and popular expositions of it, and ascribe to their authors all they find there, are prone to think original that which is often a legacy from the past. This practice of ignoring authorities, though it no doubt has its conveniences, bears hardly and disagreeably sometimes on those who may have occasion to write upon the same

subjects, inasmuch as they are liable to be charged by ignorant persons with borrowing from an eminent contemporary what the contemporary has really derived from the same well-known source, and would not claim as his own. This is trying ; the most serenely pankleptic appropriator of the fruits of past thoughts will become recalcitrant when he is charged with specific appropriation of material, not from the real proprietor of the property, who may perhaps not be known by name, but from one who, indebted for it to the same sources in the stores of the past as himself, does not make specific acknowledgments."

The following is the criticism of the phrenological doctrine by Spencer. It will be seen that many of his remarks apply to details of it and not the main principles, and that the things he objects to were most of them not created by Gall, but by his phrenological followers. In "The Principles of Psychology," par. 248 onwards, Herbert Spencer says :

"A few remarks are here called for respecting the tenets of phrenologists. It scarcely needs saying that the conception above elaborated, implying the constant co-operation of all the leading nervous centres in every thought and emotion, is quite at variance with their theory, as presented by themselves. But it may be necessary to point out that I do not hence infer the *absolute* untruth of their theory.

"That the contemptuous antagonism they have met with from both psychologists and physiologists is in great measure deserved must be admitted. They have put forth their body of doctrines as in itself a complete system of psychology—naturally repelling by this absurdity all students of mental science. At best, phrenology can be but an appendix to psychology proper ; and one of comparative unimportance, scientifically considered. [That can refer only to Combe's phrenology, not to Gall.] That those who have carefully investigated the structure and functions of the nervous system, should have long ago turned their backs on phrenology is also not to be wondered at, seeing how extremely loose the phrenologists are in their methods of observation and reasoning, and how obstinately they ignore the adverse evidence furnished by experiment. [Experiment at the time proved the unity of the brain.]

"Nevertheless, it seems to me that most physiologists have not sufficiently recognised the general truth of which phrenology is an adumbration. Whoever calmly considers the question cannot long resist the conviction that different parts of the cerebrum must, *in some way or other*, subserve different kinds of mental action. Localisation of function is the law of all organisation whatever ; and it would be marvellous were there here an exception. If it be admitted that the cerebral hemispheres are the seats of the higher psychical activities ; if it be admitted that among these higher psychical activities there are distinctions of kind, which, though not definite, are yet practically recognisable ; it cannot be denied, without going in direct opposition to established psychological principles, that these more or less distinct kinds of psychical activity must be carried on in more or less distinct parts of the cerebral hemispheres. To question this is to ignore the truths of nerve-physiology, as well as those of physiology in general. It is proved, experimentally, that every bundle of nerve-fibres and every ganglion have special duty ; and that each part of every such bundle and every such ganglion has a duty still more special. Can it be, then, that in the great hemispherical ganglia alone, this specialisation of duty does not hold ? That there are no conspicuous divisions here is true ; but it is also true in other cases where there are undeniable differences of function—instance the spinal cord, or one of the great nerve-bundles. Just as there are aggregated together in a sciatic nerve an immense number of fibres, each of which has a particular office referring to some one part of the leg, but all of which have for their joint duty the management of the leg as a whole ; so, in any one region of the cerebrum, each fibre may be concluded to have some particular office which, in common with the particular offices of many neighbouring fibres, is merged in some general office fulfilled by that region of the cerebrum. Any other hypothesis seems to me, on the face of it, untenable. Either there is some arrangement, some organisation, in the cerebrum, or there is none. If there is no organisation, the

cerebrum is a chaotic mass of fibres, incapable of performing any orderly action. If there is some organisation, it must consist in that same 'physiological division of labour' in which all organisation consists; and there is no division of labour, physiological or other, but what involves the concentration of special kinds of activity in special places.

"But to coincide with the doctrine of the phrenologists in its most abstract shape is by no means to coincide with their concrete embodiments of it. Indeed, the crudity of their philosophy is such as may well make men who to some extent agree with them, refrain from avowal of their agreement, more especially when they are met by so great an unwillingness to listen to any criticisms on the detailed scheme rashly promulgated as finally settled.

"Among fundamental objections to their views, the first to be set down is that they are unwarranted in assuming precise demarcations of the faculties. [Not to be found in Gall, and such demarcations, made by Spurzheim and Combe, have only to do with physiology, not with psychology.] The only localisation which the necessities of the case imply is one of a comparatively vague kind—one which does not suppose specific limits, but an insensible shading-off. And this is just the conclusion to which all the preceding investigations point. For as we have seen that every mental faculty, rightly understood, is an internal plexus of nervous connections corresponding to some plexus of relations among external phenomena that are habitually experienced; and as the different plexuses of external relations, in proportion as they become complicated, become less definite in their distinctions, so that when we reach these extremely involved ones to which the higher faculties respond there arises a great overlapping and entanglement of different plexuses; it follows that the answering internal plexuses must be fused together—it must be as impossible to demarcate the internal nervous aggregations as it is to demarcate the aggregations of external things and actions.

"Moreover, I believe the phrenologists to be wrong in assuming that there is something specific and unalterable in the nature of the various faculties. Responding, as faculties do, to particular assemblages of phenomena habitually surrounding any race or organisms, they are only so far fixed as they are fixed and specific. A permanent alteration in one of these assemblages would in time establish a modified feeling adapted to the modified assemblage. A habit—say of sitting in a particular place in a particular room, ending in being uncomfortable elsewhere—is nothing but an incipient emotion answering to that group of outer relations; and if all the successors of the person having this habit were constantly placed in the same relations, the incipient emotion would become an established emotion. So little specific are the faculties that no one of them is quite of the same quality in different persons. Each mental power is variable to as great an extent as each feature is variable. Yet further, the current impression of phrenologists seems to be that the different parts of the cerebrum in which they locate different faculties are of themselves competent to produce the manifestations implied by the names they bear. The portion of brain marked 'acquisitiveness' is supposed to be alone concerned in producing the desire of possession. But it is a corollary from foregoing arguments that this desire includes a number of minor desires elsewhere located. As every more complex aggregation of psychical states is evolved by the union of simpler aggregations previously established—results from the co-ordination and consolidation of these—it follows that that which becomes more especially the seat of this more complex aggregation, or higher feeling, is simply the **centre of co-ordination** by which all the simpler aggregations are brought into relation. Hence, that particular portion of the cerebrum in which a particular faculty is said to be located must be regarded as an agent by which the various actions going on in many other parts of the cerebrum are combined in a particular way. [Association-centre.] The brain, active throughout, evolves under the co-ordinating plexus that is for the time dominant an aggregate of feelings that is various in quality according to the proportions and arrangements of its components; just as out of the same orchestra, with its many instruments going from moment to moment, are drawn combinations of sounds now grave, now gay, now martial, now pathetic, according to the way in which the actions of its parts are co-ordinated by the composer's score.

"That in their antagonism to the unscientific reasonings of the phrenologists

the physiologists should have gone to the extent of denying or ignoring any localisation of function in the cerebrum is, perhaps, not to be wondered at : it is in harmony with the course of controversies in general. But no physiologist who calmly considers the question in connection with the general truths of his science can long resist the conviction that **different parts of the cerebrum subserve different kinds of mental action.** Localisation of function is the law of all organisation whatever ; separateness of duty is universally accompanied with separateness of structure ; and it would be marvellous were an exception to exist in the cerebral hemispheres. Let it be granted that the cerebral hemispheres are the seat of the higher psychical activities ; let it be granted that among these higher psychical activities there are distinctions of kind, which, though not definite, are yet practically recognisable ; and it cannot be denied, without going in direct opposition to established physiological principles, that these more or less distinct kinds of psychical activity must be carried on in more or less distinct parts of the cerebral hemispheres. To question this is not only to ignore the truths of physiology as a whole ; but especially those of the physiology of the nervous system.

" Again, they [the phrenologists] are unwarranted in their idea of a precise demarcation of the faculties. Were there anything like that definite distinction in the functions of the different parts of the cerebrum, which is indicated by the lines on their *busts* (!), and apparently supposed by them really to exist, there would be some signs of it in the cerebrum itself. In other parts of the nervous system, where there is decisive difference of function, there is decisively marked separation of structure.

" Saying nothing of the many minor objections that may be made to the phrenological doctrine, in respect of its localisations, and more especially in respect of its very faulty, unanalytical nomenclature of the faculties, it is thus sufficiently clear that, defensible as it is in its fundamental proposition, it is in many other points quite indefensible."

What Spencer tells us in the above quotation simply amounts to this, that phrenology is not perfect, but I am not aware that even Combe considered it to be so ; and if he had done so, the fact would have nothing to do with the original doctrine as set forth by Gall. In all the history of philosophy, is there one doctrine that can claim perfection ? Besides, Spencer was only criticising so that he might have greater freedom to use what was really good in the original doctrine. Thus he adopted Gall's teaching that the mind is largely made up of feelings ; that the emotions have definite localisations in the brain as have the intellectual capacities (he is the only philosopher who admits that) ; that the exercise of the mental powers gives pleasure, and their inaction and inhibition causes pain ; that with the complexity of the brain instinctive action becomes rational action ; that hereditary transmission applies to psychical peculiarities as well as to physical peculiarities ; etc., etc. He accepted many of the phrenological faculties, and, like Gall, traced their origin and development. His defence of free-will was exactly on the lines of Gall ; so was his distinction between instinct and reason, and his statement that animals have intellect and moral feeling ; and so on. Spencer has earned renown for some of these views, while Gall and his doctrines continue to be despised. Herbert Spencer said of **Free-will** :

" That every one is at liberty to do what he desires to do (supposing there are no external hindrances), all admit ; though people of confused ideas commonly suppose this to be the thing denied. But that every one is at liberty to desire, or not to desire, which is the real proposition involved in the dogma of free-will, is negatived as much by the analysis of consciousness as by the contents of the preceding chapters. From the universal law that, other things equal, the cohesion of psychical states is proportionate to the frequency with which they have followed one another in experience, it is an inevitable corollary that all actions whatever must be determined by those psychical connections which experience has generated either in the

life of the individual or in that general antecedent life of which the accumulated results are organised in his constitution.

"When, after a certain composite mass of emotion and thought has arisen in him, a man performs an action, he commonly asserts that *he* determined to perform the action; and by speaking as though they were a mental self, *present to his consciousness*, yet not included in this composite mass of emotion and thought, he is led into the error of supposing that it was not this composite mass of emotion and thought which determined the action. But while it is true that he determined the action, it is also true that the aggregate of his feelings and ideas determined it; since, during its existence, this aggregate constituted his entire consciousness—that is, his mental self.

"Naturally enough, then, the subject of such psychical changes says that he wills the action, since, psychically considered, he is at the moment nothing more than the composite mass of consciousness by which the action is excited. But to say that the performance of the action is, therefore, the result of his free-will is to say that he determines the cohesions of the psychical states which arouse the action; and as these psychical states constitute himself at that moment, this is to say that these psychical states determine their own cohesions, which is absurd. Their cohesions have been determined by experiences—the greater part of them constituting what we call his natural character, by the experience of antecedent organisms; and the rest by his own experiences. The changes which at each moment take place in his consciousness, and among others those which he is said to will, are produced by this infinitude of previous experiences registered in his nervous structure, co-operating with the immediate impressions on his senses; the effort of these combined factors being in every case qualified by the physical state, general or local, of his organism.

"The irregularity and apparent freedom are inevitable results of the complexity, The same holds good in the organic world. A body attracted by a single other body, its course in space can be accurately predicted. A body attracted by two other bodies, its course can be less accurately predicted. A body attracted by three other bodies, still less accurately. A body attracted by multitudinous bodies of all sizes and distances, as in a star-cluster, its motion will *appear* free. Similarly in proportion as the cohesions of each psychical state to others become great in number and various in degree, the psychical changes will become incalculable and apparently subject to no law.

"We speak of will as something apart from the feeling or feelings which for the moment prevail over others; whereas it is nothing but the general name given to the special feeling that gains supremacy and determines action. Take away all sensations and emotions, and there remains no will. Excite some of these, and will, becoming possible, becomes actual only, when one of them gains predominance. Until there is a *motive* (mark the word) there is no will."

Now, let us compare this explanation of the will with that by Comte, who gives Gall the credit, where Spencer does not.

"Among the innumerable objections which have been aimed at this fine doctrine —considered always as a whole—the only one which merits discussion here is the supposed necessity of human actions. This objection is not only of high importance in itself, but it casts new light back upon the spirit of the theory, and we must briefly examine it from the point of view of positive philosophy.

"When objectors confound the subjection of events to invariable laws with their necessary exemption from modification, they lose sight of the fact that phenomena become susceptible of modification in proportion to their complexity. The only irresistible action that we know is that of weight, which takes place under the most general and simple of all natural laws. But the phenomena of life and acts of the mind are so highly complex as to admit of modification beyond all estimate; and in the intermediate regions phenomena are under control precisely in the order of their complexity.

"Gall has shown how human action depends on the combined operation of several faculties; how exercise develops them; how inactivity wastes them; and

how the intellectual faculties, adapted to modify the general conduct of the animal according to the variable exigencies of his situation, may over-rule the practical influence of all his other faculties. It is only in mania, when disease interferes with the natural action of the faculties, that fatality, or what is popularly called irresponsibility, exists. It is therefore a great mistake to accuse cerebral physiology of disowning the influence of education or legislation, because it fixes the limit of their power. It denies the possibility, asserted by the ideology of the French school, of converting by suitable arrangements all men into so many Socrates, Homers, or Archimedes, and it denies the ungovernable energy of the *ego*, asserted by the German school, but it does not therefore affect man's reasonable liberty, or interfere with his improvement by the aid of a wise education. It is evident indeed that improvement by education supposes the existence of requisite predispositions, and that each of them is subject to determinate laws, without which they could not be systematically influenced ; so that it is, after all, cerebral physiology that is in possession of the philosophical problem of education."

In my opinion, it was **the study of phrenology** that led Spencer to the wider application of his philosophic abilities and the production of "The Principles of Psychology," a work which gained him world-wide renown. **In this work he proved himself an evolutionist several years before Darwin, but very much on the lines of Gall.** It was the first "psychology without a soul," for in it he studied the individual as a psycho-physical being, who has to adapt himself to his surroundings—not as an abstract psychic entity ; and in it he traced the progressive development of consciousness. He applied the physiological principles of association psychology to explain not only the development of the human mind, but also the evolution of the mental powers of the race ; claiming to show how all the powers of the human mind have been built up by the transmission and accumulation from generation to generation of the experience of each, embodied in the form of associated groups of nervous elements. And these speculations met with very general approval and exerted a wide spread influence.

He was the first philosopher to develop the theory of a progressive evolution of consciousness parallel to that of living organisms. He examined first of all the nervous system which is the *sine qua non* of consciousness, and was of opinion that the object of psychology consists in determining the connection between the series of physical phenomena and the corresponding series of mental phenomena. The individual cannot be considered as an abstract psychic entity, but as what he really is, viz., a psycho-physical being, who has to adapt himself to his surroundings. Therefore there can be no sharp distinction between biology and psychology, for there can be no interruption in evolution, which is a universal and continuous process observable in every form of existence. Life consists in a perfect harmony between the outer and the inner worlds. Thus consciousness, like the bodily organism from which it is inseparable, is subject to a progressive evolution from simpler to more complicated forms, or, as we may say, from a homogeneous to a heterogeneous form.

Just as biology was beginning to consider all organic beings, including man, as connected with one another by a continuous chain of evolution, so psychology ceased to consider man as an isolated being in order to explain the origin of conscious phenomena by means of the evolution of the species. Thus Spencer maintained the necessity of supplementing the individual method in psychology with the social and psychological methods, and divided the first into two special sciences, the *subjective* and *objective*, the latter being properly a biological science.

JOHN TYNDALL (1820-1893)

In England the materialistic wave, if we exclude the phrenologists, came much later, *i.e.*, after Darwin, with Huxley and Tyndall. The latter said : "Given the

shape of the brain, the corresponding thought might be inferred." This sounds quite phrenological, but is absolutely wrong. All that we can say is: Given the shape of the brain, the mental **dispositions** might be inferred. Given a sound eye, we know that the man will see, but we cannot tell **what** he will see. Similarly, given sound and prominent frontal lobes, we know that the man possessing them will tend to intellectual activity, but we do not know what the thoughts will be; or, again, given a sound and prominent centre for the appreciation of tones, and the other powers necessary for the practice of music, we know that the man, under the proper stimulus, will take an interest in the subject, but we cannot tell whether he will compose or what he will compose. In other words, a centre or instrument is necessary for the manifestation of mental and moral activity, as an ear is necessary for hearing; but the instruments and the psychical activity are not one.

In 1874 Tyndall gave his famous address at the British Association Meeting at Belfast, when he declared against free-will; or, rather, seemed to do so, for so it was interpreted at the time. T. H. HUXLEY (1825-1895) followed with a discourse on "animal automatism."

HUXLEY invented the term "agnostic" to express the attitude of mind which, where knowledge obviously cannot be had, is content not to know, and declines to speculate further,

Tyndall explained his views on free-will in the *Fortnightly Review*, 1877, as follows:

"What is meant by free-will? Does it imply the power of producing events without antecedents? Of starting, as it were, upon a creative tour of concurrences without any impulse from within or without? Let us consider the point. If there be absolutely or relatively no reason why a tree should fall, it will not fall; and if there be absolutely or relatively no reason why a man should act, he will not act. It is true that the united voice of the assembly could not persuade me that I have not, at this moment, the power to lift my arm if I wish to do so. Within this range the conscious freedom of my will cannot be questioned. But what about the origin of the wish? Are we, or are we not, complete masters of the circumstances which create our wishes, motives and tendencies, and action? Adequate reflection will, I think, prove that we are not. What, for example, have I had to do with the generation and development of that which some will consider my total being, the living and speaking organism which now addresses you? As stated at the beginning of this discourse, my physical and intellectual textures are woven *for* me, not *by* me. Processes in the conduct or regulation of which I had no share have made me what I am. There, surely, if anywhere, we are as clay in the hands of the potter. It is the greatest of delusions to suppose that we come into this world as sheets of white paper on which the age can write anything it likes, making us good or bad, noble or mean, as the age pleases. The age can stunt, promote, or pervert pre-existing capacities, but it cannot create them."

HENRY MAUDSLEY (1835-1918),

the distinguished alienist and author of numerous works on the physiology and pathology of mind, was an important representative of the materialistic school, at least in his younger days.

In Maudsley's opinion, "the unity of mind is merely the organic unity of the brain." Consciousness is not the most important factor in man, but is, on the contrary, an epiphenomenon—that is to say, an addition to what constitutes the essence of an organised being—viz., its impulses and instincts. It is merely a by-product, a spark thrown off by the engine, the brain. He relied on the fact that men's characters are fixed, and their actions thereby, to a certain extent, predictable, and that sane society, in fact, is based on the assumption of such fixity; and from

this he proceeded to draw the conclusion that any sort of self-determination, anything, in fact, but the inevitable fatalism of natural causation, is a delusion and a snare. Character to him was another name for organisation. **We are saints or sinners according to the configuration of the nerve tracks concerned.** Ethics is as much a matter of machinery as the basest mechanical process ; only the machine is cunningly made, and improvements are made by generations. Brethren could not dwell together in unity ; human society, in fact, would be impossible, unless men could rely on each other's conduct as a physical necessity as perfect as, and in fact the same as, the absolute bondage of physical causation. "The final reaction after deliberation, which we call Will, is a *resultant* of a certain molecular change in a definitely constituted nervous centre," or in other words, "I am a reproductive steam-engine."

Maudsley has written more than any other modern British alienist on the lines of Gall. Here are a few specimens (*Journal of Mental Science*, Vol. VII., p. 191) :

"No more useful work could be undertaken in psychology than a patient and systematic study of individuals, the scientific and accurate dissection and classification of the minds and characters of men, in connection with their features and habits of body. How vast a service it would be to have set forth in formal expression the steps of the quick process by which the shrewd and experienced man of the world intuitively judges the character of those he has to do with, and refers them in a moment instinctively to their proper classes in his mind.

"All broad-headed people," he wrote, that he has found, "are very selfish ; that is to say, all who have the head broad in proportion to its length " ; and he accepts the observation of the phrenologists, "that an undue preponderance of the breadth of head throughout the region in which they place the propensities indicates with certainty an animal self-love, which can scarcely be trusted at all times to adopt only fair means for its gratification. Undue preponderance, be it observed, for it is justifiable to expect a favourable result, even with a rather broad head which has a proportionately good length, and which has, so to say, the power of its length placed in the anterior half thereof. And why ? Simply because there is in the front the greatest natural power, the force of intellect, which by exercise and development is able to control the objectionable propensities indicated in the animal broadness of skull."

To the question, **What constitutes a noble head ?** Maudsley replied : "From the forehead the passage backwards above should be through a lofty vault, a genuine dome, with no disturbing depressions or vile irregularities to mar its beauty ; there should be no marked projections on the human skull, formed after the noblest type, but rather a general evenness of contour."

On the question, **What is a brutal head ?** Maudsley remarked : "The bad features of a badly-formed head would include a narrowness and lowness of the forehead, a flatness of the upper part of the head, a bulging of the sides towards the base, and a greater development of the lower and posterior part ; with those grievous characters might be associated a wideness of the zygomatic arch, as in the carnivorous animal, and massive jaws. A man so formed might be expected, with some confidence, to be given over hopelessly to his brutal instincts."

