F. Lombroso.

THE

INSANITY OF GENIUS

PRINTED BY
SPOTTISWOODE AND CO., NEW-STREET SQUARE
LONDON

THE

INSANITY OF GENIUS

AND THE

GENERAL INEQUALITY OF HUMAN FACULTY

PHYSIOLOGICALLY CONSIDERED

BY

J. F. NISBET.

AUTHOR OF 'MARRIAGE AND HEREDITY' ETC.

THIRD EDITION

London

WARD & DOWNEY

12 YORK STREET, COVENT GARDEN

1893

PREFACE

MEN of genius have exercised a powerful influence in the world since history began. Yet they are still more or less of an enigma even to themselves. As chiefs and warriors among savage tribes, as men of letters, art, or science, statesmen or military commanders in civilised communities, they win the admiration of their fellows without furnishing in their own lives any conclusive indication of the means by which their success is achieved. They strike out a path for themselves, and seem to owe little or nothing to help or example. Genius has never been the monopoly of any class or system. It is as likely to manifest itself in the peasant as in the peer, and, indeed, in any list that might be drawn up of the great men of the world, examples would be found of intellectual capacity asserting itself in all conditions of life, and quite independently of the much-vaunted advantages of education. By what fatality a small number of individuals thus find themselves born to pre-eminence in every successive generation—carrying, so to speak, the marshal's baton in their knapsack—is one of the most interesting questions that can engage the human mind, and many, accordingly, have been the speculations indulged in with regard to the nature and origin of the gifts which lift the favoured few above the general level of their species.

For over two thousand years some subtle relationship has been thought to exist between genius and insanity. Aristotle noted how often eminent men displayed morbid symp-

toms of mind. Plato distinguished two kinds of delirium—one being ordinary insanity, the other the spiritual exaltation which produced poets, inventors, or prophets, and which was not an evil but a gift of the gods. The *furor poeticus* and the *amabilis insania* of the Romans had reference to the same phenomenon. Dryden borrowed from Seneca the suggestion of his well-known line as to great wit and madness being near allied. Lamartine spoke of the *maladie mentale qu'on appelle génie*, and Pascal pointed out that *l'extrême esprit est voisin de l'extrême folie*, furnishing in his own person a sad exemplification of his view. In modern times the connection of genius with insanity has been scientifically insisted upon by Lélut, Moreau (de Tours), Lombroso, and one or two more recent writers. Lélut, in 1837, scandalised the world of letters by declaring upon the physiological evidence furnished by the life of Socrates that the 'father of philosophy' was not figuratively, but literally the victim of sensory hallucinations, and, ten years later, the same authority passed a similar judgment upon Pascal.[1]

Following up this line of inquiry Moreau, in 1859, laid down the principle, based upon a number of rather doubtful examples, that genius was essentially a *névrose*, or nerve affection, his contention being that originality of thought and quickness or preponderance of the intellectual faculties were organically much the same thing as madness and idiocy.[2] A few years later Lombroso, in Italy, supported this *névrosité* theory, quoting some further examples of insanity in distinguished men or their near relatives, but admitting that many others had shown no trace of mental aberration.[3] Various German writers, notably Hagen[4] and Radestock,[5]

[1] Lélut: *Du Démon de Socrate*, and *L'Amulette de Pascal*.
[2] Moreau: *La Psychologie morbide*. [3] Lombroso: *Genio e Follia*.
[4] Hagen: 'Ueber die Verwandtschaft des Genies mit dem Irresein,' *Allgemeine Zeitschrift für Psychiatrie*, 1877.
[5] Radestock: *Genie und Wahnsinn*, 1884.

have since given a similarly qualified adherence to Moreau, while Ribot,[1] in France, touching incidentally upon the question, has remarked that the objections taken to Moreau's theory have mainly been sentimental and not very distinguishable from prejudices, and that genius, whatever it may be, is but rarely transmitted.

On the other hand, there has always been a strong body of opinion, philosophical and scientific, against the supposed connection of genius with insanity. Locke, Helvetius, and other early authorities, ascribed all intellectual superiority to education; and, in the last century, in England, it was generally believed that men were not naturally adapted by mental constitution to one pursuit more than another, but that, when a particular aptitude was evinced, it was due to the direction given to the mind by casual events or circumstances. In accordance with this view Dr. Johnson maintained that genius resulted from a mind of large general powers being turned in a particular direction. Charles Lamb, forgetting the fact that he himself had been confined in a lunatic asylum, expressed a similar opinion. 'So far from the position holding true,' observes Lamb, 'that great wit (or genius in our modern way of speaking) has a necessary alliance with insanity, the greatest wits, on the contrary, will ever be found to be the sanest writers. It is impossible for the mind to conceive of a mad Shakespeare. The greatness of wit by which the poetic talent is here chiefly to be understood manifests itself in the admirable balance of all the faculties. Madness is the disproportionate straining or excess of any one of them.' Goethe, also, was opposed to the mad view, holding that the man of genius summed up in his own person the best qualities of the family or the race to which he belonged.

Unsupported as it was by any evidence except the

[1] Ribot: *L'Hérédité psychologique* 1887.

recorded insanity or eccentricity of a few great men, and leaving unexplained the cases of the many who had lived in the full enjoyment of their faculties, Moreau's theory naturally aroused the keenest opposition. The great physiologist, Flourens published, in 1861, a treatise contemptuously refuting it as absolutely fatal to the dignity of man. 'I could as soon believe in the assimilation of virtue and vice,' said Flourens, 'as in that of genius and insanity. Although vice has so long flourished in the world, virtue, as Fénelon has remarked, is still called virtue, and cannot be dispossessed of its name. So,' added Flourens, 'will it be with genius; and what vice has been unable to do with regard to virtue, that will science be unable to do with regard to genius. Genius, in short, will always be genius. . . . We are eternally reminded of the hallucinations of Socrates and Pascal. Socrates believed he was accompanied by a demon or familiar; Pascal thought he saw a precipice open at his feet. But what does all this prove? Does it prove that hallucination is genius, or that it produces genius? Without their hallucinations would not Socrates still have had his good sense and Pascal his *grand esprit*? Is it not the fact that the relations of genius and insanity are merely external, occasional, and fortuitous? . . . Genius is the faculty carried to an extreme of seeing and thinking justly. Many roads lead to the truth. The man of genius is he who opens these roads.'[1]

Among English scientific men Moreau's views have found little favour. Galton, in 1869, put forward a theory of hereditary genius,[2] maintaining that intellectual gifts of whatever kind—literary, poetic, artistic, philosophical, or administrative—were the attributes of a superior type of humanity, and that, like the physical perfections of the race-horse or the prize-bullock, they were transmissible from one generation to another in the favoured families where they

[1] Flourens: *De la Raison, du Génie, et de la Folie.*
[2] Francis Galton: *Hereditary Genius.*

occurred. Maudsley has also thrown the weight of his authority into the scale against Moreau. 'It is undoubtedly true,' says this writer, 'that where hereditary taint exists in a family, one member may sometimes exhibit considerable genius while another is insane or epileptic; but the fact plainly proves no more than that in both there has been a great natural sensibility of nervous constitution, which, under different outward circumstances or internal conditions, has issued differently in the two cases. Such a condition, moreover,' Maudsley goes on to say, 'is not characteristic of the highest genius, since anyone possessing it lacks, by reason of his great sensibility, the power of calm, steady, and complete mental assimilation, and must fall short of the highest intellectual development—of the truly creative imagination of the greatest poet, and the powerful, almost intuitive ratiocination of the greatest philosopher. His insight may be marvellously subtle in certain cases, but he is not sound and comprehensive. Although it might be said then, by one not caring to be exact, that the genius of an acutely sensitive and subjective poet denoted a morbid condition of nerve-element, yet no one, after a moment's calm reflection, would venture to speak of the genius of such as Shakespeare and Goethe as arising out of morbid conditions.' Again, 'the acts of the genius may be novel, but they contain, consciously or unconsciously, well-formed design,' whereas 'the acts of the person who has the evil heritage of an insane temperament are purposeless, irregular, and aim at the satisfaction of no beneficial desire. . . . In both cases there may be an uncommon deviation from the usual course of things; but in the one case there is the full recognition of the existing organisation as the basis of a higher development, in the other there is a capricious rebellion as the initiation of a hopeless discord.'[1] And George Henry