"**Is a man, then, hopelessly chained down by the weight of his inheritance ?**" "By no means," was the answer of Dr. Maudsley, "for there is something besides inheritance which makes fate, and that is education. It is a physiological law that the brain, throughout infancy, childhood, and youth, *grows* to the circumstances which it is placed among ; and therefore the actual development of a brain may be much influenced by the sort of nutriment supplied to it as long as it grows. It would be rash, indeed, to venture to limit the effect which a right, reasonable, moral, physical, and intellectual education may have on the worst inheritance. But given an individual at the meridian of life, with a bad inheritance and a bad education, the benevolent enthusiast may hope for his reformation, and, all honour to him, labour for it ; but the careful observer will be prone to smile at his expectations, and regarding them as a devout imagination, to compare them to those made to wash a blackamoor white."

These remarks should be read together with the reply of Gall to the criticism of Walter, who disapproved of his diagnosis of criminals (p. 327). Again Maudsley said :

" **It is extremely probable that different convolutions of the brain do discharge different functions in our mental life.** . . . That the broad, high, and prominent forehead indicates great intellectual power was believed in Greece, and is commonly accepted as true now ; the examination of the brains of animals and idiots, and the comparison of the brain of the lowest savage with the brain of the civilised European, certainly tend to strengthen the belief. Narrow and pointed hemispheres assuredly do mark an approach to the character of the monkey's brain. There is some reason to believe also that the upper part of the brain and the posterior lobes have more to do with feeling than with the understanding. Huschke has found these parts to be proportionately more developed in women than in men ; and Schröder van der Kolk said that his pathological researches had afforded him the most convincing proofs that the anterior lobes of the brain were the seat of the higher intellectual faculties, while the upper and posterior lobes ministered rather to the emotional life."

The above quotations contain practically the whole of *practical* phrenology in a nutshell, and if anybody were entitled to be called phrenologist, Maudsley would be. Yet Maudsley, though accepting what I should call the questionable part of phrenology, that part—the physiognomy of the head—which scientists have persistently refused to examine, was absolutely against " the precise mapping out of the cerebral surface, and the classification of the mental faculties, which the phrenologists have rashly made and which will not bear scientific examination." He had himself examined it. He tested the organ of " **Love of Life** " (**an organ unknown to Gall and Spurzheim**) in patients who were either very desirous of preserving their existence or were tired of it. Maudsley said that phrenologists locate this faculty in *front* of the ear, and that he found the location correct only in one out of many cases. It is unfortunate for Maudsley that phrenologists did not locate this faculty (about which, by-the-by, they were uncertain) in front, but *behind* the ear, in the posterior part of the temporal convolutions. Furthermore, to ascertain the truth of phrenology by actual measurement, Maudsley compared the size of the patients' heads with that of a model *bust*. Is it a scientific test to compare the dimensions of a living head with that of a plaster model ?

We have too much reverence for Maudsley's profound knowledge to think that he meant his criticism seriously. As a follower of Comte, he must have been acquainted with the doctrine of Gall, and have intended this as a joke.

However, Maudsley condemned not only the phrenologists, but **rejected also Broca's speech centre.** He said :

" Recently some observations have been made with the view of establishing a theory that a portion of the anterior lobe, the third frontal convolution of the left hemisphere, was the seat of language ; but the observations reported are unsatisfactory ; directly contradictory observations are overlooked or ignored, and it is contrary to the first principles of psychology to suppose that language, complex and organic as it is in its intellectual character as the sign or symbol of the idea, can have so limited and defined a seat in the brain."

WILLIAM JAMES (1842-1910),

the American psychologist, Professor at Harvard University, in his " Principles of Psychology," 1891, said that psychology is the " science of mental life " with regard to its phenomena and its conditions. He rejected the English theory of " associationism," and maintained that **in psychology a large place must be given to cerebral**

physiology. Mental phenomena, however, extend far beyond the limits of nervous physiology, and James succinctly defined their distinctive character as consisting in the fact of striving after future aims and choosing the means to reach them, this being, as he rightly observed, what distinguishes an intelligent from a mechanical act. Like Herbert Spencer, he recognised the fact that man is not merely an intellectual machine, but that he also leads a life of emotion ; and he recognised further that the emotions have their roots in the instincts, appetites, and desires.

James pointed out that **emotion and instinct are really the same thing,** the only difference being that instinct brings the organism into more practical relationship with the external world than emotion. He deprecated the method of classifying "definite tendencies by naming abstractly the purpose they subserve, such as self-preservation, defence," and the like, and insisted further that the strict psychological way of regarding instincts is to regard them as actions, which "all conform to the general reflex type," that is, the type of a definite response to a definite situation. But it seems as objectionable to speak of an instinct of imitation, or play, or curiosity, as it is to speak of an instinct of self-preservation, if we apply to human instincts the criteria which James wished to apply. As it turns out, he himself found it convenient to ignore his own criteria so soon as he came to discuss the more important human instincts and instinctive tendencies.

According to James, "every instinct is an impulse." But every instinct is not an impulse, although every impulse involves the existence of an instinct. Every instinct implies the possibility of the appearance of an impulse. We act instinctively in a thousand different ways during all our life without paying any attention to our acts ; but some day, when something inhibits our instinctive actions, we have a disturbance of our mental life, which in complex cases produces what we designate as an impulse, which we feel tends to compel us to act in accord with our instinct. With choice of instincts comes hesitation, and then reason. Instinctive actions, so far as they affect our mental life, are represented in consciousness by "instinctive feelings," and, whenever the instinctive actions are inhibited, impulses present themselves in consciousness.

James, in his article on "Emotion" in the psychological journal *Mind*, 1884, said :" Instinctive reactions and emotional expressions shade imperceptibly into each other. Every object that excites our instinct excites an emotion as well. . . . The bodily changes follow directly the perception of the exciting fact, and our feeling of the same changes as they occur *is* the emotion."

CHARLES LANGE (1834-1900), of Copenhagen, almost simultaneously with James (in his "Emotions," 1885), taught that the psychic emotion is only the state of consciousness brought about by organic disturbances which themselves are only reflexes of the circulating apparatus governed by the vaso-motor centres. For instance, there is paleness of the skin in fear due to vaso-motor spasm ; whereas in anger there is dilatation of the vessels and flushing of the skin. This is termed the **vaso-motor theory.** It amounts to this, that the perception or idea produces the feeling of the emotion, which is followed by the organic changes. It comprises two propositions : (1) The psychic emotion does not exist, but is only the state of consciousness brought about by organic disturbances ; (2) The reflex organic disturbances which are the factors of emotion are themselves only reflexes of the circulating apparatus governed by the vaso-motor centres. In joy, gaiety, and kindred states there is a vaso-dilatation of the small arteries ; and in sadness, grief, and kindred states there is a vaso-constriction of the small arteries. Now, contrary to this theory, it is held by some that these vaso-motor modifications are the true causes of joy and sadness, not the result of them.

G. SERGI ("Physiological Psychology," 1888) opposed Lange's vaso-motor theory and asserted that it is too restricted. He would include not only the vaso-motor centres, but also the bulbar centres, including the respiratory, and the centres of vegetative life. This is the so-called **bulbar theory.**

James stated that an emotion is the reaction of the brain consequent upon the excitation of afferent nerves. A number of bodily changes are set up by some exciting factor, and as a consequence of the perception of this factor and of its mental representation an emotion is the result. The emotion, in other words, is the expression of the stimulus, and the order of events is (1) the perception of some "exciting" fact; which (2) sets up reflexly some bodily disturbance; and (3) this commotion is apprehended or realised. It is this "apprehension" that constitutes the emotion. The emotion felt is either strong or weak, according to the amount of bodily disturbances set up by the exciting stimulus. This is the **physical reflex theory.** The feelings are thus solely the expression of the organic functions of the individual. The emotion does not cause the expression (as DARWIN held), but the expression, the instinctive action, causes the emotion. This omits the ethical and æsthetical feelings.

According to James and Lange, **feeling mixed with an idea is called an emotion.** There are ideas without any feeling, but the same idea may come to have a feeling tone. The emotion of fear, for example, is an intellectual anticipation of danger. The feeling may die out and the idea may persist. But may it not be the reverse way—that the idea is lost, and the feeling persists? We often feel fear without being able to account for it, but a psychological analysis reveals some event in personal or ancestral experience which brought danger.

Opposed to the theory of James and Lange that the emotions follow upon and are the result of the organic changes, we have the theory of GALL, BAIN, and SPENCER, that all affective states are connected with biological conditions and are the *direct* and *immediate* expression of the vegetative life; in other words, the emotions have their roots in the instincts, appetites and desires, as James admitted, but they do not follow but are concomitant with instinctive actions.

WILLIAM M'DOUGALL (1871-), Lecturer on Philosophy in the University of Oxford, author of a standard work on "Social Psychology" (1908) and "Body and Mind" (1911), accepts the view of James with modifications, for he declares the emotions to be the mental representation of instinctive bodily tendencies, *i.e.*, the emotions are the mental side of the bodily tendencies, innate in the individual, the result of a long evolution, yet modified by development and social customs.

CHAPTER XXIII

GERMAN PHILOSOPHY OF THE XIXth CENTURY.

JOHANN GOTTLIEB FICHTE (1762-1814)

THE philosophy of Fichte is a system of pure and subjective idealism. It emphasises the unity and self-renewing activity of the soul. The *ego* is the supreme principle of philosophy. First is sensation, which is unconsciously generated and comes from the outer world; then intuition; then the understanding, which originates from intuition and creates the form of objective being; finally reflective judgment and rational knowledge, by means of which the ego comprehends itself or comes to pure self-consciousness. Corresponding thereto is a series of practical activities; on the basis of longing and desire a system of impulses is built, and above this rises the moral will. The body is the ego in perception; therefore philosophy requires no special concept of the soul, there is no distinction of body and soul, and therefore no personal immortality. He rejected the faculty conception of the mental powers.

F. W. J. v. SCHELLING (1775-1854)

Schelling, successor of Fichte in the chair of philosophy at Jena, said that if matter, seemingly so unspiritual, were not in the last analysis spirit, there would be no connection between nature and the intelligence which knows it; for intelligence is not able to apprehend something totally different from itself. So-called inorganic nature is also animated, is the lowest stage of a series of productions, which terminates in reason, in which nature reveals its true essence, its spirituality. The psychological evolution is from sensation to intuition, reflection, judgment, and absolute will-activity, and the goal of the whole process lies not in knowledge or conduct but in artistic creation and æsthetic contemplation, for in art the soul becomes one with nature.

Schelling, who was well versed in natural science, endeavoured to escape from Fichte's subjectivity, and to restore reality to the world without separating it from the mind. The real and the ideal, the objective and the subjective, are, as it were, the two poles of the Absolute. The task of philosophy is to evolve alternately nature from intelligence, and intelligence from nature, and thus to establish the identity of the two terms; philosophy is completed by the science of the Beautiful, which is created by the simultaneous operation of the conscious and the unconscious, blended in the inspiration of genius. The unity and progress of the world can only be explained by a World-Soul, a plastic principle, which organises the universe. This world-soul with its indifference embraces and reconciles the subject and the object, is apprehended by us in an intellectual intuition of our deepest being. That which in our minds arrives at self-consciousness is the very activity which in nature created the universe. Matter is spirit with its fire extinguished. Reality is the evolution of the Absolute, the life of the universal soul; and philosophy is the history of God. Mind can only be understood by a construction of the universe;

the plurality of souls is only a means employed by the Absolute to develop itself by becoming more and more conscious of itself and of its freedom.

G. W. F. HEGEL (1770-1831)

Notwithstanding Kant, pure metaphysics triumphed again, in Hegel, the founder of the historic method of research, who claimed the *unity* of mind in human society, according to which history appears as the development of one single all-embracing spirit. For the interpretation of human history and natural history alike, a dialectical process of thought replaces the empirical laws of nature and mind.

In his "Anthropology," he dealt with subjective spirit in its immediate entanglement with the body. So far as it is under the sway of the body, it shows certain determinations which are given to man from birth and from which he cannot free himself. Here belong the racial differences, temperaments, relation of sleep and waking, etc.

In his "Phenomenology of Mind" (1807), **he worked out a genetic psychology, superseding the theory of faculties.** Mind interpreted as thought objectifies itself in the world, and shows itself subjective in the individual mind. Consciousness is the act by which spirit is distinguished from everything that is not ego; at first it apprehends objects in their isolation, then the universal, then laws and forces, and finally develops the insight that sees, in its presentation of objects, its presentation of itself.

According to Hegel, it has been a gross misunderstanding to regard the soul as a quiescent substance, and he rejects with equal vigour the customary separation of will and idea, since they are both fundamentally the same and in freedom are united.

Hegel held with Schelling that all things come from the Absolute, but he reproached him with having posited the Absolute without defining it. For Hegel the Absolute is the Idea, reality is the Truth. Consciousness is only a moment in the evolution of Being. To absolute knowledge, being and thought are identical; the rational is the real, the real is the rational. Metaphysics is a system of Logic. The Logic, in an unbroken dialectic chain, leads to the Philosophy of Nature, that is the Idea estranged, as it were, from itself; and this again leads to the Philosophy of Spirit, or to the Idea which has returned from nature to itself, and has assumed, along with possession of itself, an existence that is independent.

The subject matter of psychology in the narrower sense is spirit, so far as it exists theoretically as intelligence, and practically as will and as morality. Through conduct intelligence reaches the knowledge that a rational purpose realises itself in the world, and morality, *i.e.*, will, is formed, which has as its end the universal content of reason.

FRIEDRICH HERBART (1776-1841)

Herbart's books appeared between 1816 and 1824, when psychological studies were under the dominion of the "faculty" theory. Herbart was praised for having resisted this tendency towards a species of mechanical science of the mind, for not having gone into the question of the connection between mind and organism, and for having limited his method solely to inner tuition and to the subjective analysis of the mental elements. He was strenuously opposed to an artificial division and subdivision of consciousness into faculties, but **his criticism applied much less to Gall than to the disciples of Wolff and Kant,** who believed these faculties to be innate forces or energies, which necessarily produce corresponding mental acts, in the same way that physical forces produce certain given effects. In Herbart's opinion, these mental forces or faculties are in reality no more than "possibilities," which add nothing to the facts of the inner experience, and their effects are by no means

so certain as the effects due to physical forces. **He condemned Gall for having had no notion of the complexity of the mental processes and no comprehension of the extraordinary complexity of the cerebral processes.** (!) He argued that if we once admit different faculties, there is no stopping anywhere; every distinguishable mode of mental process may be ascribed to a separate faculty: colour-perception and piano-playing no less than feeling and will. The theory of faculties is a fiction as void of sense as the *horror vacui* of the old physicists. There exists neither feeling nor knowledge nor willing; but only feelings, facts of knowledge, and acts of willing—a statement with which Gall would have quite agreed. Herbart had no objection to raise against the use of the concept of force; but he made a distinction between force and faculty. We assume the action of a force in all cases where we have learned to look upon a result as inevitable under given conditions. We speak of a faculty, when the result may just as well not occur as occur.

Herbart's **criticism of Gall** is based on a misconception of his terms. Gall endeavoured to analyse mental capacities and human conduct. He did not pretend to have succeeded—his elements, he says, may be found to be complexes—but he calls these presumable elements "soul-activities," and that they are. The terms "powers," "faculties," etc., are used only (as by myself) to avoid repetition, but not in the sense that Kant and Wolff used them.

In Herbart's opinion the basis of psychology is to be found in metaphysics. The soul, like the whole universe, is a compound of units; and the mental life consists in the conflict and also in the harmony of these units. Mental processes must be considered as unitary processes, and to satisfy this unity Herbart raised one of the products of current psychological abstraction above all the rest. He regarded the **idea** as the real and only content of the mind. Nay, he went so far as to declare that the idea, when once it has arisen, is imperishable, while all the other elements of mind—feelings, emotions, desires and impulses—are merely the resultants of the momentary interactions of ideas. All ideas possess an inherent activity, in virtue of which they further and check one another. Ideas are real forces, no particle of whose energy is ever lost. If ideas happen to be opposed, they are said to suffer arrest, *i.e.*, they severally lose a portion of their original intensity, one or all ideas being driven below the threshold of consciousness,

Will is the consciousness of the dynamic side of the play of ideas—the tension of the idea towards clear presentation, its reaction against inhibition. When such tension exists below the "threshold" of consciousness, there is "impulse"; when the idea is consciously inhibited, there is "desire"; when it is released by the idea of the end of satisfaction, desire passes into "volition." **Feeling** is the consciousness of the resulting conditions—of success, failure, equilibrium, compromise or balance—in this continuous rivalry of ideas. **Consciousness** is the mere theatre of the mechanical play of presentations.

The influence of Herbart's psychology was very great indeed, especially in educational applications. He was opposed to the doctrine of the "drawing out" and cultivating of innate "faculties" of observation, memory, reasoning, and imagination, apart from the presentations which alone give significance to them, and held that by means of ideas every normal child can be educated into a moral and capable citizen. Now, such "faculties," as has been shown by Gall, do not exist—they are general properties—but the importance of "guiding ideas" must be admitted (see Chapters on "Education" and "Suggestion"). Herbart dealt with the intellect alone and left the elements of inherited instinct—the propensities—out of consideration. It will be shown in the chapters mentioned that the fundamental intellectual powers (the different elementary capacities) do require drawing out, otherwise they remain latent; but the emotions and propensities require proper direction only, for they are active before experience has been gained.

Herbart is esteemed, too, for his "Folk Psychology" ("Völker Psychologie"),

which owes its origin in a great measure to his followers: THEODOR WAITZ (1821-1864), of Marburg, who wrote "Anthropologie der Naturvölker" (1860), and MORIZ LAZARUS (1824-1903), who published "Das Leben der Seele" (1856), and, with H. STEINTHAL, the "Zeitschrift für Völkerpsychologie."

F. E. BENEKE (1798-1854),

author of "Psychologische Skizzen" (1825-7) and "Lehrbuch der Psychologie als Naturwissenschaft" (1833), although working in opposition to Hegel, **helped, too, to overthrow the common faculty psychology.** He continued to hold the conception of the soul as the ground of mental life; but he, too, contributed to bring about the predominance of the "psychology without a soul," by affirming the validity of purely physiological and anatomical explanations of mental disorders, and by his sympathetic presentment of Spinoza's doctrine of the relation of mind to matter. He conceived of psychology as a natural science and introduced into the study of the inner life the physical method. **He was the purest representative of the psychology of the "inner sense."** He maintained that an idea is accompanied by a feeling-tone and contains a striving; and, furthermore, that uninterrupted relations, in the way of laws, exist between conscious processes of all kinds. Feeling, will, and ideation are going on together at every moment. Mind is essentially a flux and transformation.

Beneke designated as the principal step in the progress of scientific psychology **the banishment of "innate ideas" and of innate, abstract "faculties of the soul."** Yet he admitted fundamental processes as primary faculties (Urvermögen), which are set in play by outer stimuli. A special "aptitude" (virtually faculty) is required for every sensation and its persistence; new faculties must therefore, by means of the innermost life of the soul, be continually formed and adapted to the processes already present. But just as, on the one hand, they emerge as strivings from the depth of the soul, on the other hand they are dependent on nourishment and stimulus from without. It is characteristic of the faculties that they persist outside consciousness as "traces or dispositions." Instead of the hitherto acknowledged faculties (such as understanding, judgment, etc., which have been falsely assumed as primitive, but which are in reality only hypostatised class-conceptions of very complicated phenomena), we must seek to determine which are the truly elementary faculties. This, as we have seen, was **exactly the view of Gall,** and the task he set himself. According to Beneke, power or faculty is the operative factor in any process. The faculties are not mere possibilities, but possess within the soul the same degree of reality which the developments, rendered possible by them, have as conscious phenomena. The faculties are the elements of the substance of the soul itself; they are not inherent in a substratum distinct from themselves. A thing is only the sum of its own combined forces. The immediate scientific problem is to analyse the results of direct consciousness into their simple elements, *i.e.*, to reduce them to a number of fundamental processes or laws. When these are known, we can proceed from them to the powers or faculties in question.

Beneke recognised four fundamental processes, and in view of their nature defined the soul as "a perfectly immaterial being, consisting of certain fundamental systems of forces, which not only in themselves, but also in combination with each other, are most intimately one, or constitute one being." The human soul differs from the soul of the brute by its spiritual character, which is founded in the higher energy of its elementary faculties.

Beneke's psychology was spiritualistic. Introspection, in his opinion, is the only possible method, because of the inner sense being so much sharper and more exact than the external sense. Idealistic philosophy and metaphysics ceased to be of influence in Germany after 1840.

GERMAN MATERIALISM

After Gall, speculative philosophy receded into the background. Science and invention, and their results, occupied mankind. The application of steam and electricity, and consequently technology and industry, made rapid progress and wealth increased. These factors also helped to make men more practical in their views, if not actually materialistic. Metaphysics ceased to interest men outside the circle of University professors, whose business it is to lecture on the subject. Introspection was no longer sufficient; the philosopher must have studied the sciences, or, at all events, be an observer of men. Philosophy must take the whole of experience for its contents. It must not isolate itself from practical life, nor refuse the findings of scientific discovery. Again, it was recognised that **psychology was incomplete without a study of the functions of the brain and nervous system.** All these changes proceeded gradually.