[1] Maudsley: *The Pathology of Mind.*

Lewes's studies led him to the conviction that nothing was less like genius than insanity, although unquestionably some men of genius had had occasional attacks of this malady.[1]

Latterly, heredity and environment have been recognised as factors in the moulding of genius. Herbert Spencer regards the great man as the product of many co-ordinated social influences over which he personally has no control.[2] 'Along with the whole generation of which he forms a minute part,' says the eminent evolutionist, 'along with its institutions, language, manners, and its multitudinous arts and appliances, he is a resultant. The genesis of the great man depends upon the long series of complex influences which has produced the race in which he appears and the social state into which that race has slowly grown. . . . Before he can remake his society, his society must make him. All those changes of which he is the proximate initiator have their chief causes in the generation he is descended from.' This view is controverted, however, by a recent writer of some distinction in America. 'The causes of production of great men,' says William James, 'lie in a sphere wholly inaccessible to the social philosopher. He must accept geniuses as data, just as Darwin accepts his spontaneous variations. For him, as for Darwin, the only problem is, How does the environment affect them, and how do they affect the environment? Now, I affirm that the relation of the visible environment to the great man is in the main exactly what it is to the "variation" in the Darwinian philosophy. It chiefly adopts or rejects, preserves or destroys—in short selects him.' The determining causes of the great man, in Mr. James's opinion, are, 'molecular and invisible, and inaccessible, therefore, to direct observation of any kind. . . . The same parents, living in the same environing conditions, may at one birth produce

[1] *Fortnightly Review*, February 1872.
[2] Herbert Spencer: *Principles of Sociology*.

a genius, at the next an idiot or a monster . . . and the more we consider the matter, the more we are forced to believe that two children of the same parents are made to differ from one another by a cause which bears the same remote and infinitesimal proportion to its ultimate effects as the famous pebble on the Rocky Mountain crest, whose angle separates the course of two rain drops, itself bears to the Gulf of St. Lawrence and to the Pacific Ocean.'[1]

And more recently still, Henri Joly, rejecting Moreau's views, which he holds to be untenable, concurs to a large extent in the environment theory of William James and in the physiological view expressed by Goethe. 'The great man,' says Joly, 'is evidently the culminating point of his race, and all experience shows the unlikelihood of two geniuses following each other in the same family. If, however, by the side of an extraordinary individual immediately preceding or succeeding him, there should be found a nature resembling his, it appears almost always under a feminine form. Here may be found maintaining for a time, or reviving, their lustre, those gifts which the head of the family has brought to perfection, and whose fertility at the same time he has exhausted.'[2]

The merely literary theories of genius are numerous, but too vague to call for serious consideration. For example, Oliver Wendell Holmes conceives genius to be a 'creating and informing spirit which is with us and not of us. This,' he goes on to say, 'is the Zeus that kindled the rage of Achilles; it is the muse of Homer; it is the demon of Socrates; it is the inspiration of the seer; . . . it shaped the forms and filled the soul of Michel Angelo, when he saw the figure of the great law-giver in the yet unhewn marble, and the dome of the world's yet unbuilt Basilica against the black horizon; . . . it comes to the least of us as a voice that

[1] *Atlantic Monthly*, October 1880.
[2] Henri Joly: *Psychologie des Grands Hommes*, 1883.

will be heard; . . . it lends a sudden gleam of sense and eloquence to the dullest of us all; we wonder at ourselves, or, rather, not at ourselves but at this divine visitor who chooses our brain as his dwelling-place and invests our naked thoughts with the purple of the kings of speech or song.'[1] Very pretty, but very unsubstantial! Mrs. Oliphant, again, wonders whether not only an infusion of Irish blood, but the breathing of Irish air, for a generation or two, has not quickened the imagination of the Irish descendants of English settlers in Ireland;[2] while 'Ouida,' greatly daring, urges that the social atmosphere of England is fatal to poetic genius and that of Italy peculiarly favourable to it.[3]

From this review of authorities, great and small, it is clear that no convincing explanation of genius has yet been put forward. The various theories above set forth are one and all open to the fatal objection that they do not cover all the admitted facts of the case. While insanity treads upon the heels of genius in quite a remarkable number of instances, the fact remains that many men of the highest attainments retain full possession of their senses to the last, and otherwise display no outward affinity with the insane and the idiotic. Equally insufficient is Galton's theory of hereditary genius. For if there is one thing more clearly established than another in this connection, it is that the families of men of genius, so far from exhibiting any of the qualities of prize stock, fall considerably below the average both in point of numbers and fitness. If education be pointed to as an all-important element in the making of character, we may ask what it did for Faraday, Dickens, or Burns, who received but a very insignificant amount of schooling. Year by year thousands of young men are turned out by the universities and the higher schools of the country, but very few rise to the level

[1] Oliver Wendell Holmes: *Mechanism of Thought and Morals.*
[2] Mrs. Oliphant: *Life of Sheridan.*
[3] *North American Review*, February 1890.

of genius Such education as is received in his youth by a great man has seldom much to do with the shaping of his career. It was not education that made Shakespeare a poet, Reynolds a painter, or Darwin a naturalist. As to the Johnsonian theory of genius, one can hardly believe that it was ever based upon practical observation. Diversity of tastes and aptitudes is shown by boys in the schoolroom long before circumstances influence their lives materially, and if an eminent poet or painter could be found willing to take the command of an army in the field, it is inconceivable that a successful general should, by taking thought, excel in writing poetry or painting pictures in times of peace. Much is said, again, of the importance of taking pains. But nothing is more certain than that industry alone is not enough to enable the aspirant in any walk of life to become distinguished. Some men toil hard to learn what others acquire by the slightest application. Nay, more, the art of taking pains is, itself, a natural endowment, like a good or a bad memory, and is probably responsible for much of the difference existing between the reckless, scatterbrained ne'er-do-well, who never accomplishes anything, and the steady, persistent worker who, with similar faculties, carves his name indelibly upon his epoch.

Turning now to the philosophical view that the great man is the resultant of many co-ordinated social factors, it is not easy to realise how such influences should have so impinged at the little town of Stratford-on-Avon, on April 26, 1564, as to ensure the birth of one William Shakespeare. Admitting that the sixteenth century in England was favourable to the advent of a great dramatic poet, we are entitled to ask why William Shakespeare, the third child of his father, was the chosen man rather than his brother Gilbert, who became a respectable hosier, or his brother Edmund, who was an actor of no repute. The man