The impetus that was given through Gall to brain research caused a strong materialistic tendency. We have seen how Engledue broke up the Phrenological Society of London by his extreme views, in 1842; but it was in Germany that materialism took the deepest root. To a large extent, this was merely a revival of the materialism which prevailed in France at the end of the XVIIIth century, when GEORGE CABANIS (1757-1808) taught that "the brain secretes thought as the liver secretes bile." Exactly the same was said by **CARL VOGT** (1817-1895), professor in Jena, when he had his dispute with RUDOLF WAGNER (1805-1864), of Göttingen, in "Menschenschöpfung und Seelensubstanz" (1854), and in his famous work, "Köhlerglaube und Wissenschaft" (1854). He wrote: "Physiology is categorically opposed to an individual immortality, and, in general, to all the hypotheses referring to the existence of a distinct soul. Spiritual activities are merely the functions of the brain, that is, of a material substance." Vogt's book had an enormous circulation. Another work on these lines was by **LUDWIG FEUERBACH** (1804-1872), a positivist.

ROBERT MAYER (1814-1878), having expounded the famous theory of the conservation of matter and energy, in 1845—a theory confirmed in 1847 by J. P. JOULE (1818-1889) and HERMANN v. HELMHOLTZ (1821-1894)—gave a further stimulus to the materialistic hypothesis. A work that went through innumerable editions was "Kraft und Stoff" (1855), by **LUDWIG BÜCHNER** (1824-1899), professor at Darmstadt. Another materialist of fame of that period was **JAC. MOLESCHOTT** (1822-1893), a Dutchman, professor at Turin and afterwards at Rome, who, in his "Kreislauf des Lebens" (1852), set out from sensationalism, whence he deduced a materialistic theory. Matter, according to him, is inseparably united to force. Both are eternal, and there is a perpetual exchange or circulation of force and matter. "Thought is to the brain what bile is to the liver, or urine to the kidneys." Moleschott, as a proof that consciousness is only in the brain, alleged the well-known observation of A. J. JOBERT DE LAMBALLE (1799-1867), according to which a girl injured at the top of the spinal cord remained conscious for half an hour, although the whole body, with the exception of the head, was completely paralysed. "Thus the whole spine may become inactive without the consciousness being affected." RUDOLF VIRCHOW (1821-1902), and ERNST HEINRICH HÄCKEL (1834-1919), the celebrated naturalist, might be included in that circle.

The materialists considered the mental phenomena as one of the aspects, or functions, of matter, which alone is real. To this they added the notion of the continuity and continual transformation of matter and energy, with which they thought to explain the production of mental phenomena. Owing to the enthusiasm which recent scientific discoveries had awakened, the natural sciences were looked

to for the solution of every problem, physical or moral; and for some time moral and philosophical science did little more than strive to appreciate and adapt to their own uses the laws of the natural sciences. In affirming, as they did, that thought is merely a product of the brain, they practically denied the existence of psychology. They exercised, however, an indirect influence through their demolition of obsolete spiritualistic ideas and their demonstration of a connection between cerebral and mental processes. As investigation proceeded, so more and more phenomena, which had formerly been ascribed to spiritual action, were explained in mechanical terms; but the materialists ousted the spiritual agency altogether, and accounted for everything, even for human conduct—nay, even for the totality of the human mind—as matter or as mechanism. The moment this conclusion is reached, the majority of mankind rightly revolts against it.

This was the period of the godless and the pessimists. Listen to SCHOPENHAUER (1788-1860) in his discourse upon the vanity and sufferings of life. We shall deal with him presently. Faith in God was greatly diminished. True, He was still upheld and believed in; He was admitted as the Creator of the world, and the laws which govern the world were still regarded as divine laws; but it was assumed that, having created these laws, He ceased to control its destinies by the exercise of autocratic power. This belief allowed scientists to prosecute their researches undisturbed by fears of incurring odium, and it enabled those among the educated classes, who were inclined to lend a friendly ear to science, to read learned works with a clear conscience. It will be noticed also in English scientific textbooks that God was frequently referred to at the beginning of the XIXth century, but gradually less and less, until about 1850 He ceased to be mentioned.

For example, Sir CHARLES LYELL (1797-1875), in the early editions of his "Elements of Geology" (1830), praised the glory of the Creator, words which he expunged in the later editions. It was no longer the fashion to speak of God, such mention was deemed unscientific. Science became indifferent to problems that cannot be solved by the aid of instruments and calculations, and ignored religion. More and more distinctly did she consider herself as resting on objective experiment entirely, and as having no other object than the discovery of the immanent connections of phenomena. As Prof. ÉMILE BOUTROUX put it: "In entering his laboratory, the scientist left his convictions at the door, though he might take them up again on leaving."

But the world without faith in God seemed strange and cold. Men were unused to such conditions. They had become adapted to another environment, where prayers, hopes of after-life, and fear of punishment after death had reigned almost as fixed ideas. Responsibility had been laid on the shoulders of a divinity for centuries; it now seemed to lie very heavily upon the shoulders of men. And, having relinquished all past interpretations of what people call "The First Cause," they began to ask themselves: What is the world? What is its object? What are we all driving at? If there be no God, no Heaven to go to, no Hell to which we may relegate our enemies—what, indeed, is the purpose of existence? The thinking world, the world that looks for an object in existence, and will have an ideal after which it may strive—this world was in despair. The rise of pessimism was inevitable.

ARTHUR SCHOPENHAUER (1788-1860)

Greatly admiring Kant, and adopting many of his first principles, Arthur Schopenhauer, as a young man of twenty-six years of age, deeply versed in the lore of Hindu antiquity, took up Kant's doctrine of the relativity of our knowledge. He developed it in his principal work, "Die Welt as Wille und Vorstellung" (1819), by

attempting to show that—although the world is only our notion, our idea—if we regard another aspect of it we can actually arrive at a knowledge of things in themselves, we can learn the inner nature of external objects.

In what concerns our perception of the outside world, he adopted Kant's view, that we are totally unable to derive from our mental representation of it any knowledge whatever as it really is. The inner nature of external objects, in the process of imaging them in our minds, completely eludes our perceptive powers. It must be clear to every one, said Schopenhauer, "that what he knows is not a sun or an earth, but only an eye that sees a sun, and a hand that feels an earth; and that the world which surrounds him is there only as idea, *i,e,*, only in relation to something else, the consciousness which is himself. . . . The consciousness of everyone is in general opposed to the explanation of objects as mere ideas. The objective world, the world as idea, is not the only side of the world, but merely its outward side; and it has an entirely different side—the side of its inmost nature—its kernel—the thing-in-itself."

How can we discover what this kernel, this thing-in-itself is? We have seen that we cannot arrive at this real nature of things from without. But, said Schopenhauer, we are objects in nature, we are things among things, and of ourselves we have a special, second view which we cannot have of other things. Besides being an object of perception, the body of each individual is known to him in its inner nature; he knows its kernel immediately; and what is this kernel, which each can immediately perceive in himself? Is it not that which we call mind or spirit—that embodiment of feeling, volition, and intellect, which some call soul?

This soul, ego, or first principle, Schopenhauer resolved into two factors—will and intellect; but of the latter he made small account, regarding it merely as a cerebral phenomenon, dependent upon the organism, a function of the body. What is most essential in man is not the intellect, but **the will,** by which he means that mass of impulses which have their origin in our moral and physiological nature and over which reason exercises no power. The intellect has no other function than that of illuminating the will, so that man may know his own self, though without any possibility of modifying his inner essence. Though not a materialist, he placed the seat of human will in physiological temperament and considered presentation a product of the brain.

If we wish to find out what is in ourselves which best expresses our inmost being, and which differentiates us from other human beings, we are obliged to recognise that it is not our intellect: because not only is this common in different degrees to all men, but it is without power to regulate our moral conduct. For it is a fact that we never really conform our actions to our ideas. We may have the noblest moral principles regarding truth, justice, and humanity, and yet act entirely at variance with them. That which determines our actions, rules our whole life, and represents consequently better than any other mental activity our personality, is what we call our "character." When the latter coincides with our ideas, the mental life is harmonious, and we have the illusion that it is they which regulate our actions, whereas we are really only obeying our own nature. And of this we have an evident proof when there arises a discrepancy between our ideas and our character, for in that case it is always the character which conquers. The intelligence is consequently a superadded element, an "epiphenomenon," and the real basis of our nature is the "will," which has its root in our innate instincts and organic tendencies.

According to Schopenhauer, man's innermost nature, constituted by innate, deeply-rooted instincts, is not susceptible of change, in spite of the continual progress of his intelligence; for the latter has a purely cognitive mission, and does not influence the original character of the individual. The mind may consequently

be endowed with acumen and culture, it may perceive what is wrong and disapprove of it; but if the character of the individual is inclined to wrong-doing, the intelligence cannot prevent or even correct his reprehensible inclinations. Well-doing and wrong-doing do not therefore depend upon the intellect, but on the character, on the "will."

This is not the case. Character, though possessing a substratum of hereditary instincts and aptitudes, which we shall show in due course are merely "possibilities," is nevertheless in a state of continual formation, and therefore susceptible to the influences and circumstances of the external world and of intellectual culture. In order to have a real, conscious morality, the mind must be free and aspire towards high ideals, and nothing favours such a state so much as intellectual culture. Of course, learning alone does not improve morality, and it is possible to have high ideals without culture.

It used to be customary to allot intellect the first place in a classification of our mental phenomena; but Schopenhauer denied its primitive importance.

Again and again he told us, "the intellect, like the claws and teeth, is nothing else than a weapon in the service of the will," it is "the lantern of the will," or "an assistant organ of the will." In every blind force of nature Schopenhauer saw a factor that cannot be accounted for by an appeal to intellect; in the early actions of animals, as also in all functions of our body which are not guided by knowledge, a power is at work which has nothing in common with the understanding or with reason. Every feeling we have involves an action of our will; for, if it be agreeable, we will have that which awakens it in us; whereas, if it be disagreeable, we will not have it active under any circumstances. Willing and feeling—how can they be thought of apart? From the very dawn of our lives, they, as one phenomenon, infallibly guide us to perform life-preserving actions without the very slightest assistance from the intellect, which can only act upon acquired knowledge. We may take it, therefore, that our inner life consists of these two sharply defined mental attributes: the intellect with its derivatives—understanding, reasoning, and thought—and the will, which, as we have seen, covers feeling.

The will is more important than the intellect, for the intellect is an instrument, a mere means in the service of the will. We desire, we want, we will have something, and our intellect is employed, that this desiring, this wanting, this willing, may be stilled. Our passions, our love, hate, and physical appetites, are matters of feeling and will; and we certainly do make our intellect work, in order to find the means of administering to them. But *they* are the primitive force; intellect is but their intermediary. It is a common illusion to believe that our actions follow as consequences of our ideas; on the contrary, they cannot be guided by any law, but solely by the will, which resides in our inmost nature and eludes all determination.

The will, which is "the innermost kernel of our nature," is not in truth individual: it is merely a manifestation of the one universal will. Hence the study of psychology is vain, because there is no "psyche"; there is nothing but will and phenomena. Not less vain, according to Schopenhauer, is any notion of free-will in man. **He was a strict necessarian.** Our character—our "intelligible" character, as he termed it to distinguish it from our "empirical" character—is born with us and is absolutely subject to the law of cause and effect which reigns in the phenomenal world. As logical necessity presides over the sequence of ideas, and physical necessity over the succession of phenomena, and geometrical necessity over the relations of space, so moral necessity rules in the actions and motives of men. This theory makes an end of conscience, which he thought might be resolved into five elements: fear of man, superstition, prejudice, vanity, and custom; also, of course, it overthrows the old bases of moral obligation. Virtue, he taught, consists in universal sympathy, grounded on the fact that the whole universe, sentient and non-sentient, is simply a manifestation of the one will, and therefore is identical with ourselves.

It is therefore merely a form of self-love, and to show kindness to any man or thing is to show kindness to that which we ourselves are. "Tears," he said in one place, "spring from self-pity." Theism, he held, is a tradition of the nursery; pantheism is an invention of the professors and fatal to the personality of man.

The one reality is will, manifesting itself in the phenomenal world as the will-to-live (self-preservation). This is not a rational desire, but a blind instinct, altogether foolish and irrational. We are the sport of that dark and mysterious power—will, which is perpetually rushing into life, whether conscious or unconscious. Everywhere among creatures that are driven by this blind will there is warfare, oppression, suffocation, maiming, torture, misery.

"Everywhere in nature we see strife, conflict, and alternation of victory. This universal conflict becomes most distinctly visible in the animal kingdom, for each animal can only maintain its existence by the constant destruction of some other. Thus the will to live everywhere preys upon itself, and in different forms is its own nourishment; till, finally, the human race, because it subdues all the others, regards Nature as a manufactory for its use. . . . But an optimist bids me open my eyes and look at the world, how beautiful it is in the sunshine, with its mountains and valleys, streams, plants, animals, etc., etc. . . . Is the world then a raree show? These things are certainly beautiful *to look at*, but to *be* them is something quite different. . . . Whatever one may say, the happiest moment of the happy man is the moment of his falling asleep, and the unhappiest moment of the unhappy is that of his waking. . . . And to this world, to this scene of tormented and agonised beings, who can only continue to exist by devouring each other; in which, therefore, every ravenous beast is the living grave of thousands of others, and its self-maintenance is a chain of painful deaths; and in which the capacity for feeling pain increases with knowledge, and therefore reaches its highest degree in man, a degree which is the higher the more intelligent the man is; to this world it has been sought to apply the system of optimism, and demonstrate to us that it is the best of all possible worlds! The absurdity is glaring!"

Schopenhauer turned in horror from the world he thus depicted. The sufferings of existence choked him; in the voice of Nature he heard but an exasperated groan, in her smiles he read deception.

He maintained that existence is in itself, and essentially, an evil; because for every sentient being to live is to will, and to will is to strive, and to strive is to suffer.

"Man's capacity for pain increases far more with the passage of time than does his capacity for enjoyment, and is especially increased by his foreknowledge of death. Animals only fear death from instinct, without having any real knowledge of it, and without having the prospect of it always before their eyes, as is the case with human beings. . . . Life, so far from being a state of enjoyment, is always and necessarily one of suffering, and the deepest cause of this suffering lies in the will itself. . . . Our nature is a perpetual striving, and may be compared in every respect with an insatiable thirst. . . . It is a struggle for existence, with the certainty of being vanquished."

Nor is there any exception to this rule. It presses upon animals as upon men, and upon wise men as upon the ignorant and foolish, but ever with the more terrible severity the higher we ascend in the scale of being. For increased intelligence merely means increased capacity for pain—the man of genius being more miserable than the fool, and the fool more miserable than the animal—while the only moments of life which deserve to be called happy, save those passed in the absolute unconsciousness of sleep, are such as are spent in the disinterested contemplation of works of art. Æsthetic enjoyment is the temporary deliverance from all which makes up the fatigue of life, its chain of vulgar realities and petty egotism. The

notion of what is called progress, the dream that man will become in some vague future wiser, gentler, better, is the master delusion of the age, for "the advance of civilisation means but the enhanced capacity of the human race for suffering."

We have seen that, to Schopenhauer, Will is the master and intellect its servant, and the elementary dispositions give the motives to action. By Will, he meant the sum of the innate dispositions, which is physiologically fixed, yet not in the brain, for "injuries to the head with loss of brain substance," he said, "are as a rule very detrimental to the intellect—they are followed by total or partial idiocy, loss of speech, temporarily or permanently, and so on; whereas **we never read that after an accident of this nature the character has undergone a change,** that the man has become morally better or worse, that he had lost particular propensities or passions, or gained any; no, never!" This, of course, is quite wrong. Schopenhauer simply placed reliance on the statement by JOHANNES MÜLLER (see p. 365), a great authority on physiology, but in this instance absolutely in error. Schopenhauer pronounced therefore against Gall's doctrine, though much that he wrote on the relative value of the intellect and the character dispositions was very much on the lines of Gall.

Neither Herbart nor Schopenhauer met with much success in their day, owing to the predominance of the absolute idealism of Hegel; but, although their efforts at founding a metaphysical science based on psychological observation were doomed to failure, they exercised no little influence on the philosophers and psychologists who came after them.

C. R. E. v. HARTMANN (1842-1906),

in his chief work, "Philosophy of the Unconscious" (1869), **followed Schopenhauer's pessimistic views.** In his extravagant estimate of the misery of the world, Hartmann came very near to the standard set by his predecessor. He affirmed that in all relations the sum of pain greatly exceeds that of pleasure.

Hartmann held with Schopenhauer that pleasure in the main is but the absence of suffering. As proof of the negativity of pleasure, he bid us take any acute pain—neuritis, headache, hunger, thirst; when relieved from these we at first feel pleasure. As soon as the pain is forgotten the pleasure passes into indifference. We have no positive pleasure in the air we breathe any more than from habitual health. Deprived of either we suffer. In all cases the suffering incomparably outweighs the enjoyment. A healthy child is overflowing with boisterous activity and apparent happiness, yet the child is never conscious of that state as happiness. Take away its toy and it screams.

The advance of civilisation tends to increase the amount of pain, and improvement in material conditions is no source of happiness. Civilised people are more wretched than those in a state of nature; the poor, the low, and the rude are happier than the rich, the aristocratic, and the cultivated. Stupidity is a much better title to happiness than cleverness. The design of the increasing sum of misery is to educate the intelligence of men and to discipline their feeling up to the point of choosing in common the one means of escape, the cessation of conscious individual existence. It is futile to pursue happiness. When men fail in life in obtaining happiness, they base their faith on, and console themselves with, the happiness in life after death. Immortality is a delusion. The most primitive and the uneducated people are the happiest. Education increases discontent. The progress of science contributes little or nothing to the absolute happiness of the world.

Being and being conscious are not the same, according to Hartmann. There is an unconscious being, which an explanatory science must take into account. The

causes of the appearance of consciousness and the laws of the change of its contents rest in the unconscious, especially in the physiological unconscious—which is located in the nervous system in the form of irritability or purposive reflex action and in the absolute unconscious. The latter is at once vital principle and soul, and, as immaterial activity, lies at the basis of both corporeal and mental phenomena.

Instinct is "purposive action without consciousness of the purpose," and it is "conscious willing of the means to an unconsciously willed end." We may explain it "as a mere consequence of corporeal organisation," or as "a cerebral or mental mechanism," or as "a result of unconscious mental activity." The first two views are inadequate, and incapable of accounting for the facts. Instinct must be regarded as conscious willing, as volition, not as unconscious willing, conditioned by an unconscious purpose, and not as a mere unconscious mechanism. But conscious willing cannot itself explain instinct. Instinct must also involve "unconscious ideation and volition," an unconscious purpose, because nothing else will explain the connection between the sensuous presentation as motive and the "conscious will to some particular action." Putting it briefly, instinct is not the result of conscious reflection, nor of corporeal, cerebral, or mental mechanisms, but of the conscious activity of the individual, "springing from his inmost nature and character." The end, towards which the activity is directed, is not conceived by an external mind, a Providence, but "unconsciously willed and imagined" by the individual, and the suitable means unconsciously chosen. The knowledge involved in this unconscious cognition, which is frequently such as could not be obtained from sense perception, is of the nature of "clairvoyance," and manifests itself as "clairvoyant intuition." Clairvoyance may occur apart from instinct. They are two distinct facts. But clairvoyance alone will explain the nature of instinct-knowledge. This clairvoyant intuition is "the characteristic attribute of the unconscious."

It is necessary that the instinctive action itself should be vividly realised in consciousness, in order that the necessary accuracy of execution should be secured, but it is the execution only that is conscious.

There are two main ends which instincts subserve: preservation of the self and preservation of the race. But there is a third end: "the perfection and the enoblement of the species." The progress of the human race, individual, social, and national, the appreciation of the beautiful, the development of science and philosophy, the satisfaction of the deeper spiritual needs of the heart, all derive their driving force, their interest and will, from the Will and Idea of the Unconscious.

Hartmann, unlike Schopenhauer, **acknowledged Gall's doctrine,** from which he borrowed some notions of instinct and such distinctions as "potentia" and "libido" sexualis, and analysed the mental powers, like Gall, on Natural History lines. His work is a valuable contribution to the Science of Character.

FRIEDRICH NIETZSCHE (1844-1900)

For Nietzsche, as for Schopenhauer, "God is dead," but Nietzsche was no pessimist. Happiness, roughly speaking, means that state to which we have attained when we perform those actions which we are best apt to perform. It means that state to which an organism arrives when it is in complete harmony with its environment. But an environment may be unworthy of adapting one's self to it. Like Schopenhauer, Nietzsche regarded blind Will as the motive force of the universe; but he did not think this will is a will to live, but **a will to power.** The struggle for existence is changed to the struggle for power. It is our needs that interpret the world, our instincts and their impulses for and against. Every instinct is a sort of thirst for power; each has its point of view, which it would fain impose upon all the other instincts as their norm. Even in our very bodies there is a fight for power between the cells and the tissues.

Nietzsche, like Lamarck, believed in adaptation to the environment and the inheritance of acquired characters. Like Spencer, he based his sociology and ethics on biology, insisted upon the elimination of the weak and degenerate. Gradually the idea of environmental influence weakened, and the "Will to Power" was then considered by him to be the chief evolutionary factor. He distinguished between "masters and slaves" according to the different quanta of energy in different men. Not the competitive fight, the struggle for existence, but the struggle for might. He considered war and struggle as a biological and social necessity.

Man is not only striving to survive but he strives for power, for supremacy—one individual over another, one tribe over another, one nation over another—hence there is no peace either between individuals or nations. (Nietzsche inveighed against nationalism and was in favour of a United States of Europe.) The two forces to that end are aggression and dissimulation. Those animals are doomed to become extinct that cannot select the order of conduct which is best calculated to make them overcome, either numerically, strategically, or by sheer physical strength, the will to power of other species. The animal world, therefore, is the scene of an uninterrupted war.

A living thing seeks above all to discharge its strength. It is a natural function of the strong to discharge their energy. They thirst for enemies, resistance, triumphs. The superfluity of their energy is the pressure in them which accounts for their acts of destruction for destruction sake; it is the motive force which explains their will to overpower, to create or destroy above their immediate needs, to fight, kill, and altogether to seek danger. This natural function of the strong was perforce regarded as "good" by those possessed of such energy. The wolf says, "Eating lamb is good"; the lamb says, "Eating lamb is evil."

As Plato has pointed out in the "Republic," so Nietzsche explained how morality is imposed on the weak by the strong in the interest of the rulers. The conqueror forces the conquered to serve him; that is considered by the latter as "oppression" or "atrocity." Accordingly there is a **master morality** and a **slave morality.** The man with power calls it wicked to deprive him of it. He teaches goodness; he moralises. The slave holds that to be good which alleviates the state of suffering. Pity, patience, humility, industry, benevolence, excite his approval and admiration. Of course, the two classes are not always so distinct; they shade imperceptibly one into the other.

Not only the actually powerful, but also the impotent, the oppressed, the ill-constituted, the defeated, will struggle for power. Life means struggle, battle, war. Those who do not want to fight will shout for peace, love of one's neighbour, love of one's enemy.

Christianity is the religion of pity. "The most general effect, the most complete transformation that Christianity has produced in Europe, is perhaps the fact that the man who performs social, sympathetic, disinterested, and benevolent actions is now considered as *the* moral man. Christianity itself, when flourishing, was thoroughly selfish, for the Christian cared really but for the one thing needful, the absolute importance of eternal and *personal* salvation. Now, when Christian dogmas are slowly receding, when people become gradually separated from these dogmas, they seek the more some justification for this separation in a cult of the love of humanity. In the hands of the strong 'religion is an additional means of overcoming resistance in the exercise of authority."

"There are **no moral phenomena,** there is merely a moral interpretation of phenomena." Morals depend on the geographical and historical conditions of the people. Every conception changes with time. Much that passed for good with one people was regarded with scorn and contempt by another. **To be moral means to be obedient to an old-established law and custom.** The motives of this morality are fear of loss and injury, and hope of usefulness and advantage.

"Man does not seek **happiness** and does not avoid unhappiness. Pleasure and pain are mere results, mere accompanying phenomena; that which every man, which every tiny particle of living organism, will have, is an increase in power. In striving after this, pleasure and pain are encountered." Evolution does not make happiness its goal; it aims merely at evolution and nothing else. "Good" is all that enhances the feeling of power, the will to power, and power itself in man. Evil is all that proceeds from weakness, envy, and revenge. **Self-discipline** is the thing on which Nietzsche insisted most, and obedience and fidelity next. Morality is self-control and self-conquest.

Morality is the herd instinct in the individual. Fear is the mother of morals. Everything that elevates the individual above the herd, and is a source of fear to the neighbour, is henceforth called evil; the tolerant, unassuming, self-adapting, self-equalising disposition, the mediocrity of desires attains the moral distinction and honour. The masses are to be harmless, good-natured, and easily gulled. **The most virtuous man is the tamest man,** because he would be the least likely person to ruffle other people's feelings, or to make ripples upon the calm waters of peace and comfort. Conformity with a given harmless, domesticated type, uniformity of manners, views, and few desires, these are the qualities most appreciated in men.

Compulsion precedes morality; indeed, morality itself is compulsion for a time, to which one submits for the avoidance of pain. Later on it becomes custom, later still free obedience, and finally almost instinct; then, like everything long-accustomed and natural, it is connected with pleasure—and is henceforth called **virtue.** Since, however, no one is really responsible for his action, the concept of free-will being a happy delusion, remorse is cowardice. Formerly people argued: conscience condemns this action, therefore this action is reprehensible. But, as a matter of fact, conscience condemns an action because that action has been condemned by custom for a long period of time. All conscience does is to imitate; it does not create values. That which first led to the condemnation of certain actions was not conscience, but the knowledge of or the prejudice against their consequences.

Our actions follow in a continuous stream, there is no intervening vacuum. Their sources are hidden away in the dim past (heredity) and the mystery of the present (environment). Now, the belief in **free-will** is "incompatible with the idea of a continuous, uniform, undivided, indivisible flow." This belief presupposes that every single action is isolated and indivisible. "It is the extravagant pride of man, this desire for freedom of the will, this desire to bear the entire and ultimate responsibility for one's actions oneself and to absolve God, the world, ancestors, chance, and society therefrom. . . . No one is responsible for the fact that he exists at all, that he is constituted as he is, and that he happens to be in certain circumstances and in a particular environment."

Nobody is responsible for his actions, nobody for his nature. To judge is identical with being unjust. This also applies when an individual judges himself. "We do not complain of nature as immoral because it sends a thunderstorm and makes us wet—why do we call those who injure us immoral? Because in the latter case we take for granted a free-will functioning voluntarily; in the former we see necessity. But this distinction is an error." All systems of morals allow intentional injury in the case of necessity—that is, when it is a matter of self-preservation. Yet the insect and criminal do that which seems to them good (useful) according to the degree of their intellect.

Nietzsche was the first modern philosopher to advocate eugenics. The law that the fittest survive in a given environment does not by any means imply that the stronger or the better will survive. It is the survival of those who are constitutionally fittest to thrive under the conditions in which they are placed; and very often that which, humanly speaking, is inferiority, causes the survival.

Nietzsche advocated the elimination of the unfit and prohibition of offspring to certain people. He believed the worst impediment to elimination was and still is the Christian Church, because the latter protects and preserves the unfit and weak. What the species requires is the suppression of the physiologically botched, the weak, and the degenerate ; they ought to be helped to perish, but it was precisely to these people that Christianity appealed as a preservative force. A man should not marry unless he is sound, of good ancestry, and entitled to desire a child. Nietzsche would improve the race by a eugenic marriage system, so that gradually an aristocracy, strong in body and mind, and from it a new race of " higher men," and from these higher men a new species of **" supermen,"** would evolve.

HERMANN LOTZE (1817-1881),

successor to Herbart in the University of Göttingen, a disciple of E. H. Weber (1795-1878), was a thoroughgoing modern **defender of animism.**

When Lotze published his principal psychological work, " Medizinische Psychologie oder Physiologie der Seele," 1852, a great change had taken place in scientific ideas, owing to the progress of the physical, chemical, and biological sciences, culminating in the discovery of the conservation of matter and energy. This progress affected physiology. The metaphysical explanation, according to which organic phenomena were supposed to be derived from an imaginary vital principle, was not discarded in favour of the explanation common to all physical phenomena, viz., that organic and vital phenomena, like all other phenomena of the external world, are the result of physical causes. This principle was, however, much disputed, and is still rejected by some.

Trained in the medical sciences, and a master of the physiology of his time, one of the first efforts of Lotze was an **attack on vitalism.** He exhibited the futility of the formless notion of the vital force, and conceiving the mechanical principles in a very broad spirit, he attempted to show the adequacy of these principles to the explanation of all the facts of biology. But in his chief works he defended in the most thorough and searching manner the notion of psycho-physical interaction and the conception of the soul as a being distinct from the body. **Lotze was a dualist :** the mental and the somatic (physiological) processes were two different events, but running concurrently.

Lotze represented the unusual spectacle of a thinker who is at once thoroughly imbued with the spirit of empirical science, and yet in earnest with metaphysics or ontology. He had no doubt about the existence of the **soul-entity,** and, while prepared to welcome all the results of physiological research and pathological evidence, was firmly convinced that no extension of natural knowledge can dispense with the admission of spiritual activity over and above all mechanical and biological forces. The difficulty which seems to have impelled him to, and maintained him in, this position would appear to be the unity of self-consciousness. Among other things this ultimate unity renders, in his view, all attempts to derive extension, or the most general property of the object-world, from experimental data, futile. In experience representations possess only intensiveness—space is a mental construction, occasioned by, but not generated from, phenomena of sense, whether motor or sensory.

Lotze, in his capacity of psychologist, philosopher, and physiologist, first reopened the question of the relations of mind and body, placing himself at the modern standpoint in accordance with recent scientific discoveries. His philosophic principles were, however, entirely spiritualistic. In his opinion, we can only obtain an exact knowledge of internal phenomena because we have a direct perception of them ; whereas of external phenomena, which are apprehended indirectly, we can but have an imperfect notion. He thus rejected Descartes' dualism, which gives to spirit and matter an equal value. On the other hand, he stoutly maintained the

principle of the mechanical causality of biological phenomena, although he refused to admit that the physical energy which is spent in physiological processes is preserved as such. In his opinion, this energy, although remaining intact as to quantity, can be transformed into a force of a different kind—namely, psychical energy. The point at which this transformation takes place he held to be the seat of the soul, herein approaching very near to Cartesian theories of the reciprocal influence of mind and body.

Lotze designated the fibreless parenchyma of the brain as the probable **seat of the soul,** since the existence of a common point for all nerve fibres cannot be demonstrated, nor is it likely, indeed, that the separate excitations of the soul are conveyed to it in a condition of entire isolation.

His opinion of the old **faculty psychology** was that it was inadequate; but he thought that we were compelled, without detriment to the supposition of the soul's inexplicable unity, to assume as many separate faculties as there are irreducible groups left by our study. Such ultimate groups of inner life are presentation, feeling, and will.

FRANZ BRENTANO (1838-1902)

held that the only means of arriving at an exact knowledge of psychological phenomena consists in introspection, coupled with the observation of other individuals. Psychology is the science of the soul, used in the old metaphysical sense, but meaning that it is the science of everything connected with feeling, thinking, and willing. In other words, modern psychologists are no longer concerned with an inquiry as to the substance of the soul.

GUSTAV THEODOR FECHNER (1801-1887),

Professor in Leipsic University, was the author of "Psycho-Physics" (1860) and the founder of modern scientific psychology. HERMANN v. HELMHOLTZ (1821-1894), in his great works on vision and hearing, had already shown how physics mount into physiology and psychology; and after him Weber, Fechner, Lotze, and Wundt had, step by step, pushed forward the parallels of the material accompaniments of thoughts and feelings.

Whereas Lotze was practically a follower of the Cartesian dualistic principle, Fechner, on the contrary, believed in a **universal animism,** by which matter and spirit are indissolubly connected, not only in man and animals, but also in plants and the celestial bodies. The difference between the external and internal worlds, he taught, depended rather on a different point of view than on substantial difference between the two.

Fechner received from his master, E. H. WEBER (1795-1878)—"Der Tastsinn und das Gemeingefühl" (1849)—the idea of a constant relation existing between the external stimulus and the sensation. This led to his formulating the **psycho-physical law,** which he called by Weber's name, *i.e.*, the variation in the intensity of the mental state is not proportionate to the actual force of the stimulus, but to the difference between the amount of energy manifested by the corresponding material state and that existing previous to the action of the new stimulus; in fact, sensation increases as the logarithm of the stimulus. **Psycho-physics** is therefore the exact science of the connections between the functions of the body and of the soul, or, more generally, between the physical and mental worlds.

Fechner preserved the old distinction of inner and outer perception. The connection between body and mind may be direct or indirect. Sensations are in direct dependence on certain activities of the brain, of which they are the immediate

consequences ; but they depend also indirectly on the external stimuli whose action is conveyed through the nerves. The mental process being viewed as a direct emanation of the physical process, the latter may be considered the substratum or vehicle of the former ; and those physical activities which are in more direct connection with the mental activities are called psycho-physical. Psycho-physics may therefore be divided into two branches, according as it studies the indirect or the direct relations intervening between consciousness and the external world. The former, the psycho-physics of the external world, borrows its method from the science of physics ; while the latter, or psycho-physics of the inner world, presupposes a knowledge of physiology and anatomy, especially those of the nervous system, and constitutes, in other words, so-called **physiological psychology.**

WILHELM MAX WUNDT (1832-) AND EXPERIMENTAL PSYCHOLOGY

Fechner's work was carried on by Wilhelm Wundt, a pupil of Helmholtz. In 1878 he founded in Leipsic **the first laboratory of physiological psychology, or experimental psychology,** and since then, not only in Germany, but in all European and American countries, this one has served as model for numerous laboratories which have been established for the same purpose.

Not satisfied with the definition of psychology—and of psychological phenomena as compared with physical—given by his predecessors, Wundt re-examined the whole question from the beginning. He arrived at the conclusion that there is no substantial difference between psychology and the natural sciences, the external world existing only inasmuch as it is perceived by our consciousness, and consciousness existing only inasmuch as there is an object to be perceived—*i.e.*, the external world. The only difference between the physical and psychical sciences lies in the point of view from which they consider their object. Psychology studies it in connection with the direct impression it creates on our consciousness, whereas the physical sciences make abstraction of the effects produced on our consciousness and are concerned with general laws. That which appears directly to our consciousness is constituted by qualities,or values, which manifest themselves either as sensations or as feeling and will. The two latter are what lend an eminently qualitative character to the mental processes, the will being that which represents the spontaneous character of the mental life, and distinguishes it from a merely physical mechanism. As a consequence of his principle that the phenomena of consciousness and those of nature are the same thing differently considered, follows the application of physiological methods to psychology. The experimental method completes what introspection can only partly achieve, and gives a more exact basis to psychological research ; but it is by no means sufficient in itself, and **can only be applied to the simpler mental processes.** As regards the more complex ones, social psychology, or, as it is also called, the psychology of peoples or Folk-Psychology (Völker-psychologie), studies the great mental phenomena which are the outcome of man's life as a member of society. Additional help is derived from a study of child-life and animal life, and abnormal mental phenomena.

Wundt started his philosophic career as a monist, but later became a defender of the dualism of body and soul. He says : "Every psychic event has a corresponding physical change ; but the two are completely independent, and are not in any natural causal connection."

The **application of experiment to psychology,** now so general, was largely due to Wundt. These experiments may be divided into two classes : those which refer to the measurement of the sensations and to the study of perceptions, and those which aim at determining the duration of certain mental processes ; the law of the relation between sensation and stimulus. Let us see what they teach us.

There are various states of consciousness which can have an influence on the

attention and, indirectly, on the sensibility. Thus depression or agitation or physical discomfort is apt to diminish the intensity of the attention ; whilst, on the contrary, a strong interest in the work on hand and a great faith in its results render the attention keener. Expectation and habit may also modify the subjective conditions of the individual under observation. Expectation renders the sensibility more acute, for it resolves itself into a preparatory attention, which serves to strengthen the attention itself. Habit also may be a cause of error, in that the individual, after a certain number of experiments, is apt to acquire a disposition of the mind or nerves towards the reception of a determinate stimulus. In a series of sensations this disposition may easily lead to an erroneous appreciation, as some sensations may appear more and others less intense than they are in reality. Naturally this factor should be taken into account by observer and experimenter alike, and it should be reduced as much as possible to a constant value. Further disturbing causes are practice and fatigue. Practice tends to sharpen and facilitate perception ; fatigue, on the contrary, renders it slow and obtuse.

One of the most important methods of this school has been the investigation of the time relations of mental phenomena. A sensation of standard quality and intensity is selected, the moment of its appearance is expected, and its recognition is indicated by a simple muscular action to which the experimentee is well accustomed. This gives what is called the **reaction time,** which is found to vary a fraction of a second in different individuals, and in the same individual under different conditions. Since only so many separate excitations can be recognised by the experimentee in a given unit of time, the smallest interval in which he can discriminate between two successive stimuli is called the period of latency. Simple reaction time minus the period of latency is known as perception time.

Simple reaction time is found to be shortened by the intensity of the stimulus, by use and expectancy. It is delayed by fatigue, brain and mental disorders. It is markedly shortened by coffee, and would appear to be considerably delayed by alcohol, though the subject of the experiment always believes it to be hastened. But alcohol, taken slowly in small sips, appears, like coffee, to diminish reaction time.

KRÄPELIN's association experiments consist in presenting, orally or visually, words—as a rule substantives—to the test person, who must respond as quickly as possible with the first word which occurs to him.

Experiments have also been made to investigate the time taken up by the higher mental operations ; for instance, the time taken up in clear and discriminating perception, so-called discernment time. The method is to submit to the subject of the experiment opportunities for the discernment of varying sensations more or less complex and of different intensities, and to subtract from the results thus obtained the simple reaction time which is peculiar to him. Then the will time, or the time occupied in choice can be measured, if the same series of experiments be repeated, but a choice of ways of reacting be permitted, when the differences in time resulting between the two series of experiments will show the difference due to the operation of the will in choice.

Other subjects of experimental psychology are : testing tactile, visual, muscular, acoustic sensations and presentations ; tests of memory and verbal association, observations on physical and mental reactions ; the response of individuals to definite prescribed conditions ; effects of drugs ; testing of sensibility, susceptibility, and effects of fatigue and abnormal influences on the mind.

Another subject is the **measurement of emotions by the galvanometer.** Every stimulus accompanied by an emotion causes in normal people a deviation in the galvanometer, recorded upon a kymograph as a curve, the amount of such deviation —or the height of the curve—being in direct proportion to the liveliness and actuality of the emotion aroused.

In this country, Dr. **CHAS. S. MYERS,** Director of the Experimental Psychological Laboratories at Cambridge, is the most distinguished representative of experimental psychology in England. In a recent lecture on " Industrial Efficiency " he claimed that laboratory researches on mental and muscular work had shown the relation existing between rest and length of task, the importance of determining and employing the optimal load, and the various psychological factors which affect the

work curve. A study of these factors brought out the economic value of introducing scientific management and systematic rest pauses in the workshops and of selecting by appropriate tests employees fitted for tasks demanding special ability. There was, in Dr. Myers' opinion, a wide difference between the increased production due to scientific shorthand methods in industrial efficiency and that due merely to the dangerous process of speeding up. Real industrial efficiency would result from the establishment of **vocational bureaux,** where lads and girls on leaving school were psychologically examined, and advised on the basis of this examination, supplemented by a dossier of opinion collected during their school career, as to the occupation for which each was best fitted. The early and skilful treatment of nervous breakdown was most important to industrial life. Psychologists are now alive, he said, to the preponderating influence of the feelings, in the light of which current conceptions of memory, of personality, and of consciousness required to be revised. A case in point was the danger attending the apparent cure of contractures, paralyses, tremors, and other functional bodily disorders, when practised without reference to the psychic disturbance from which they arose.

The latest American studies on " Fatigue " (such as that by Prof. **A. H. RYAN,** " The Human Machine ") disclose the different types of fatigue found in different types of work and tend towards a solution of the problem of what are **the physiological requirements of each specific job.** The occupations are being classified into types on the basis of the parts of the worker's body brought into play, and the degree of participation by machinery. It is found that rough, bodily labour requiring muscular strain occupied thirty-five per cent. of the factory manufacturing force ; purely hand work, thirty-eight per cent., of which half is repetition " bench " work and half " crafts " and repairs requiring dexterity. Machine operating occupied twenty-three per cent., and inspection, watchmen, etc., the remaining four per cent. of the manufacturing force. Women are occupied almost exclusively in two types of work—benchwork and machine operating—where they form sixty-four per cent. and forty-seven per cent. respectively of the total so occupied. Fatigue studies in the form of hourly output records have been made mainly on benchwork and machine operating types—forty-two per cent. of all factory operations. The fatiguing effect on operators of operations representative of each type of occupation is being studied along three lines : (1) By showing the hourly output distribution over the working day ; (2) by the use of Prof. Martin's muscular strength test, at the beginning and the end of the day's work ; (3) by the use of Prof. A. H. Ryan's skin reaction test, four times a day, at the beginning and end of each spell. The hourly output distribution has shown so far that there is a distinct fall in output during the working day in all operations requiring muscular strength, dexterity, or any degree of attention, however slight ; but that there is no fall in the work of operating machines in the strict sense. In interpreting this difference in the curve of output the investigators consider " rhythm " the main factor, *i.e.*, the regular and frequent repetition of a group of differentiated motions and pauses. To measure the exact rhythm, the investigators employ an instrument which automatically records the worker's motions on a kymograph through electrical contacts.

Experimental psychology in Italy owes much to **GIUSEPPE SERGI,** Professor in the University of Rome, author of " Principii di Psicologia " (1874), " Elementi di Psicologia " (1879), and a work on the " Emotions " (1901); and to **ANGELO MOSSO** (1846-1910), Professor in the University of Turin, who contributed largely to the study of psychology with his works on " Fear," " Fatigue," and " The Temperature of the Head."

Altogether, experimental psychology may determine :

The degree of attention with its resistance against distracting stimuli ;
The power of memory under various conditions and various material ;
The mental excitability and power of discrimination ;
The quickness and correctness of perception ;
The chains of association and the rapidity of the associative process for various groups ;
The types of reaction ;

The forming of habits and their persistence ;
The conditions of fatigue and of exhaustion ;
The emotional expressions and the emotional stability ;
The time needed for recreation, and the resistance against drugs ;
The degree of suggestibility and the power of inhibition.