of genius necessarily contains within the four corners of his system all the elements of his greatness. Environment may be favourable or unfavourable to him; he may be unnoticed by his contemporaries, and obtain merely the tardy recognition of posterity, or conceivably he may be snuffed out altogether by adverse circumstances before being able to make his power felt. With the genius that perishes in embryo, or that never comes to perfection, we are not here concerned; for, although it might be curious to speculate as to the number of able generals unhappily shot as subalterns in their first engagement, or as to the village Hampdens who have lost their opportunity through the passing of the Reform Bill, the inquiry could hardly be of a practical character. To the genius that contrives to assert itself environment is more or less an accident. It is true that we do not look for the rise of a great dramatic poet like Victor Hugo among the Zulus, or of a Mozart among a tribe of tom-toming savages. But this admits of easy explanation. The great man assimilates and recasts the material supplied him by his epoch. It is the faculty of utilising existing material that constitutes his genius, and this he cannot be said to owe to his environment. It is something personal to himself; something due to his physical organisation. For, clearly, the social influences which act upon a Victor Hugo and a Mozart, act equally upon masses of their totally undistinguished countrymen. The 'heir of all the ages' is never alone in the enjoyment of his privileges; he shares them with multitudes of his fellow-men. Merely to be born in an epoch favourable to the advent of a great poet, a great commander, or a great statesman, implies little or nothing, therefore, as to the individual's chances of distinction. Looked at from any point of view, in short, the inadequacy of the existing theories of genius is manifest.

This is obviously one reason why another attempt should be made to solve the problem of what constitutes genius. It is not, however, an entirely sufficient reason. If so many distinguished philosophers and physiologists have been unable to come to any agreement upon this subject, what justification, it may be asked, have I for taking it up? The answer to this is simple. Within the past few years science has opened up new methods of inquiry, thrown new light upon many cognate subjects, and placed new instruments in the hands of the investigator for getting at the truth. The results of modern research affecting most intimately the question of genius are, first, the localisation of the functions of the brain, and, secondly, the established kinship of an extensive group of brain and nerve disorders, of which insanity or paralysis is the more obvious expression, and gout, consumption, malformations, etc., the more obscure. Both these branches of knowledge are of greatest utility in solving the problem before us; and their due application to the facts of biography will be found to rob genius of much, if not all, of the mystery which has hitherto enshrouded it.

The result is to place upon a solid basis of fact the long-suspected relationship of genius and insanity. Apparently at the opposite poles of the human intellect, genius and insanity are, in reality, but different phases of a morbid susceptibility of, or a want of balance in, the cerebro-spinal system. This conclusion is arrived at from a close examination of the lives of all the greatest men whose personal and family history is authentically known. For obvious reasons I have refrained from dealing with living personages; but the abundance and sufficiency of the material to hand happily renders this restriction of no moment. In the selection of names I have been guided solely by the desire to obtain a representative list. I have, indeed, been under no temptation to trim or

square the facts, for whenever a man's life is at once sufficiently illustrious and recorded with sufficient fulness to be a subject of profitable study, he inevitably falls into the morbid category—a remarkable proof, surely, of the soundness of a theory which after all need not, like a chain, be tested by its weakest link.

My method of inquiry is not unlike that of the family doctor who is called in to examine a patient. With the help of the biographer I ask the great man, figuratively speaking, to stand up; I look at his tongue, feel his pulse, and inquire into his family history. By this means a wholly different view of genius is obtained from that generally current. The biographer, unfortunately, is too often as troublesome a person to deal with as the family nurse. It is difficult to learn the essential facts of a great man's life if they conflict, as they not infrequently do, with the biographer's notion of greatness. Commonly, the writer falls in with the popular view of genius, which is that a certain quasi-divine influence, or *afflatus* of an inscrutable nature, descends upon certain individuals after the manner of the Holy Ghost. If, however, he happens to be of a scientific turn of mind, he affects to believe that the great man has inherited his genius from his mother, or that, as Goethe held and as Joly has further insisted, he is the culminating point of his race, the crowning triumph of a sound and vigorous ancestry on both sides. In any case, the smallest suggestion that the object of his veneration has not been entirely sane, affects the ordinary biographer as a red rag affects a bull. He loses temper and treats it as a shameless affront to the great man's memory; for insanity, in his view, seems to be a sort of reprehensible thing which no well-conducted person would be guilty of. Sometimes he condescends to argue the point with the subtlety of a special pleader, and when the facts happen to be too strong for him,

he is ready with an explanation as to 'over-work,' 'anxiety,' 'excessive strain,' 'excesses,' and the like.