The *chronoscope* measures the reaction times and association times in thousandths of a second ; the *kymograph*, by the help of the *sphygmograph*, writes the record of the pulse and its changes in emotional states ; while the *pneumograph* records the variations of breathing, and the *plethysmograph* shows the changes in the filling of blood-vessels in the limbs which is immediately related to the blood supply of the brain. The *ergograph* gives the exact record of muscular work with all the influences of will and attention and fatigue ; the *automatograph* writes the involuntary movements, the *galvanoscope* registers the influence of ideas and emotions on the glands of the skin, and hundreds of other instruments are used in the psychological laboratory.

Experimental psychology, like everything new, promised much at the outset. Thus Prof. **CATTELL**, of the Psychological Laboratory in the University of Pennsylvania, wrote :

" The high *a priori* way having led philosophers into hopeless quagmires, science has stepped in to rescue them, and the bold step has been taken of subjecting the intangible and imponderable phenomena of mind to the experimental tests of the laboratory. Whenever experiment has been introduced into science a rapid and most sudden advance has followed, and there are good grounds for hoping that methods which have been so fruitful in physics will not prove barren in the study of mind."

It was claimed that psychology had made progress because it had taken on a new phase ; it had become experimental and had laboratories equipped with delicate and elaborate apparatus. But though registration of the action of nerve force, in normal conditions or under the influence of internal or external stimuli, is interesting, it adds little to the science of mind, nor would it do so even if it could give the length of an idea in millimetres and the weight of an emotion in milligrammes. Trying to get results as to memory from tests with letters, unconnected words, long rows of figures, has little bearing on the true memory of man, on the memory by which he recalls the experiences of his life. Man has an individuality and is not a mere registering apparatus. Experimental psychology cannot explain the social, ethical, and religious side of man, cannot tell us what makes a man a miser and another a spendthrift, a drunkard, or a wife-beater. These are practical problems for the solution of which we must look to comparative, developmental, pathological, and to the new social psychology on natural history lines. It is not to be denied that these experiments give precision and exactitude to some minor facts of our knowledge, but they have the same relation to psychology proper as the taking of temperature, blood-pressure, and pulse-rate has to general medicine. They are aids to the science but not the science itself. As Wundt himself acknowledged : " We can apply the experimental method only to the simpler mental processes. No doubt they have their value. The measurement of the intensity and duration of sensation, of the extent of consciousness, and so forth, would be nothing but a useless pastime if it did not find some practical application. It would be better in that case to apply oneself to the improvement of sewing-machines." But if experimental psychology is applied to minor points, it certainly is a valuable aid, and when extended to include the larger, as it will do in course of time, it may fulfil all its expectations.

Wundt, though so thorough as a philosopher, was yet extremely superficial in his

examination of Gall's doctrine. ("Principles of Physiological Psychology," 1902, and "Essays," 1906.) He rejected it on the ground that its localisation theory is mere charlatanism. The brain and skull do not agree in conformation (!) and "if Gall were right, the gorilla should have an enormous organ of divine veneration where there is actually only a bony excrescence over the longitudinal suture at the junction of the parietal bones."

He went on :

"Gall regarded the mental functions as the business of a number of *internal senses*, to each of which, on the analogy of the external senses, he attributed a special organ. Nearly all of these internal sense organs he localised on the outer surface of the brain, assuming a parallelism of skull-form and brain-form which, as can be easily demonstrated, does not obtain, at any rate to the extent required.

"Gall distinguished twenty-seven 'internal senses,' in naming which he makes use at need of the expressions : sense, instinct, talent, and even memory (!) . . . It is useless to repeat the statements of the phrenologists regarding these localisations. It may, however, be mentioned that in one case—and the fact shows that he possessed some gift of observation—Gall made a **lucky hit** : he localised his 'sense of language' in a region of the cerebral cortex approximately corresponding to the area whose lesions, as we shall see later on, have been proved in modern times to constitute the most frequent cause of the syndrome of 'aphasia.' Indeed, the discovery of the seat of aphasia is directly traceable to Gall's suggestion, as has been expressly acknowledged by Bouillaud, to whom it is due. (!) At the same time, we must not forget that even in this instance, where a pronouncement of Gall's has received a certain measure of confirmation from the facts, there is really an essential difference between what was actually discovered, viz., the anatomical seat of central derangements of speech, and the phrenological 'organ of language.'

"Granted that Gall was, in his day and generation, one of the highest authorities on brain morphology : the honour is his, and is not to be taken from him. The phrenological system, nevertheless, is and remains a scientific aberration, the joint-produce—like its predecessor, the physiognomics of Lavater—of charlatanism and unreasoning caprice."

Wundt asked : Supposing a particular convolution was found highly developed in mathematicians and deficient in men who lack the mathematical ability—what would follow ? And he replied to his own question : "Certainly not that there was a mathematical organ, in the sense of the phrenologists, but at best this : that we were in presence of a fact, which for the time being we could not explain, and which had about as much value for science as the law that most great men possess unusually large skulls."

Wundt criticised as a psychologist. Were he a brain surgeon, he would know that **such localisations as Gall made, if proved correct, would be of the utmost value for the saving of human lives,** for they would enable us to put the finger on the exact spot of the brain where is the lesion ; and that such localisation would also be of the **utmost value to the psychiatric physician** for the understanding, diagnosis, and treatment of insanity. Proof of this will be furnished in later chapters.

Psychologists have done with Gall. Unacquainted with his works, they labour under the mistaken notion that "the faculty psychology was completed, and rendered ridiculous at the same time, by Gall's doctrine, which was its physiological counterpart." Thus said GUIDO VILLA, of the University of Rome, in his "Contemporary Psychology" (1899). Villa relies on Lange's description (Chapter XVIII.), and said Gall had "no notion of the complexity of the mental processes" and "no comprehension of the extraordinary complexity of the cerebral processes." It has been shown repeatedly in the course of this work that Gall was against the faculty psychology, and the assertion that he did not comprehend the complexity of the nervous system can only be made by one totally unacquainted with his works. Villa relied on Lange's criticism, Lange on Müller, Müller on his teacher Rudolphi,

and so on ; and so an unanimous opinion has been formed, without anyone ever inquiring whether the original critic was not mistaken.

SIGMUND FREUD (1856-),

Professor of Neurology in Vienna, is celebrated for his contributions to **abnormal psychology.** At the basis of his theory (which originated with Dr. J. BREUER, in 1861, with whom Freud was associated as student and assistant) are certain well-known facts, namely, that no experience is ever wholly lost ; that our present acts are the outcome of all our antecedent acts ; that our perceptions, even when apparently new, are in reality nine parts memory ; and that disclosing of and talking over old troubles clears the mind and relieves the feelings of distress. We can substitute or we can neutralise the effects of our experience, but we cannot kill them. A large number of even ordinary mental processes come from hidden sources, unknown or unsuspected by the individual.

The larger and the most important part of each person's character is made up of habits, tendencies, preferences, aversions, moods, and principles, of which for the most part the individual has little distinct consciousness, and these at critical moments have often a decisive effect on his destiny. Chains of unconscious associations, relations, unknown to the ordinary consciousness, exist between events and recollections of most different epochs, and apparently altogether distinct in origin ; autonomous groups of mental images and memories at high emotional coefficiency, a vast intricate web, which, from the depths of the unconscious, constellate our thoughts and acts in a particular fashion and without our being aware of it.

We all have instincts and passions which press for gratification, and ungratified or imperfectly gratified desires remain as unconscious comrades to our thoughts. We have ostensible personalities and concealed personalities, and though the two may harmonise fairly well, they are never fully in accord. Constant adaptation to our surroundings necessitates the repression of some of our most urgent desires. Our organised conative tendencies are apt to come in conflict with one another, producing moral struggles. Every case of what is commonly called temptation involves such a conflict of conative tendencies, the more moral with the less moral or disapproved tendency. When the less moral is defeated, when the temptation is conquered, it is not always destroyed or wholly abolished by such a victory ; it is apt to be only repressed and to work in the mind in a subterranean fashion. The conscious mind will have none of it, so there still goes on an **unconscious conflict.**

From an early period of life the child finds gratification of its instinctive impulses checked or even prevented by the presence of its environment. Conflict is thus set up between the two forces of instinctive pressure within and social pressure from without. Instinctive impulses which thus come into conflict with the repressing force are not destroyed, but are deflected from their natural outlet, are repressed within the mind and ultimately prevented from rising into the conscious field at all, except in disguised and symbolic forms. The emotions and temptations, in spite of being discarded and repressed, continue to be important portions of ourselves. The repression of a desire gives rise to a vague sense of disquiet ; and this feeling may attach itself to a definite object and be felt as a morbid impulse or a defined fear.

There exists quite a cluster of phenomena occurring in ordinary daily life which have not been registered by official psychology, and to which Freud has drawn very special attention. I refer to the **slips of pen and tongue,** a kind of forgetfulness, incongruous or at least unexpected gestures, apparent blunders, etc., which reveal, under psycho-analysis, the hidden thoughts, the least marked but most profound

tendencies of the individual; the tendencies of his unconsciousness. These troubles of conscious activity are betrayals which it is possible to interpret; that is to say, to cause to pass from the unconscious to the conscious. These "accidents" which interrupt the normal course of thought or action are due to the intervention of repressed ideas possessing a high emotional co-efficient, and which make their irruption into the field of the ordinary consciousness at a moment when its sway is weakened, on the occasion of some lively emotion which partially dissociates the normal consciousness.

Freud applied the same experience to the **interpretation of dreams.** Fantasy, in dreams and in the waking state, borrows its elements from experience; it creates nothing, it only combines. During sleep, when the control of consciousness is withdrawn, thoughts and feelings, desires and fears, more especially such as have been repressed, may emerge from subconsciousness to occupy the theatre of the mind with dreams in fantastic and extravagant disguises, symbolic of their real meaning. In analysing a dream, the first step consists in seeking for the materials which have contributed to its elaboration, the source of every detail; this leads to the discovery of a world of memories of very different origins and epochs, the latent contents of the dream. Dream is therefore a means of expression of the unconscious. It becomes more complicated with the widening of the intellectual operations and the refinement of the affectional life, with the increase of the moral conflicts to which modern man is exposed in social life. The community binds him to a host of concessions, of submissions; that is to say, of victories over himself, over the most marked tendencies of his nature. These restrained desires seek for an outlet, an escape towards another issue, under the form of dream fantasies or fantasies in the waking state: castles in the air. Freud distinguished between the "manifest" and the "latent content" in dreams, and stated that the latter was always the imagined fulfilment of an unconscious wish. Dreaming gratified unconscious desires which could obtain gratification in no other way; it is, however, not merely a veiled gratification of repressed desires, but a continuation through the hours of sleep of the struggle for adaptation.

In this way Freud interpreted the significance of dreams, witticisms, infantile amnesia and auto-erotism, unconscious memories, absent-minded actions, anxiety-neuroses, and other aspects of **psycho-pathology of every-day life.** He believed that there is a rigid determinism of psychical effects, and that many complex mental processes never attain to consciousness and can only be elicited by a long process of **psycho-analysis,** the technique of which was largely developed by his pupils C. G. JUNG and SANDOR FERENCZI.

By means of psycho-analysis, it is possible to discover a certain unity of action in the individual throughout the whole of his life by tracing out the ensemble of the motives of his acts, the super-determination of the intellectual processes, the motives of which he is, to a large extent, quite unconscious. One may thus quickly understand how an individual's past acts upon his present activity, as each impression—where an affective value is engaged—registered at any period of his life, even in the earliest years of his childhood, leaves its durable traces: a most precious dowry for the doctrine of psychical determinism.

The correctness of Freud's reasoning seems to be borne out by the successful treatment of hysteria through the disburdening of the mind, or by other appropriate psycho-therapy. He traced hysteria to some mental shock or trauma, very frequently to one experienced in childhood, and most frequently of a sexual nature. The painful event becomes buried but its effect is not lost; the stream of emotion, the effect to which it gave rise, not being normally and fully discharged at the time, undergoes conversion into some physical phenomenon.

Freud had the correct view, but at first exaggerated the importance of the sex instinct, as if it was the only human instinct, the suppression of which can cause

abnormal phenomena. Though it is the strongest instinct, all the primary propensities of human nature influence man unconsciously and any one may be abnormally strong.

C. J. JUNG differs somewhat from Freud. According to Jung, when a patient falls ill of a psycho-neurosis, it is because he is not adequately adapted to his present social and physical environment. Life is too great a task for him ; he has not sufficient energy to face facts, with the result that, if of a neurotic disposition, his mind turns back to childhood's memories, activities, and early fancies, and his mental energy or " libido " becomes linked up to them, and what Jung calls " regression " takes place. The libido being no longer of use to the individual in his present mental situation, he becomes still less competent to deal with his environment. The treatment must, therefore, be directed to the disclosing of these earlier memories, and this is done by a process of psycho-analysis, which is simply a method of free association, allowing the unconscious mental activity to come to the surface.

Abnormal psychology has many distinguished investigators in the United States. The most prominent are : BORIS SIDIS, MORTON PRINCE, ISADOR H. CORIAT, JAMES J. PUTNAM, A. A. BRILL, SMITH ELY JELLIFFE, and ERNEST JONES (formerly of Toronto, Canada, now in London).

CHAPTER XXIV

HISTORY OF BIOLOGY

And the General Progress of Science in the XIXth Century

PHYSIOLOGY

In addition to the Physiologists already mentioned, three great authorities stand out in the first half of the XIXth century: a Frenchman, an Englishman, and a German.

CLAUDE BERNARD (1813-1878),

a pupil of Magendie and the successor of Flourens in the "Academy," was the first Professor of General Physiology in Paris (1854), and the year later (1855) became Professor of Experimental Physiology. He is memorable for his **experimental investigation of physiology** and the **application of chemical and physical knowledge to the solution of biological problems.** He showed the vaso-motor mechanism (1851-3), and the internal secretion of ductless glands into the blood was first investigated by him in 1855.

The secretion of the thyroid, pituitary, suprarenal, and genital glands acting on other tissues at a distance by means of substances, for which the Scotch professor STIRLING has suggested the name **hormones,** has given rise to the therapeutics by "organic extracts," which, together with the preventive treatment by "vaccines," to which we shall refer later, has set the present fashion in the direction of chemical regulation of function.

MARSHALL HALL (1790-1857)

an opponent of Gall and of any attempt at brain localisation, is recognised as the **discoverer of the reflex action of the spinal cord** (1832), foreshadowed by Descartes.

The Royal Society would not permit the publication in the *Transactions* of Marshall Hall's early papers on his extremely important discovery. This refusal is paralleled by that of the Faculty of Medicine of Paris, which carried its blind opposition to practical knowledge so far as to refuse permission to Ambroise Paré (1510-1590), the great surgeon, for the printing of his invaluable discovery of the application of ligatures to arteries—a discovery which enabled the surgeon, in the amputation of a limb, to arrest the flow of blood by the application of a thread to the artery, in place of searing the stump over with a red-hot iron.

JOHANNES MÜLLER (1801-1858),

of Coblenz, a pupil of Rudolphi, whom he succeeded in Berlin, was one of the greatest German physiologists and a great all-round medical naturalist. Originally,

like all the physiologists of his time, a vitalist, he admitted the existence of a unique vital force as the supreme cause and regulator of all phenomena. JUSTUS v. LIEBIG (1803-1873), one of the founders of biological chemistry, shared these ideas. Later Müller, in his "Manual of Physiology" (1833), **attempted to explain the phenomena of life by chemical and mechanical processes.** He is also considered the **greatest comparative physiologist** after Cuvier, though he wrote very much as Gall did, whom he opposed. He said :

"In no part of physiology can we derive greater aid from comparative anatomy than in the physiology of the brain. Corresponding with the development of the intellectual faculties in the different classes, we meet with very great differences in the form of the brain, which are highly important in aiding us to determine the functions of the different parts of the organ. . . . The brain undergoes a gradual increase of size from fishes up to man, in accordance with the development of the intellectual faculties. All parts of the encephalon, however, do not keep pace equally with the development of the intellectual powers. It is in the cerebral hemispheres that the increase of size in the higher animals chiefly takes place."

Johannes Müller conceived the motor nerves to be all spread out at their central extremity to receive the influence of the Will, and compared them, as they lie side by side, to the keys of a piano on which our thoughts play or strike. He had many distinguished pupils. Besides those already mentioned incidentally in previous chapters, there was **HERMANN v. HELMHOLTZ** (1821-1895) equally celebrated as physiologist and mathematical philosopher. In 1847 he established the doctrine of the conservation of energy, conceived by Mayer in 1842. He invented the ophthalmoscope (1850).

EMBRYOLOGY

The classical works of ARISTOTLE are also the oldest known scientific sources of embryology. The great philosopher gave many interesting facts, which were not fully appreciated for two thousand years—until FABRICIUS (1537-1619) in 1600, and MALPIGHI (1628-1694) in 1687, CASPAR FRIEDRICH WOLFF (1733-1794) in 1759, BICHÂT (1771-1802) in 1801, and KARL ERNST v. BAER (1792-1876) in 1828, renewed the investigation.

E. H. HACKEL (1834-1919) condensed the main conclusions of embryological research in the following theses :

(1) Each human individual, like every other higher animal, is a single simple cell at the commencement of his existence.

(2) This "stem-cell" is formed in the same manner in all cases—that is, by the blending or copulation of two separate cells of diverse origin, the female ovum and the male spermatozoon.

(3) Each of these sexual cells has its own "cell-soul," *i.e.*, each is distinguished by a peculiar form of sensation and movement.

(4) At the moment of conception or impregnation, not only the protoplasm and the nuclei of the two sexual cells coalesce, but also their cell-souls ; in other words, the potential energies which are latent in both, and inseparable from the matter of the protoplasm, unite for the formation of a new potential energy, the "germ-soul" of the newly constructed stem-cell.

The nucleus of the spermatozoon contributes the qualities of the male parent, and the nucleus of the ovum gives the qualities of the mother, to the newly-born stem-cell. The blending of the two nuclei is the "physiological moment" of heredity ; by it the personal features of both body and soul are transmitted to the new individual.

A new individual comes into existence at the moment of conception ; yet it is not an independent entity, either in respect of its mental or its bodily features, but

merely the product of the blending of the two parental factors, the maternal egg-cell and the paternal stem-cell. The cell-souls of these two sexual cells combine in the act of conception for the formation of a new cell-soul, just as truly as the two cell-nuclei, which are the material vehicles of this psychic potential energy, unite to form a new nucleus. As we now see that the individuals of one and the same species—even sisters born of the same parents—always show certain differences, however slight, we must assume that these variations were already present in the constitution of the generative cells themselves.

Such is the provision made by nature for the continuity of the *psyche* of each parent.

MATHIAS SCHLEIDEN (1804-1881) discovered in 1838 that the common element of all tissues in the plant world was the *cell*—[the plant cell was discovered by Sir ROBERT HOOKE (1635-1703) in 1677]—and immediately afterwards **THEODOR SCHWANN** (1810-1882), assistant to Johannes Müller, proved the same for the animal world. The individual cells of a complex organism are usually themselves alive; sometimes, as in ciliated epithelium, they give indications of life long after they have been separated from the body.

The cellular theory of Schleiden and Schwann—the cell being "a small vesicle with a fine membrane enclosing fluid content" [the cell nucleus was discovered in 1831 by ROBERT BROWN (1773-1858)]—was gradually replaced by the protoplasmic theory [the term "protoplasm" was introduced by HUGO v. MOHL (1805-1872) in 1846]—the distinct membrane was found to be frequently absent, and there only remained "a small mass of protoplasm endowed with the attributes of life."

It was shown by two other pupils of Johannes Müller—the able physiologist ERNST W. v. BRÜCKE (1819-1892), of Vienna, and the distinguished histologist ALBERT v. KOLLICKER (1817-1905), of Würzburg—that the activity of all organisms is, in the ultimate analysis, the activity of the components of their tissues, the microscopic cells. These elementary organisms in the body of man and of all other animals are the only actual, independent factors of the life-process.

RUDOLF VIRCHOW (1821-1902),

another pupil of Johannes Müller, stated formally that the cell was to be regarded as the proper, ultimate, vital element. He conceived the happy idea of transferring the cellular theory from the healthy to the diseased organism. He sought in the more minute metamorphoses of the diseased cells and the tissues they composed the true sources of those larger changes which, in the form of disease, threaten the living organism with peril and death. He is **the founder of "cellular pathology"** (1858) as distinguished from cellular physiology, and proved by his researches in that field that the body is an aggregate of cells, each of which leads its own life, and leads it sometimes in dangerous independence of the rest.

Virchow was considered one of the foremost exponents of the new materialistic theory of the vital processes in man, which he took to be purely mechanical natural phenomena. He emphasised the inseparable connection of spirit and body, of force and matter. He wrote:

"Every animal appears as a sum of vital unities, each of which bears all the characteristics of life. The characteristics and unity of life cannot be found in any determinate point of a higher organisation, *e.g.*, in the brain of man, but only in the definite, ever-recurring arrangement which each element presents. Hence it results that the composition of a large body amounts to a kind of social arrangement—an arrangement of a social kind in which each of a mass of individual existences is dependent upon the others, but in such a way that each element has a special

activity of its own, and that each, although it receives the impulse to its own activity from other parts, still itself performs its own function."