Still, patient research in biography brings to light a vast number of facts of an instructive character, all helping to solve the problem of that diversity of faculty which is seen to exist among men born under similar circumstances. The heredity of genius is abundantly established, but it is not heredity of the simple and direct kind imagined by Galton when he wrote his treatise on the subject twenty years ago. Variation steps in at every point, and an instability of the nervous system of one or both parents manifests itself in the offspring in a manifold shape, the sensory or intellectual faculties being quickened at the expense of the nutritive, and *vice versâ*, upon a scale of almost infinite complexity. The word genius is susceptible of many interpretations. For the purposes of this inquiry I give it the widest, applying it not merely to the creative gift in literature and art, but to that inherent ability which enables its possessor to excel in any given sphere of human activity, literary, artistic, scientific, administrative, military, commercial, religious, philanthropic, or even criminal. Genius is essentially a manifestation of nerve energy, and the scope of a man's faculties is necessarily determined by a physical organisation over which he has no control. In thus asserting the principle of a fatalism in the lives of great men, like that which Orientals conceive to exist in all human affairs, I am well aware that I am flying in the face of many excellent treatises written for the edification of the young; but no fiction, however well-intended, can, after all, be as beneficent as truth, and if any prejudices suffer from contact with the facts set forth in the following pages so much the worse for them.

Incidentally, I endeavour to lift the veil from one or two obscure but interesting subjects, which, in an inquiry of this kind, force themselves upon the attention. The cause and

the manner of Shakespeare's death are, for the first time, investigated in the light of his family history, or such of it as is known to us, and the result is to convey a different impression of the man from that hitherto prevailing. From the neuropathic point of view there are incidents in Shakespeare's life, which, though small, are extremely significant, and by a new chain of circumstantial evidence, of which the signatures attached to his will are an important link, the death-bed scene of the poet is reconstituted in a manner which only the latest advances of physiological and medical science have rendered possible. For the first time, also, the difficult subject of Inspiration is made to yield up, as it seems to me, some portion at least of its secret. 'The great desideratum in the theory of intellectual character,' says Bain, 'is to give an intelligible resolution of the innate power of recasting and moulding the raw material of thought, of the determination to self-activity, so to speak, in place of remaining content with the received forms and order of the communicated impressions. In short, it is the problem of original genius that is the reproach of the schools of mental philosophy.' To some extent, I venture to think, this reproach is now wiped away, and here, again, I avail myself of the latest discoveries with regard to the mechanism of the brain and nervous system. Phrenology necessarily receives some share of attention, and is, in a limited degree, rehabilitated, or, at least, shown to have more foundation in fact than seemed at first compatible with the mapping out of the sensory and motor areas of the brain upon Ferrier's system.

Lastly, this investigation of the neuropathic side of genius will be found to throw fresh difficulties in the way of an application of the principle of Natural Selection to the human race. In his latter years, Darwin's confidence in his theory as applied to man was somewhat shaken, and his distinguished co-worker, Alfred Russel Wallace, has since admitted

that the 'noblest and most characteristic of human faculties' do not appear to come under the Darwinian law. Whatever may be man's relations with the lower animals, and whatever may be the causes of Darwin's spontaneous variations, the fact, now clearly established, that the progressive achievements of the intellect are wholly unconnected with a survival of the fittest, may be allowed to have an important bearing upon the evolution theory.

LONDON: *March*, 1891.