THE VITALISTIC THEORY

Since the middle of the XVIIth century two distinct theories have been applied to the interpretation of the phenomena of life : the mechanistic and the vitalistic.

The **mechanistic** theory holds that life—apart from that mysterious accompaniment of vital activity : consciousness—is nothing but a physical and chemical process, and can be explained in terms of matter and motion, in accordance with the chemical, physical, or mathematical laws known to us. It is represented in the writings of DESCARTES (see Chapter IX.), who compared living bodies to automata animated by non-luminous heat such as is produced during the fermentation of grape-juice. The comparison of life to a fermentation was seen to be tautologous, however, when it was shown that fermentation itself is dependent on the growth and multiplication of living organisms. The attraction of the mechanistic theory of explaining physiological processes as resultants of mechanical, physical, and chemical laws is that it offers something which can be tried out experimentally ; whereas vitalism is not a thing of the laboratory.

The **vitalistic** theory holds that some obscure vital principle or force is at work in the living body to regulate the chemical, physical and other processes, that result in what we all recognise as life, and that this vital principle is an influence that resists the tendencies of physical and chemical agencies to produce disintegration of the structure of the living body, which is perceived by us and maintains itself as a whole. The vitalists hold that it is only isolated fragments of physiological facts that we can explain by the mechanistic theory. The life processes—respiration, absorption, secretion, etc., are not so simple ; they are of great complexity. Life represents much more than any known physico-chemical activities. The body effects its own repairs without help from without. In the vitalists' opinion, the chemical physiologist, with his gloomy creed that life is fermentation, and love, hope, memory, and artistic creation but phosphorescence on the surface of the brain, forgets the power of mind, which no mere philosophy and test-tube can comprehend.

We have mentioned already **J. C. REIL** (1759-1813), the eminent anatomist and physiologist, in connection with Gall. Reil, while admitting that a certain number of the vital processes may be traced to physical and chemical causes, held that others are the outcome of a special " vital force," which is independent of physical agencies. This divergence of the vital phenomena from the mechanical processes of life became, naturally, more conspicuous as science advanced in the chemical and physical explanation of the latter. Hence there arose a complete physiological dualism—an essential distinction was drawn between inorganic and organic nature, between mechanical and vital processes, between material force and life-force, between the body and the soul.

CLAUDE BERNARD (1813-1878), whom we cited at the beginning of this chapter, held that mechanical, physical, and chemical forces are the only effective agents in the living body, and that they are the only agencies of which the physiologist has to take account. The substances of which the living body is made up are, no doubt, extremely complex, yet none the less physiology is in the last resort the chemistry of the proteids.

J. R. v. MAYER (1814-1878) established in 1842 the " conservation of energy " and showed in 1845 that vital energy is accounted for by the oxidations that go on in the living body. This was the beginning of the end of the view that there is a distinct " vital force " in organisms, a special source of energy apart from what we can account for by the chemical and physical circumstances of the case. Mayer's principle remained unknown until HELMHOLTZ (1821-1894), in his celebrated memoir on the conservation of energy (1847), brought it to light and gave it the importance it deserved.

The inevitable reaction followed. It was found that only isolated fragments of physiological facts can be explained by the mechanistic theory [for example, **JUSTUS v. LIEBIG** (1803-1873) regarded respiration and heat production as relatively single processes of oxidation; **CARL LUDWIG** (1816-1895) and others regarded secretion and absorption as processes of filtration and diffusion]; the manner in which the various processes are determined as a whole finds no explanation in physics and chemistry. ERNST PFLÜGER (1829-1910) and others showed that oxidation does not, like ordinary chemical oxidation, increase or diminish in proportion to the varying supply of oxygen brought to the seat of oxidation, but is controlled by living cells.

The vitalistic argument from the facts of development has found its finest expression in the work of **HANS DRIESCH** (1867-), who was led to his theoretical position by a series of steps well marked in his successive papers, and corresponding definitely to a series of brilliant embryological experiments. He endeavoured to get nearer to the secret of development by altering the normal environment of the egg and observing the results, or by tampering with portions of the developing egg itself. He gave two proofs of the autonomy of life. The first is based on a study of morphogenesis, *i.e.*, of the way in which an organism realises its specific form and structure. The second is based on a study of inheritance. Driesch restated the evidence for the view that we must assume the existence of some guiding influence or vital force—entelechy—in living matter which directs development into the right way. According to him, "there is something in the organism's behaviour—in the widest sense of the word—which is opposed to an inorganic resolution of the same, and which shows that the living organism is more than a sum or an aggregate of its parts. . . . This something we call 'entelechy.'" This entelechy he conceived as an agent at work in nature, non-spatial, without a seat or localisation; it is immaterial and it is not energy, and its function is to suspend and to set free, in a regular manner, pre-existing potentials, *i.e.*, pre-existing faculties of inorganic interaction.

THE HISTORY OF THE MODERN EVOLUTION THEORY

(See also Chapter X.)

JEAN BAPTISTE de LAMARCK (1744-1829)

published his first views in his "Observations on Living Organisms," in 1802, and extended them in his profound work "Philosophie Zoölogique," in 1809. He was the founder of invertebrate zoology; at least, he reconstructed it.

In opposition to the prevalent dogma of fixed species, he declared that the organic "species" is an artificial abstraction, a concept of only relative value, like the wider-ranging concepts of genus, family, order, and class. All species are changeable, and have arisen from older species in the course of very long periods of time. The common parent-forms from which they have descended were originally very simple and lowly organisms. While the type is preserved by *heredity* in the succession of generations, *adaptation*, on the other hand, effects a constant modification of the species by change of habits and the exercise of the various organs. Even our human organism has arisen in the same natural manner, by gradual transformation, from a group of pithecoid mammals.

He attributed the change of species mainly to physical conditions of life, to crossing, and especially the use or disuse of organs, which not only resulted in the modification, growth, or atrophy of some, but, under the stress of necessity, led to the formation of new ones. He also held that changes produced in the individual as the result of habit and environment accumulated in the germ and were transmitted to the offspring. Organic life was traced back and back to a small number of primordial germs or monads, the offspring of spontaneous generation.

Owing to changes, climatic and otherwise, affecting their needs, animals, in order to sustain life, are forced to adopt new habits, to adopt new methods of satisfying their wants of food, etc. These new habits being forced on all the animals alike, and the new habits being voluntary in those with a nervous system, the results are registered on the germ plasm and its developed stages, germ, sperm, zygote, and embryo. The gradually acquired new habits, being permanent, and being forced on all, young and old, male and female, the organism is also gradually modified to suit the new conditions of life until full or relatively full adaptation is reached. Acquired habits, with their passing from generation to generation, become fixed in the nervous structure; that is, they become instinctive. The bird builds its nest as it does because its ancestors learned consciously how to do so in the first instance. This function, acquired by experience, has been inherited and improved upon by countless generations, and has thus become native or innate. Finally, it has become a purely nervous function, requiring no antecedent experience on the part of the individual bird. In this way all sorts of ancestral experiences were made available to later generations by the simple bridge of heredity, thrown across the chasm between parent and child. Reflex acts, the adaptations due to the "efforts" pointed out by Lamarck, the actual accommodations acquired by the intelligence and preserved by the experience of the forebears—all these are preserved in solid nervous connections, in the organisms of the individuals of the species. In this way the individuals are endowed with instincts. The instincts seem so intelligent because they once *were* intelligent; they were acquired by the aid of intelligence. It is only their nervous apparatus that has been conserved in the form of instinct; the intelligence, at first required, has lapsed, disappeared.

Lamarck said: "All that nature has caused individuals to acquire or lose through the circumstances to which their race has found itself for a time exposed, and consequently, through the predominant exercise of certain organs, or through a failure to exercise certain parts, it preserves through heredity to the new individuals that are produced by them, provided the changes acquired are common to the two sexes, or to those that have produced these new individuals."

Lamarck would have accounted for the long neck of the giraffe by supposing that in remote ages its ancestors were short-necked like other animals, but that they exercised their necks in browsing off high trees, that the necks were elongated in consequence of this stretching, and that this elongation was transmitted by heredity, although even by imperceptibly slight degrees, from one generation to another, until the part gradually grew to the present length.

The Darwinian hypothesis, as we shall see presently, was that, somehow or other, among giraffes a variety occurred with longer necks and forelimbs, and that this variety, being better adapted to the surroundings, survived.

Lamarck was little known during the half century that preceded the publication of Darwin's "Origin of Species." Darwin himself, as his correspondence shows, had a very imperfect apprehension of his speculations.

In this Lamarckian view of heredity we have two ideas: first, that fresh characters may be acquired during an individual's lifetime, due to the action of his surroundings or environment; and secondly, that these fresh characters are transmitted to the offspring and may produce in time marked racial change. The first idea is undoubtedly and admittedly true. It is the second idea, the supposed transmission of these acquired characters, which is called in question.

GEORGES CUVIER (1769-1832),

Professor of Natural History and Comparative Anatomy in Paris, whom we have already mentioned in connection with Gall, was Lamarck's chief opponent. Cuvier, who distrusted new hypotheses, **maintained the fixity of the species,** and opposed the theories of Lamarck and St. Hilaire, in which a later generation recognised, the beginnings of the Darwinian doctrine of the transmutation of the species. GEOFFROY ST. HILAIRE (1772-1844) pointed out (1818) that the parts or organs are

the same in all animals, only modified to suit their wants ; that is to say, that there is a common plan of structure pervading the whole animal kingdom—a unity of type and progressive development. Cuvier proved that the parts of an animal agree so exactly, that from seeing one fragment the whole can be known. In 1840 Cuvier's doctrine of the fixity of the species seemed to be victorious, and closed discussion until the advent of Darwin.

Cuvier, besides being the recognised authority on zoology, was even more renowned as an anatomist. He was celebrated, too, for his study of fossils, and was the founder of the new science of palæontology (1822). He restored the remains of fossil animals in 1812, and published in 1821 elaborate and well illustrated descriptions of nearly a hundred extinct animals, an extraordinary output for one investigator. In 1847 BOUCHER DE PERTHES furnished geological proofs that man lived upon earth in ages long gone by, with animals which are now extinct. The theologians believed that the fossils were caused by the deluge of Noah, and no supposition was too violent to support this theory, which was considered vital to the Bible.

Cuvier upheld the theory of the **catastrophe,** of alternate destructions and regenerations, against the new theories of transformation and evolution (1812). According to this widely accepted belief, the universe was subject to violent terrestrial revolutions, involving the destruction of all existing things and the total annihilation of all living beings belonging to the past epoch.

Sir **CHARLES LYELL** (1797-1875), in his "Principles of Geology" (1830) discredited Cuvier's "Theory of the Earth," traced the evolution of the earth to natural causes, and secured the recognition of the theory of continuity in the formation of the earth's crust, as opposed to the catastrophic theory of Cuvier.

In 1844, **ROBERT CHAMBERS** (1802-1871) published his "Vestiges of Creation." In his view the several series of animated beings, from the simplest and oldest to the highest and most recent, were the result of two distinct impulses : the first imparted to forms of life, lifting them gradually through higher grades ; the second tending to modify organic substances in accordance with external circumstances. Eight years later, HERBERT SPENCER (1820-1903) published an essay contrasting the theories of creation and evolution—reasoning with great force in favour of the latter, showing that species had undoubtedly been modified by circumstances.

On July 1st, 1858, there were read before the Linnæan Society in London two papers—one presented by CHARLES DARWIN (1809-1882), the other by ALFRED RUSSEL WALLACE (1823-1913)—and with the reading of these papers the doctrine of evolution by natural selection was born.

CHARLES ROBERT DARWIN (1809-1882)

In 1859 Charles Darwin published his epoch-making work, the "Origin of Species." He laid great stress upon the facts (1) that organisms vary, no two animals or plants being precisely alike, and (2) that they tend to increase to the utmost limits of subsistence. More are born than can come to maturity, and there is a "struggle for existence" which resulted in the preservation of those most fitted to the environment, or what Herbert Spencer called the "survival of the fittest," the fittest being those with some variation which gave them an advantage in the struggle for life. The inheritance of these beneficial variations, with still further modification in the same direction in the offspring, will account for the origin of species from ancestral forms of a simpler type. And the process may, in imagination, be carried backward until we come to a single speck of living matter. This is the theory of "natural selection."

The key to the puzzle of *affinity*, a property by which organisms were associated

in natural groups, which had so long baffled thinking naturalists, was at last supplied by Darwin, who explained in his "Origin of Species" that

"the natural system is founded on descent with modification; that the characters which naturalists consider as showing true affinity between any two or more species are those which have been inherited from a common parent, all true classification being genealogical; that community of descent is the hidden bond which naturalists have been unconsciously seeking, and not some unknown plan of creation, or the enunciation of general propositions, and the mere putting together and separating objects more or less alike."

Darwin not only showed that the development of the species proceeds by a regular and natural evolution from the lowest forms of life to the highest, but that also by the aw of survival of the fittest under the conditions in which they live, through struggle for existence and natural selection, new types have been evolved with organs, faculties, and habits tending to the preservation of the individual or of the species under the conditions of life in which it is placed. As far more individual animals of all kinds come into the world than can be supported in it, those that have some slight advantage—who are most fitted to their surroundings—have the best chance of surviving and of producing their kind, while injurious or weaker variations, those unadapted to their environment, are destroyed. This law of natural selection, or "slurvival of the fittest"—brought forward by Darwin and simultaneously by Walace (1858)—naturally leads through the ages to the improvement of each type, and consequently to an advance in organisation.

Taking the case of the giraffe, Darwin and Wallace would have explained the length of the neck somewhat as follows: They would agree with Lamarck that the ancestor was short-necked, but the subsequent elongation they would explain in quite another way. They would take for granted that there are times when grass and foliage are scarce, that short-necked animals would soon exhaust the herbage and shrubbage, but that the taller shrubs and trees would afford subsistence to animals with a higher reach. Amongst the ancestral giraffes those born with the longest necks would at such times have an advantage over the rest, who in large numbers would die out. The longer-necked ones, more suited to their environment, would perpetuate their inborn quality of long-neckedness; of the next generation those again with the longest necks would survive, and so on.

There are three ideas in this law of natural selection: (1) that there are inborn variations among the offspring even of the same family; (2) that these various individuals living in surrounding conditions on the whole uniform and common to all of them, will start in life, some with an advantage and others with a relative disadvantage, and that those possessing an advantage will, more of them, tend to produce offspring; (3) that the variations, inborn in this case and not acquired, will probably be transmitted.

The conception that the organic world is the scene of an incessant struggle, of a keen, vital competition, in which the fittest survive—that is, the fittest for their environment in the capacity to obtain food, to resist their enemies, and propagate their kind—while the unfit perish, has been recognised as the fundamental law of life. The operation of natural selection is, however, negative rather than positive. It does not actively assist the superior individuals; it merely cuts off the individuals who are less beneficially endowed. The "struggle for existence" and "natural selection" do not account for the creation of—for example—the philanthropist or the poet.

According to Lamarck, **"instinct"** is originally a character, consciously acquired, and established as a habit, in successful adaptation to environment, and then transmitted to descendants and unconsciously performed; the inherited

character being subsequently modified by new successful adaptations, which are in turn transmitted. A complex instinct is thus due to a number of successful adaptations, made at different times in the history of the race, and transmitted as gradually changing "race habits." In other words, instinct is largely "lapsed intelligence."

According to the Darwinian view, instinct is due mainly to the operation of natural selection upon accidental or spontaneous variations. It is at no period consciously purposive and implies the transmission of acquired characters.

Instinct is an actual performance or act, not a mere innate impulse or disposition. Impulses or dispositions may be "instinctive," in the broad sense of inborn; but an instinct, properly speaking, is an action, *congenital, i.e.*, not the result of a process of education or self-education; *adaptive, i.e.*, conducive to the welfare of the organism; *co-ordinated by nerve-centres*, thus excluding the superficially similar behaviour of the lowest animals and all plants; *actuating the whole organism*, thus excluding most, if not all, reflex acts in the higher animals, as well as the wonderful adjustments affected by bone-corpuscles and other parts of organisms; and *common to all the members of a species or other group*, thus excluding individual aptitudes.

Darwin threw a new light upon instinct by showing that natural selection can operate on the subtlest modifications. It can discriminate shades of hardiness to climate, shades of intellectual acuteness, or shades of courage. It can intensify qualities which appear only in adults past bearing or in individuals congenitally incapable of propagation. Human selection, though a blunt tool in comparison with natural selection, can originate a bold and hardy race of dogs, or showy double flowers incapable of producing seed.

Darwin brought the valuable proof that the instincts of animals are subject, like all other vital processes, to the general laws of historic development. The special instincts of particular species were formed by *adaptation*, and the modifications thus acquired were handed on to posterity by *heredity;* in their formation and preservation natural selection played the same part as in the transformation of every other physiological function. Darwin afterwards developed this fundamental thought in "The Descent of Man," 1871, and other works, showing that the same laws of "mental evolution" hold good throughout the entire organic world, not less in man than in the brute, and even in the plant. Hence the unity of the organic world, which is revealed by the common origin of its members, applies also to the entire province of psychic life, from the simplest unicellular organism up to man.

In connection with man, it has, however, to be remarked, in opposition to Darwin's theory, that the struggle between members of the human community is not so much a struggle for existence as a struggle for a superfluity of the good things obtainable. It is a struggle for property, and not therefore necessarily a struggle in which the most successful will be the largest race-producers. Property is not always acquired by the most capable. The property-holders are frequently less capable than the property acquirers. The poor child may have a vigorous personality, but may not get the training essential for success. Push counts for more than capacity. The capable are frequently sterile, marrying late in life.

The evolution theory presented difficulties for the problem of the soul, for at what stage of the evolution did the human soul replace the animal soul?

Bishop WILBERFORCE, in the *Quarterly Review*, declared that Darwin was guilty of "a tendency to limit God's glory in creation"; that "the principle of natural selection is absolutely incompatible with the word of God"; and that there is "a simpler explanation of the presence of these strange forms among the works of God," that explanation being "the fall of Adam."

Cardinal MANNING also declared his abhorrence of the new view of nature, and described it as "a brutal philosophy—to wit, there is no God, and the ape is our Adam."

In an address at Liverpool, Mr. GLADSTONE, the great statesman, remarked : "Upon the grounds of what is termed evolution God is relieved of the labour of creation ; in the name of unchangeable laws he is discharged from governing the world." Herbert Spencer called his attention to the fact that Newton with the doctrine of gravitation and with the science of physical astronomy is open to the same charge.

The *Dublin University Magazine* charged Darwin with being "resolved to hunt God out of the world."

The *Times*, that important London daily paper, published a review stigmatising Darwin's "Descent of Man" as an "utterly unsupported hypothesis," full of "unsubstantiated premises, cursory investigations, and disintegrating speculations," and Darwin himself as "reckless and unscientific."

CARLYLE, too, refused to accept Darwin's theories, and even Sir RICHARD OWEN (1804-1892), the celebrated naturalist, was an opponent of Darwinism until converted by HUXLEY.

LAMARCK had already shown, in 1809, that the theory of descent was of universal application ; that even man himself, the most highly developed of the mammals, is derived from the same stem as all the other mammals ; and that this in its turn belonged to the same older branch of the ancestral tree as the rest of the vertebrates. He had even indicated the agencies by which it might be possible to explain man's descent from the apes as the nearest related mammals.

Darwin put forward a similar theory that man is descended from some lower form ; a view which T. H. HUXLEY (1825-1895) had already discussed in 1863 in his famous "Man's Place in Nature."

E. H. HÄCKEL (1834-1919), the zoologist, professor at Jena, in his "Anthropogeny," 1874, presented in historical connection the entire series of ancestors through which the human race has slowly evolved in the course of millions of years. He popularised Darwin's teaching in Germany before it gained recognition in England. Indeed, he may be called the prophet of evolution. His "Creation of Man," 1868, covered the same ground as Darwin's "Descent." It had an enormous circulation and was translated into fourteen languages. His "Riddle of the Universe," 1899, enjoys the same popularity. He has taught, like Spencer, that the principle of evolution applies not only to the history of nature, but also to human civilisation and human thought. Häckel was a monist.

He showed the unity of the universe, the merging of energy and matter into one, the underlying unity in inorganic and organic nature. He emphasised the common origin of all organisms. There is no absolute difference between plant and animal, animal and man. There is no schism between body and soul : the psychic development is dependent on the physical and the human consciousness differs from the animal only in degree. The individual soul disappears with the individual body. There is no personal God interfering in human affairs. Nature is the sole ruler.

GEORGE ROMANES (1848-1894),

Professor of Biology in Cambridge, developed further Darwin's views of the mental faculties and their evolution in the animal world and in man. He presented, in natural connection, the entire length of the chain of psychic evolution, from the simplest sensations and instincts of the lowest animal to the elaborate phenomena of consciousness and reason in man. He gave convincing proof "that the psychological barrier between man and the brute has been overcome." Man's power of conceptual thought and of abstraction has been gradually evolved from the non-conceptual stages of thought and ideation in the nearest related mammals. Man's

highest mental powers—reason, speech, and conscience—have arisen from the lower stages of the same faculties in our primate ancestors. Man has no single mental faculty which is his exclusive prerogative. His whole psychic life differs from that of the nearest related mammals only in degree, and not in kind ; quantitatively, not qualitatively.

All this, as we have shown, has been said by Gall (1796), but nowhere is any mention made of him. He is remembered only as a phrenologist, whose system has been discarded long ago.

MODERN THEORIES OF HEREDITY

Buffon, Lamarck, Charles Darwin, Romanes, Brown-Séquard, and Francis Darwin expressed themselves in favour of the inheritance of acquired characters—characters which are acquired during the lifetime of the individual. The leader and founder of the opposite school—the non-inheritance of acquired characters—was AUGUST WEISMANN (1834-1914), of Freiburg (1882), and he was supported by Sir FRANCIS GALTON (1822-1911), who said : "Acquired modifications are barely, if at all, inherited " (*Journal of the Anthropological Institute*, 1876), and by DE VRIES, MORGAN, BATESON, and others. All these latter authorities maintain that only those mutations are heritable which arise as a result of some modification of the germ cell.

Darwin and other biologists accepted the Lamarckian principle of the inheritance of characters acquired by use during the life of individuals. The efforts of the animal to satisfy its instinctive needs, to avoid the painful and secure the pleasurable influences of its environment, result in the formation of habits and in other modifications of structure and function ; and these modifications, according to the Lamarckians, are in some degree inherited by the offspring, or at least determine in the offspring variations in the direction of similar modifications. Now we have three forms of the theory of evolution : (1) The theory of the *Neo-Darwinians*, who deny that any such inheritance takes place, that any determinate variations are provided in this way for the operation of natural selection. According to them, the essential causes of variation are the differences inherent in the germ borne by the individual, and not the experience or behaviour of the individual in the course of his career ; and in denying this, they deny that mind has played any such part in organic evolution ; (2) the theory known as *orthogenesis*, according to which there is a continual changing in a definite direction from generation to generation ; and (3) the *Neo-Lamarckian* theory, according to which the cause of variation is the conscious effort of the individual, an effort passed on to descendants. Each of these theories may be true to the extent that it explains certain facts.

According to Darwin's selection theory, only useful characters can survive. According to a more recent theory, the **mutation theory of HUGO DE VRIES** (1901), variation has not been continuous, but discontinuous, not along an inclined plane, but by steps or sudden leaps ; and new forms, completely and sharply separated from the parent species, have frequently, if not generally, come into existence. According to this theory, useless characters may also survive, and even those that may be hurtful in a small degree. According to De Vries, "Natural selection may explain the survival of the fittest, but it cannot explain the arrival of the fittest."

Inherited variations are called by De Vries " mutations," whereas non-inherited variations are known as " fluctuations." The former are caused by changes in germinal constitution, the latter by alterations in environmental conditions ; the former represent changes in heredity, the latter changes in development. Fluctuations are continually occurring generation after generation ; mutations are rare and occur intermittently. Fluctuations imply a little more or a little less of characters already present ; mutations are novelties, they imply some new pattern.

The appearance of mutations is explained by *Mendelians* as being due to the presence of some definite factor in the fertilised ovum from which the organism sprang. On the other hand, the *Adaptationists* hold that variations which may become transmissible arise as a direct response of the organism to the external forces of its environment; a response which is made possible by the inherent variability or modifiability of the organism itself.

As a result of the permutations of ancestral characters, the appearance of mutations, and the fluctuations of organisms due to environmental changes, it happens that in all cases offspring differ more or less from their parents and from one another. Every offspring is a unique being that is, on the average, more like its kind than like anything else.

AUGUST WEISMANN (1834-1914),

following the suggestion of NUSSBAUM, laid the foundation of his fame by demonstrating the **continuity of the germ plasm** (1885). His theory is to this effect:

The ovum splits up into two portions: (1) a modifiable somaplasm which develops into the organs and tissues of the body generally, and (2) a persistent germplasm which is not used up in the formation of the offspring, but is reserved unchanged for the formation of the germinal cells of the following generation. This germ plasm is situated in the chromosomes of the nucleus. Weismann thought the chromosomes are constituted of an immense number of small parts, which he called "determinants"; hence the character of the offspring depends on the adjustment made by the determinants of maternal and paternal origin. He proved how, after division and subdivision of the zygote or fertilised egg, a colony of cells is formed out of which one only of the colony ultimately develops into a new organism. Hence the new organism becomes, as it were, a brother or sister of the previous organism, and not a son or daughter.

Each one of us, male and female, is developed from a simple undifferentiated cell, the direct descendant of the undifferentiated germ-cells of the parents and grandparents. The germ plasm is potentially eternal and always remains undifferentiated, the cells composing it always remain simple. This is what is meant by the continuity of the germ plasm. The undifferentiated germ-cells, or blastogenic cells, give origin to the soma, and at the same time to the next generation of germ cells, being thus hereditary cells; while the soma gives rise to nothing but itself, and ultimately perishes. The "soma" is the actual body of the adult and exists only for the life-time of the individual. These germ-cells divide and divide, giving origin to similar simple cells until such time as one of them, being discharged, encounters a germ-cell of the other sex—and the result of the combination of the two is that marvellous complex of cells of all orders, the animal body, enclosed in which is a group of unaltered cells, the germ-cells—the future heredity cells (ultimate ova and spermatozoa)—which, in their turn, undergoing discharge, are capable, upon fertilisation, of giving origin to another complex individual. The adult does not transmit certain of his "somatic" qualities by his "soma" but by his heredity cells. The determinants of heredity lie in the germ plasm in the form of "chromosomes" in the heredity cell nucleus. They are protoplasmic, and contain the immediate family qualities and those of recent and long past ancestors. Each species of animal has its special number. In maturation, half of the chromosomes are lost by the male and by the female, but in fertilisation the normal number is made up. This, then, means a reduction of hereditary determinants on each side by one half, and thus we may have here a striking variation brought about for the future organism. It seems certain that the great majority of inborn differences between parent and offspring are due simply to new combinations of previously existing characters. It is easy to see that with sexual reproduction, where two parents are involved in the production of the offspring, there is a continual mixing of different germ plasms, and thus almost infinite changes of new combinations. The

changes or mutations may be either progressive or retrogressive. Any variation in which a characteristic of a remote ancestor recurs is termed a reversion.

This is the theory of the continuity of the germ-plasm on which the fame of Weismann rests; but he, not content with demonstrating the continuity of the germ-plasm, went further and maintained that **the germ-plasm was inviolable,** *i.e.*, that it was impossible for it to be influenced or affected by any means. To justify his position, he was forced to postulate the theory that variations arose, not alone through a mixing of the germ-plasms of germ and sperm, but also that the inviolable germ-plasm was imbued with an intrinsic power of throwing out indefinite variations of varying qualities. On that assumption, he postulated the theory of the all-sufficiency of natural selection. Subsequently, however, he was forced to admit, through the results of experiments by others, that the germ-plasm was not inviolable, but that it could be influenced by various conditions in the environment.

Variations are produced in an individual organism either (1) by external, or (2) by internal influences. External influences comprise climate, food, accidents, and all the effects produced upon the individual by the general surroundings, or his own habits and activities (use or disuse of particular organs). Internal influences comprise those arising out of the qualities inherited from parents and remoter ancestry, qualities which have not been acquired by parent and ancestor, but belong to the parental or ancestral germ-plasm, which has come down to the individual through his parent and ancestors. The germ-plasm, according to this view, though *in* the body, is not strictly *of* it. It has been transmitted from the past through the bodies of successive individuals, each of which has played the part of host to it.

Lamarck and Spencer and other evolutionists held that both kinds of variations (due to external and internal influences) could be transmitted hereditarily; in other words, they considered that acquired variations could be so transmitted. Weismann and his followers contend, on the other hand, that there is no proof, and little, if any, possibility of the transmission of acquired variations, and that only those due to internal influences, *i.e.*, germinal variations, can be hereditarily transmitted. Putting it in another way, the Weismannites consider that evolution is worked by means of "natural selection alone." Internal influences, they say, will supply variations in sufficient numbers and diversity for natural selection to operate upon, and thus promote evolution by (indirectly) preserving such of these chance variations as are useful, and (directly) weeding out those which are detrimental.

The other schools (the Transmissionists), while recognising that *acquired* variations are much less heritable than germinal variations, consider that the former may be, and are, hereditarily transmitted in some cases, and to a certain extent, and thereby supply natural selection with an additional class of variations to work upon.

According to Weismann, a father and mother can endow their posterity with the germ-plasms which they have respectively received from their own parents, but they can do nothing to improve upon them. All the improvement comes from the stimulus of the transmitted culture of past ages—the mental acquirements of the past. These stimuli bring out the possibilities inherited from the progenitors. Weismann addressed himself to the transmission of bodily acquirements chiefly, but we are concerned with the transmission of cerebral acquirements. He cut off the tails of twenty-two generations of mice without producing any transmitted reduction of the tail. But we know from surgical experience that bodily mutilations of adults are not transmitted. Weismann then points to the fact that speech is not inherited; neither is any other human capacity, except elementary instincts; but we inherit a certain nervous mechanism to enable us to speak, and other cerebral endowments for other capacities. As that eminent writer on heredity, Sir **ARCHDALL REID**, has pointed out: What is transmitted is not the acquirement, but the power of making it. It is educability that can be transmitted, but not the results

of education. So much may be admitted. But there comes another problem. Mental activity causes cerebral modifications. Can these produce any effect on the germcells ? Can brain modifications be transmitted ? We shall deal with this problem in Vol. II.

Another problem is whether the germ plasm and its developments can be directly acted on by adverse conditions in the environment. Now, Professor **ADAMI** has brought together overwhelming evidence that alcohol and other poisons do adversely influence the germ-plasm and its developments. Yet, although the direct injurious influences are transmitted through individuals, there is no doubt that the direct inimical influences are, in the long run, as seen in racial survival, counteracted by an indirect reaction of a beneficial nature. This is seen as regards infectious diseases, adverse conditions of life, as in city life. This racial survival through adaptation is attributed to natural selection by Sir Archdall Reid. But its explanation is far easier to the physician by recognising the fact that all living bodies in the presence of continuous inimical influences tend to protect themselves by elaborating an antidotal principle which, ultimately by the educability of the cells, serves to prevent extinction, and thus to lead to survival of a race.

Sir **FRANCIS DARWIN** (British Association Meeting, 1908), and other modern investigators, have given a fresh stimulus to the whole problem of heredity by their view that, in certain cases at any rate, the germ plasm is not confined to the germcells, but is diffused more or less through the entire organism.

GREGOR MENDEL (1822-1884),

Abbot of Brünn, in Moravia, in 1865 published the results of his now famous experiments in the crossing of common peas. His paper appeared in the *Proceedings* of the Natural History Society of Brünn, and it lay buried and forgotten in this publication for thirty-five years. Mendel lived before his time, for apparently no one who knew of his paper was capable of realising its importance. In 1900, after the law which Mendel discovered had been simultaneously re-discovered by three separate investigators, the original paper was brought to light.

The essence of the Mendelian principle is, first, that in great measure the properties of organisms are due to the presence of distinct, detachable elements, separately transmitted in heredity ; and secondly, that the parent cannot pass on to offspring an element—and consequently the corresponding property—which it does not itself possess. In sexual reproduction the characters inherited are not an evenly blended mixture of those of the parents ; but some, at least, are exclusively derived from one parent, or may even be missing ; and that the proportion in which these elements are distributed among the progeny can often be calculated on the abstract theory of probabilities—that is to say, as a mere matter of chance.

No man is pure-bred in respect to all the factors, physical and mental. He may be pure-bred in respect to his musical ability and cross-bred in respect of the colour of his eyes. There may be some inhibiting factor to a character. It may remain latent in the person, and some factors may be broken up in the process of heredity. Factors may also influence one another in different ways, and may thus be either more or less capable of combination in one individual. In these ways there is great scope for variation in progeny, apart altogether from immediate influence on the developed organism or varying environment. On the theory that the germ-cells are physiologically isolated from the parent organism and its environment, we can thus account for variation, provided we assume that variation is due to a mere re-shuffling, or dropping-out, of original factors. (See Prof. Bateson's Presidential Address, British Association Meeting, 1914.)

Mendel formulated certain laws that underlie variation. Thus *regression* means

the tendency of offspring of exceptional parents to "regress" towards the racial average. *Reversion* means the appearance in a child of traits not apparent in the parents, but possessed by some other members of the stock—a grandparent, for example. *Atavism* means the appearance in a child of some trait supposed to be *remotely* ancestral.

Each germ, cell, ovum, or sperm may contain or be devoid of some element or elements; and since all ordinary animals and plants arise by the union of two germ-cells in fertilisation, each resulting individual may obviously receive in fertilisation similar elements from both parents or from neither. In these cases the offspring is pure-bred for the purpose of the character in question, or for its absence. But it may be found by the union of dissimilar germs, one containing the element, the other devoid of it, and in this case we call the individual cross-bred in that respect.

A population thus consists of three classes of individuals, those pure for the presence, having received two doses of an element; those pure for the absence of an element, having received none of it; and the cross-breds, which have received one dose only. A plant, for example, though cross-bred for tallness, may be as tall as one pure-bred for tallness. Each dwarf plant, whatever be its parentage, can only produce dwarf offspring; not having tallness it cannot transmit that property. A cross-bred tall plant can, by self-fertilisation, produce both tall and dwarf offspring.

Mendel called the tall quality dominant and the dwarf recessive, the latter term having been chosen because the characters thereby designated withdraw or entirely disappear in the hybrids, but nevertheless reappear unchanged in their progeny. The recessive quality "withdraws." According to this doctrine of dominance and recession, the corresponding character of the second parent always exists in the offspring side by side with the character which finds expression; but the former, termed recessive, is obscured by the latter, the dominant. This is the explanation of a characteristic feature of a particular grandparent which was not visible in the parent reappearing in the child. It also accounts for those heritable diseases and abnormalities which are transmitted by the females in ancestry and appear in the males. As it passes through a daughter to a grandson, and so on, it must be latent in the germ cells, though, for some obscure reason, it has not found expression. In fact, non-expression of a disease does not imply non-inheritance of a disease, but rather a predisposition to disease.

Applying Mendel's theory to the inheritance of congenital abnormalities we distinguish four classes:

(1) Those in which the defect behaves as a Mendelian dominant. A dominant character is transmitted only from an affected parent, and when the other parent is normal the expectation is that it will appear on the average in half the children. The unaffected member of an affected family never transmits the defect. Example: brachydactyly.

(2) Those congenital abnormalities which are recessive. Recessive characters only appear if the factor for the defect is received by the child from both parents, as is frequently the case in the marriage of first cousins. Each parent may unwittingly bear the factor without showing any trace of it, but if the germ-cells which unite in fertilisation both possess it, the child will show the defect. Examples of this kind are albinism, some forms of deaf-mutism, hereditary epilepsy and insanity.

(3) Those congenital abnormalities which are "sex-limited" in transmission. Sex-limited transmission occurs chiefly in males, rarely in females, and is transmitted from an affected man through his daughters to half their sons. The sons of the affected man are normal, but on the average half their sons are affected and half their daughters are again transmitters. Only if an affected man married a transmitting woman can the affection appear in a female. Examples: colour-blindness and hæmophilia.

(4) Those congenital abnormalities which are undoubtedly hereditary, but which are irregular in their appearance, being sometimes transmitted direct from parent

to child, and sometimes appearing in the children of normal persons who belong to affected families. For example, hare-lip and cleft palate. This class is probably dependent on more than one hereditary factor, one alone being insufficient to produce it.

One conclusion from these theories of heredity is both safe and important: the germ is the undeveloped organism which forms the bond between successive generations; the person is the developed organism under the influence of environmental conditions; "the person is merely the carrier of the germ plasm, the mortal trustee of an immortal substance."

BACTERIOLOGY

Another of the new sciences which sprang up during the last fifty years, after much tedious, self-sacrificing labour, is bacteriology. It revealed a new world, that of the micro-organisms, and contributed more than any other to a huge saving of human lives. In the hands of a number of brilliant and distinguished workers, most elaborate and beautiful methods of cultivating, identifying, and differentiating micro-organisms, which are the cause of a large number of infective, contagious and septic diseases, have been worked out and perfected, and, what is of still greater importance, methods have been discovered by which these injurious effects may be prevented or counteracted.

The germ theory has helped us to manage disease, but the task was laborious. In the first place, it was not easy to destroy the germs without injury to their host, and in the case of some bacilli, though they could be easily killed, their spores had wonderful vitality. Then further research showed that ill effects mainly depended upon what we call **toxins,** substances formed by the bacilli in the blood, or locally, and afterwards absorbed into the blood. This led to the discovery of anti-toxins, and their injection for the prevention of disease.

The origin of this new preventive medicine must be traced back to **EDWARD JENNER** (1749-1823), a pupil of John Hunter, who received £30,000 from the British nation for his discovery of vaccination against small-pox. The first trial of cow-pox-vaccination was made May 14th, 1796. An older process of inoculation had been introduced into England from Mahommedan countries by Lady Mary Montagu (1689-1762) in 1721.

Before Jenner was rewarded so handsomely by a grateful nation he had met with vehement opposition. He was refused a licence to practise by the College of Physicians, treated with ridicule and contempt, and the theologians hurled their anathemas against him. J. C. EHRMANN (1749-1827), a physician of Frankfort, alleged that vaccination was a real anti-Christ. "Are not these scars the mark of the Beast?—they were taken from the cow." Jenner was threatened with expulsion from his club, and was actually prevented from publishing the results of his experiments in the *Transactions of the Royal Society.*

LEEUWENHOEK (1632-1723), in 1683, made mention for the first time of bacteria. One hundred and fifty years later, in 1836, LATOUR discovered the living character of yeast cells by which fermentation was produced, a discovery denied by Liebig and Helmholtz. SCHWANN (1810-1882) shortly afterwards proved experimentally that putrefaction is just as much the work of living organisms as alcoholic fermentation.

In 1856 **LOUIS PASTEUR** (1822-1895), the pioneer of preventive inoculation against disease, confirmed and extended this knowledge, and showed that putrefaction and fermentation were the result of living particles, and that for each type of fermentation a specific particle was necessary; in other words, that putrefaction is due to living ferments and not due to the oxygen of the air, as had hitherto been supposed; indeed, some causes of decomposition could thrive only in the absence of oxygen.

This suggested to Lord **LISTER** (1827-1912) the thought that the putrefaction changes in wound discharges might be due to living organisms, and that the exclusion of these by aseptic dressings would enable wounds to heal more readily. Lister made it possible to operate with safety upon conditions and diseases which formerly proved fatal. Lister published his theory of asepis in 1867. Before that time the mortality in operative surgical cases (amputations) was about forty per cent.; it is now under three per cent., notwithstanding that operations which no surgeon would have dared to attempt before 1860 are now performed. Lister's teaching encountered no more bigoted opposition anywhere than in his own country, and bacteriology was a laughing-stock to most men over middle age up to a comparatively recent time.

Some time before Lister, in 1844, a Budapesth obstetrician, **IGNAZ SEMMELWEISS** (1818-1865) investigated the problem of that fatal fever which levied so heavy a toll on the lying-in women of the hospital at Vienna (ten per cent.), of which he was then a physician. C. E. v. BAER (1792-1876) and OLIVER WENDELL HOLMES (1809-1894) had already hinted at contagion as a factor in these cases (1842), but in vain. Semmelweiss noticed that the deaths among patients were greater in those clinics whose chief attended to post-mortem examinations as well, and he advocated surgical cleaning of the hands before attendance in the maternity wards. This practice was followed by a considerable reduction in puerperal mortality. Henceforth he assailed all uncleanliness in medical practice and aroused the enmity of the orthodox school. He had to leave Vienna and return to his native city, where he became Professor of Midwifery in 1850. In 1860 he published his defence of the employment of antisepsis in midwifery, gynæcology, and surgery, which later made Lister so famous. In 1863 he performed the first ovariotomy operation. He was persecuted in every way, and was urged by his friends to prove his position by experiments on animals, but his energy had already given way and he did not proceed far in the investigation. His sensitive nature was not equal to the strain of violent controversy, and, brooding over the wrongs he suffered, he became insane. Semmelweiss, at a time when bacteriology was still unknown, laid down the doctrine that puerperal fever and other hospital poison diseases are caused by infected material due to decomposed organic matter, and that, by disinfection of the hands with chlorinated lime, the mortality could be reduced by at least sixty per cent.

In 1886 ERNST v. BERGMANN (1830-1907), of Berlin, introduced sterilisation in surgery. [Bergmann greatly advanced cranial surgery in his "Memoirs on Head Injuries" (1873) and "Surgical Treatment of Cerebral Diseases" (1888).]

In 1867 **JULIUS COHNHEIM** (1839-1884), pupil of Virchow, demonstrated the migration of leucocytes and their part in the process of inflammation, a theory which received additional significance by the discoveries of ELIE METCHNIKOFF (1845-1916), the eminent Russian biologist, who developed the subject of immunity on the cellular side by his studies of inflammation, 1884. His theory of phagocytosis, in the hands of Sir **EDWARD ALMROTH WRIGHT** (1861-) and others, led to vaccine-therapy (1902-7), rendering the blood immune to the virus.

In 1880, EBERTH and GAFFKY discovered the typhoid bacillus; in 1882, BAUMGARTEN (1848-) and ROBERT KOCH (1843-1910) discovered the tubercle bacillus, and the latter, in 1883, discovered the cholera bacillus. In the same year EDWIN KLEBS (1834-1913) and FRIEDRICH LÖFFLER (1852-1915) isolated the diphtheria bacillus; and in 1885 ALBERT FRÄNKEL and ANTON WEICHSELBAUM the micro-organism of pneumonia. These are only some of the bacteriologists. From their discoveries grew an enormous body of knowledge.

HISTORY OF DISCOVERY OF ANÆSTHETICS

The aseptic method of performing operations has enabled surgery to make wonderful strides, but another factor in its success was the discovery of anæsthetics in the early part of the century.

What must have been the agonies of patients in pre-anæsthetic days, considering that at the present time we shudder at the thought of having the slightest incision

made without being first rendered unconscious, either entirely or at least locally! Just at the time when successful attempts were made to hypnotise patients for surgical operations, the simpler methods of anæsthesia by ether and chloroform came into vogue. In 1841 JAS. BRAID, of Manchester (1795-1860), made his hypnotic trials, and JAS. ESDAILE (1808-1859), in Calcutta, successfully operated upon mesmerised patients (1840). JOHN ELLIOTSON (1791-1868), who had migrated from St. Thomas's to University College Hospital, was then giving the full weight of his great mental power to mesmerism, although his book on "Surgical Operations Performed in the Mesmeric State without Pain" was not published until 1843. There is no doubt that at the time mesmerism, or the hypnotic trance, was regarded as the accomplished fact of anæsthesia, and that many of the leading men in medicine and surgery accepted it as the long-hoped-for panacea whereby suffering humanity could pass unflinchingly through the ordeal of the surgeon's knife. In France, A. B. RICHERAND (1779-1840) had tried it and pronounced in favour of its value, and other surgeons scarcely less eminent were willing to swallow the doubtful reputation of Anton Mesmer so long as they could benefit their patients by employing methods which had been exploited by him. (See Chapter XXXVII.)

Internal medication by narcotic substances to prevent pain in surgical operations was known in ancient times. In the days of Hippocrates the root of the *Atropa Mandragora* was used for that purpose. It is mentioned also by Albertus Magnus. The vapours given off by these medicaments were noticed to have a stupefying effect on those who prepared them, and in this way came to be applied for surgical purposes in the XIIIth century, and were in general use in the XVth century.

Even local anæsthesia for surgical operations was known in antiquity. Pliny mentions *Lapis Memphiticus*, which was applied in the form of an ointment over parts which were to be cut or cauterised, to render them insensitive.

SIR HUMPHRY DAVY (1778-1829), the great chemist, had suggested **nitrous oxide** as an anæsthetic in 1799, but the suggestion was ignored. In 1818 FARADAY (1791-1867), another great chemist, called attention to the stupefying effects of **ether.** In 1820 **HENRY HILL HICKMAN** (1800-1829) experimented with carbonic dioxide and later nitrous oxide gas on dogs, rabbits and kittens. In 1825 he placed the results before his professional brethren, but everywhere he was met with the greatest scepticism, and his system was generally derided and condemned as dangerous and useless. Disheartened by his failure to secure a hearing from the profession in his own country, Hickman laid the matter before the Royal Academy of Medicine in Paris (1828), but although BARON LARREY, the Surgeon-General of the *Grande Armée*—a friend of Gall—offered himself to be experimented upon, Hickman's discovery was received by the majority of the members with derision and contempt, and the demonstration was allowed to drop. Discouraged and broken-hearted, he returned to England, to die a few months afterwards at the early age of twenty-nine.

ALF. VELPEAU (1795-1867), in his day the leading surgeon of France, declared that the abolition of pain in surgery was a chimera which it was no longer permissible to pursue. MAGENDIE (1783-1855) said he believed that pain was useful, and expressed doubt whether there was any real advantage in suppressing it by making patients insensible during an operation. He added that it was a trivial matter to suffer, and that a discovery the object of which was to prevent pain was of little interest. In England prevailed very much the same opinion, that pain was desirable and salutary.

In 1842 Dr. **CRAWFORD** and **C. WILLIAMSON LONG** (1815-1878), two Americans, made the first trial of ether inhalation, but they did not exploit it.

On October 16th, 1846, the first operation under ether anæsthesia was successfully performed in the Massachusetts General Hospital, Boston, by Dr. **J. COLLIE WARREN** (1778-1856), the administrator being **WILLIAM T. G. MORTON** (1819-1868). **C. T. JACKSON** (1805-1880) and **HORACE WELLS** (1815-1848) of Hartford, Connecticut, also claimed to have used anæsthesia (nitrous oxide) in dentistry in 1844, but Long proved his priority. A fatal case caused Wells to end his life.

Sir **JAMES Y. SIMPSON** (1811-1870) of Edinburgh introduced **chloroform** anæsthesia for surgery and midwifery at the end of 1847; and the ether was neglected in favour of the new element. It was suggested to him by DAVID WALDIE (1812-

1889), a pharmacist. The first trial was made in November, 1847; but previously, in March, 1847, J. P. FLOURENS read a paper before the *Académie des Sciences* on the effects of chloroform on the lower animals, but as in the case of Sir Humphry Davy's discovery of the pain-subduing power of nitrous oxide gas in 1800, no notice was taken of the communication.

Chloroform was rejected for some time by surgeons, who looked upon pain as a tonic; and its employment in midwifery was considered against the teachings of the Bible.

Another factor in the success of surgery is the modern system of **nursing.**

It had its commencement at Kaiserwörth, in Germany, where the first institute for training deaconesses was founded; and it was at this institute that **FLORENCE NIGHTINGALE** (1820-1910), an English lady, acquired the practical knowledge which enabled her afterwards to turn her remarkable gift of organisation to such brilliant account. She went out to the Crimea in 1854 with a body of nurses to take charge of the barrack hospital at Scutari, where she achieved unexampled success. Until then there was no proper nursing by competent attendants outside Catholic orders.

Altogether, hospital architecture and administration have made wonderful strides in the XIXth century. The wards are the very acme of cleanliness, not ordinary cleanliness, but surgical cleanliness, with which no private home, however scrupulous its owner and whatever the number of servants, can compare. The attention a poor patient gets often surpasses what the wealthy can pay for. To enable the reader to appreciate the progress made, I will quote a description of hospitals in the XVIIth century.

Most of the hospitals were still in a lamentable, indeed, a dreadful condition, rather nests of disease than institutions for the cure of the sick; for hospital hygiene, with which even Paracelsus was acquainted, was utterly lost sight of or neglected. In the *Hôtel-Dieu* at Paris single large halls contained more than 800 patients. The entire institution contained 1,220 beds, of which 734 were large, (*i.e.*, five feet wide), occupied by four to six patients, and 486 small (three feet wide) for single patients. The mortality amounted to twenty per cent. Almost all those who underwent operations, particularly amputations, died. The following is MAX NORDAU'S description of this hospital at that period:

"In the lower halls, which lacked light and air, there were no beds. On the tiled floor lay heaps of straw, and upon these pallets the sick crowded each other, packed together like herrings in a cade. On one occasion, when Louis the Saint visited the hospital, the straw upon which the miserable creatures were rolling was so frightfully filthy, stinking and rotten, that the king in affright ordered fresh straw to be brought at once from the Louvre and spread out in the halls. About the middle of the last century (XVIIIth) beds were furnished, but the situation of the sick was in no way improved thereby. In one bed of moderate width lay four, five or six persons beside each other, the feet of one to the head of another, children beside grey-headed old men, indeed, incredible but true, men and women intermingled together. In the same bed lay individuals affected with infectious diseases beside others only slightly unwell; on the same couch, body against body, a woman groaned in the pangs of labour, a nursing infant writhed in convulsions, a typhus patient burned in the delirium of fever, a consumptive coughed his hollow cough, and a victim of some disease of the skin tore with furious nails his infernally itching integument. Medical service was deficient, the medical directions scarcely followed, and the choice of remedies very limited. The patients often lacked the greatest necessaries. The most miserable food was doled out to them in insufficient quantity and at irregular intervals. The nuns were in the habit of feeding with confectionery those patients who seemed to them pious enough, or at least those who reeled off their rosaries with sufficient zeal; but the body, exhausted by disease, required not sweets, but cried out for meat and wine. Such food, however, the sick never received in profusion, save when it was brought to them by the wealthy citizens from the city. For this purpose the doors of the hospital stood open day and night. Any one could enter; any one bring whatever he wished; and while the sick on one day might be half-starved, on another day they might very likely get

immoderately drunk and kill themselves by overloading their stomachs. The whole building fairly swarmed with the most horrible vermin, and the air, of a morning, was so pestiferous in the sick-wards, that nurses and inspectors did not venture to enter them without a sponge saturated with vinegar before their mouths. The bodies of the dead ordinarily lay twenty-four hours, and often longer, upon the death bed before they were removed, and the other sick during this time were compelled to share the bed with the rigid corpse, which in this infernal atmosphere soon began to stink. . . . Whoever has not had enough of these revolting details will find them still more highly coloured in the monograph regarding the Hôtel-Dieu published in 1867 by Dr. Pietra-Santa."

Under Louis XVI. each patient was first furnished with his own bed, the sexes were separated, children placed by themselves, attention given to better nourishment, and the feeding of the sick by the charitable abolished.

Such was the condition almost everywhere, so that in many places physicians declined hospital service as equivalent to sentence of death, and it was not until the introduction of clinical instruction that the situation was somewhat improved.

ANTHROPOLOGY

Another science of special importance to the subject-matter of this work, that sprang up in the XIXth century, is anthropology—meaning "the science of man," though as a matter of fact it confined itself largely to the study of racial characteristics (ethnology), the study of skulls (craniology), and the measurements of the dimensions of the head and body (anthropometry).

One of the fore-runners of anthropology was **PIETER CAMPER** (1722-1789), a pupil of John Hunter and friend of Buffon, Haller, and Blumenbach. He was interested in a variety of subjects: philosophy, anatomy, botany, surgery, and medicine; and had already been studying head-forms before Gall, though from a totally different standpoint. At different times he lectured at the Academy of Fine Arts in Amsterdam, and in one of these expositions, delivered in 1770, he enumerated the principles of the **facial angle,** which from that time has borne his name. These lectures were not published until after his death, in 1791. The method by which he examined the formation of heads was as follows:

If a line be drawn from the upper jaw by the side of the nose over the most prominent part of the forehead, it will form an angle with another line drawn horizontally from the nostril to the opening of the ear. This is the celebrated facial angle of Camper. The angle varies with the form of the head. It is more obtuse or open as the forehead advances, and with the retreating of the forehead it is more acute. The facial angle of the horse, in this way, measures twenty-three degrees, of the ram thirty, the dog thirty-five, orang-outang fifty-six, and the European adult eighty-five degrees.

Camper's facial angle entirely neglects the breadth of the head. It gives no information concerning the form and capacity of the head proper, and no index to intellectual power. It measures only the prominence, without the breadth, of the anterior parts, and takes no cognisance whatever of any of the dimensions of the upper and back parts of the brain. Moreover, the facial angle changes at different periods of life. Also, prominent jaw-bones, which increase this angle, have no relation to the intellect of man. There have been great men with large faces and very prominent jaw-bones. All this was pointed out by Gall, who added that three-fourths of all known animals have nearly the same facial angle, and that the cerebral mass is by no means placed in all animals immediately behind or beneath what is called the forehead. In a great many species of animals, on the contrary, the external table of the frontal bone is at a considerable distance from the internal, and this distance increases with the age of the animal. The brain of the pig is placed an inch lower than the frontal bones seem to indicate; that of the ox, in some parts three inches; and that of the elephant from six to thirteen inches.

PAUL BROCA (1824-1880), who established the localisation of the speech centre in the brain, **originated craniometry** and founded the Anthropological Society of Paris in 1859. In those days anthropologists were looked upon with some

suspicion. They were regarded as men with advanced ideas—ideas which might possibly prove dangerous to Church and State. It had been attempted in 1846 to found such a society, but the attempt was rendered futile by the intervention of the Government; and when permission was granted, in 1859, Broca was bound over to keep the discussions within legitimate and orthodox limits, and a police agent attended its sittings for two years to enforce the stipulation. A similar Society in Madrid was suppressed. The Anthropological Society of London was founded in 1863.

Crania vary much in size and shape, and are only of value because they represent the outline of the brain that was once within. In order to gauge the size of the brain that formerly filled the cranial cavity various methods have been in use.

The internal capacity of the skull first received attention from TIEDEMANN (1836), who determined it by filling the skull with millet seed and then ascertaining the weight of the seed. SAMUEL GEORGE MORTON (1799-1851), of Philadelphia, author of "Crania Americana" (1839), first used white poppy seed, which he discarded later for No. 8 shot, while VOLKOFF employed water. Modifications in the use of these three media—seeds, shot, and water—are still employed by craniologists.

A method of determining the probable weight of the brain from external measurements of the living head is obtained by adding together (1) the head circumference (above supra-orbital ridges and over occipital protuberance; (2) antero-posterior arch (from occipital protuberance to root of nose); (3) transverse arch (from auditory meatus to auditory meatus over vault). The sum of these three measurements taken in inches equals very nearly the weight in ounces of the brain contained in the head measured.

There is a greater variety in the shape of the cranium than in that of its size. If a number of skulls be taken and placed on the floor so that one can look down upon them, we can at once realise that they display a great variety of form.

The variety in the shape of heads has never yet received its due appreciation. Craniologists have been satisfied with taking what they call the **cephalic index,** which conveys very little information. It was invented in 1846 by ANDREAS RETZIUS (1796-1860), of Stockholm. It is obtained by the following formula:

$$\frac{\text{Breadth} \times 100}{\text{Length}} = \text{cephalic index.}$$

The results were grouped by Retzius as follows: Skulls with a proportionate width of eighty or over are termed *brachycephalic;* skulls of which the index lies between seventy-five and eighty are *mesocephalic;* whilst skulls with a proportionate width below seventy-five are *dolichocephalic.* Retzius also recorded the projection of the jaws, demonstrated by Camper.

The cephalic index gives, however, a very poor indication of the size and shape of the brain, for it is a measurement in two directions only. **No conclusions of any value can be drawn from it.** It can tell us nothing of the size of the different lobes of the brain, which presumably have distinctive functions. Even were the brain for intellectual function only, and acted always as a whole—as so many investigators still wrongly believe—the cephalic index would not suffice; for a skull which, according to the measurement of the index, ought to be dolichocephalic might be brachycephalic, and *vice versa;* a skull which is short might make up for the deficiency in breadth; and it gives absolutely no idea of the height and vaulting of the skull. The conclusions drawn from it are, in my opinion, valueless.

Retzius started the anthropological, or, rather, craniological measurements—Kraniometrie. Libraries are now filled with records of these measurements, taken with an exactitude truly admirable. None but anthropologists seem to be interested in them, and we need not marvel at this apathy. For what is the significance of these measurements? They might serve a useful purpose if anthropologists had some theory to guide them, but they have none.

First of all, the measurement of the skull can only have a value if it represents the brain, and on this point, we have seen, we are not agreed. The followers of Gall say yes ! Others say no !

Granted that, as Gall proved, skull and brain do correspond in outline, we must next know the value of the brain. Are anthropometrists measuring skulls only to discover the strength of the motor and sensory centres ? Or are they assuming that the brain has mental functions ? If the latter, whose theory do they accept ? I have already shown that there are some physiologists who declare the entire brain has intellectual functions ; that some say with Gall only the frontal lobes ; some only the parietal lobes, and others only the occipital lobes ! Any absurdity is good enough, so long as it apparently disproves Gall. To examine whether there is anything in his view has so far been considered equivalent to a crime.

In the latter part of the last century a rage for skull measurements arose. Most elaborate instruments were invented for the purpose. Measurements of the body as well as of the head were made systematically. This so-called **anthropometry** was first introduced in 1880 by A. BERTILLON (1853-1914), and at that time solely for police work for the identification of criminals. In 1901 the system of taking finger-prints was added.

One of the greatest experts now existing on the morphology of skulls and skull measurement, an authority to be respected, is Prof. **ARTHUR KEITH,** F.R.S., the Conservator of the College of Surgeons, of London. Other authorities are Prof. **ELLIOT SMITH** and Dr. **SMITH WOODWARD.**

Anthropology has not fulfilled its anticipations. It has contributed a great deal to the knowledge of the lower races, which is really *ethnology*, but nothing to what its title conveys, *i.e.*, to the knowledge of civilised man.

The misuse of craniometry is described by Professor ALEXANDER MACALISTER (1844-1910), in his Presidential Address, Section H., British Association (1892) :

" Despite all the labour that has been bestowed on the subject, craniometric literature is at present as unsatisfactory as it is dull. Hitherto observations have been concentrated on cranial measurements as methods for the discrimination of the skulls of different races. Scores of lines, arcs, chords, and indexes have been devised for this purpose, and the diagnosis of skulls has been attempted by a process as mechanical as that whereby we identify certain issues of postage-stamps, by counting the nicks in the margin. But there is underlying all these no unifying hypothesis ; so that when we, in our sesquipedalian jargon, describe an Australian skull as microcephalic, phænozygous, tapeino-dolichocephalic, prognathic, platurhine, hypselopalatine, leptostaphyline, dolichuranic, chamæprosopic, and microseme, we are no nearer to the formulation of any philosophic concept of the general principles which have led to the assumption of these characters by the cranium in question, and we are forced to echo the apostrophe of Von Töröck : ' Vanity, thy name is craniology.' "

OTHER DISCOVERIES

The XIXth century saw also rapid progress in **chemistry,** starting at the beginning of the century with **JOHN DALTON** (1766-1844), who in his " New System of Chemical Philosophy " (1810) founded, with the assistance of Lavoisier's law, the " atomic theory," showing chemical substances composed of minute elements or " atoms," which combine together according to certain simple principles. This theory enabled him not only to explain all the facts of chemical combination and decomposition which had already been ascertained by experiment, but also that it was possible by their aid to predict what would happen in any further experiments of a similar kind ; and thus he opened the way for modern chemistry.

Dalton was colour-blind, and on his post-mortem examination the phrenologists were able to confirm their theory that this defect is due to a deficiency of a certain part of the brain (one of the supra-orbital convolutions). See Mr. Stanley's paper to the Royal Medical and Chirurgical Society, March 1st, 1845; *Manchester Courier*, August 17th, 1844; and *Journal of Psychological Medicine*, 1856, p. 106.

Transformation in astronomy resulted from the discovery of **spectrum analysis,** thanks to which we know the chemical constitution of the most remote stars more correctly than that of our own planet. [It was in 1822 that Sir WILLIAM HERSCHEL (1738-1822), and in 1859 that G. R. KIRCHOFF (1824-1887) and W. v. BUNSEN (1811-1899) discovered the meaning of the spectral lines.] The **RÖNTGEN rays,** which have the property of traversing all opaque bodies with the exception of metals, were discovered in 1895; and in 1898 Mr. and Mrs. CURIE isolated **radium chloride.** The **electric telegraph** was invented by WHEATSTONE (1802-1875) and COOKE in 1837; later came **telephonic communication** (BELL'S Telephone, 1872), and the realisation of **wireless telegraphy** by HERTZ (1887) and MARCONI (1895). JAMES WATT (1736-1819) made the first **steam engine** (1765), locomotive engines were made in 1804, and the first **railway** by GEORGE STEPHENSON (1781-1848) in 1825; and now we have **aerial navigation,** both by dirigible balloons and by aeroplanes. Finally, as the result of the recent world war, destructive engineering has made such progress that more human lives can be destroyed in an hour than could be massacred formerly in a number of years. This is progress in the wrong direction. Altogether the external achievements of humanity have outrun the moral achievements.

We have shown that novel philosophic theories met with opposition; but in the enlightened XIXth century practical inventions sometimes fared not much better. Thus, when gas was first introduced, such a sagacious and practical mind as that of Sir Walter Scott recoiled from this great practical improvement, apparently for no other reason but that the idea was new to him, and he wrote of the idea as that of a visionary; and yet, before thirty years had passed, he had a gas factory at Abbotsford, and was chairman of the Edinburgh Oil-Gas Company. Similarly Stephenson, who invented the locomotive steam engine (1812), a safety lamp (1815) before Sir Humphry Davy, and built the first railway (1825), was ridiculed and violently opposed by all the great men, with a few exceptions. Still, he ultimately conquered all opposition. It seems that it is a primary impulse of man to reject the new. This is more likely to be the case where the new doctrine treats of matters not lying on the surface, and where a personal knowledge and conviction of the truth can hardly be obtained without laborious study and observation. If, in addition, the new doctrine should clash, or should appear to clash, with established views on points on which the feelings are apt to be excited and interested, we may reckon, with absolute certainty, even at the present time, on opposition to it.

The XIXth century saw also the extension of education to the masses of the population through the establishment of **compulsory elementary education,** and the propaganda for popular education, beginning in Switzerland with PESTALOZZI (1746-1827) and his follower, the celebrated FRÖBEL (1782-1852), the founder of the Kindergarten. Pedagogics and juvenile psychology have been treated by BINET, SEGUIN, STANLEY HALL, MARIA MONTESSORI, and others. DIETRICH TIEDEMANN (1748-1803), with his "Observations on the Development of the Mental Capacities in Children" (1787), was followed nearly a century later with an essay by CHARLES DARWIN, "Psychology of Infants" in *Mind* (1877); by WILHELM PREYER (1841-1897), with his classical work on "The Mind of the Child" (1881); by J. MARK BALDWIN, "Mental Development in the Child and the Race" (1895); and a host of others too numerous to mention. Finally came the enormous spread of knowledge by periodical literature and the enormous power of the Press, which is not always exercised for the good of the public.

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