PREFACE

TO

THE SECOND EDITION

FROM the rapid sale this book has met with, a second edition being called for within the space of a few months, and the keen controversy it has excited in many quarters, it would appear that I did not over-estimate the desirability of endeavouring anew to solve the perplexing question of genius, and to ascertain, in the light of the latest discoveries in physiology, its bearing upon the progress of the human race. 'The Times,' in a leading article, characterised the subject of my inquiry, namely, the genesis of the better members of the community, as 'one of vital importance to every civilised country.' Acknowledging the force of the evidence brought forward in support of my view, the leading journal went on to say: 'History seems to teach that the continuance of great gifts, either mental or physical, for several successive generations, although not unknown, is at any rate highly exceptional; and that the rise of individuals above the current level of humanity is most frequently compensated for, so to speak, by a swing of the pendulum in the opposite direction. . . . At present, we fear, in so far as the facts offer themselves to

experience, the inheritance of great qualities is the exception rather than the rule.' Mr. Galton himself, whose opinions as expressed in his work on 'Hereditary Genius' I had set myself to refute, felt constrained to admit, in an address delivered before the recent Congress of Hygiene and Demography, that the best, like the worst, members of the community, did not seem to be able to hold their own in point of fecundity.

Professor Huxley also has been good enough to express his general agreement with me on this question in the following terms: 'Genius to my mind means innate capacity of any kind above the average mental level. From a biological point of view, I should say that a "genius" among men stands in the same position as a "sport" among animals and plants, and is a product of that variability which is the postulate of selection both natural and artificial. In my apprehension, Darwin's theory proper assumed variation as a fact, and does not attempt to account for it, nor can be called upon to do so. And ever since the subject was first discussed, I have tried to insist upon this. On the general ground that a strong and therefore markedly abnormal variety is, *ipso facto*, not likely to be so well in harmony with existing conditions as the normal standard, which has been brought to be what it is largely by the operation of those conditions, I should think it probable that a large proportion of "genius sports" are likely to come to grief, physically and socially, and that the intensity of feeling which is one of the conditions of what is commonly called genius, is especially liable to run into the fixed ideas which are at the bottom of so much insanity.'

That such weighty support as the foregoing should be lent to my view, in however qualified a degree, more than compensates me for the obloquy I have incurred from anonymous reviewers who have roundly asserted my theory to be

that all men of genius are lunatics. No intelligent reader of the book need be told that such an assertion is nonsense. Genius is not lunacy; it is insight, power, and energy in excess of the normal allowance, and my contention is that such great gifts, however desirable in themselves, are not obtained, as a rule, without some disturbance of the healthy equilibrium of the brain and nervous system. Emerson had some inkling of this truth, though he knew nothing of the mechanism of mind upon which I am able to base it. 'In the chief examples of religious illumination,' he observes, 'somewhat morbid has mingled, in spite of the unquestionable increase of mental power. . . . Shall we say that the economical mother disburses so much earth and so much fire to make a man, and will not add a pennyweight though a nation is perishing for a leader? . . . If you will have pure carbon, carbuncle, or diamond to make the brain transparent, the trunk and organs shall be so much the grosser; instead of porcelain they are potter's earth, clay, or mud.'

It has been objected to my theory that neuropathy exists among the 'dolts and dunderheads' of the world in perhaps as great a degree as among the men of genius. I dare say it does. Indeed, I should expect this to be the case wherever the dolts and dunderheads fall as much below the average level of mental capacity as men of genius rise above it. I expressly say that the soundest man is he who most nearly approaches the average. It is upon the medium type that Nature evidently relies for the continuance of the species, not upon extremes or accidental variations. All Darwinians will admit in the abstract that divergencies or variations from the main type are bad and bound to come to naught. Nevertheless, there is one variation for which some among them deem it their duty to stand up at all hazards, namely genius. I can attribute this only to prejudice—to the rooted conviction which has obtained for so many years that

exceptional ability of any kind denotes the superior animal. It will surely be evident on a moment's reflection, that if the musician with his exceptional ear, or the painter with his exceptional eye, were as sound and as prolific as his neighbours, and if his gift were freely transmissible, the human race would soon be splitting up into a number of distinct species, each with a special endowment. On Professor Huxley's showing it is inevitable that all departures from the mean, in the human species, including those which constitute genius, should be unsound.

In the face of the existing evidence, it cannot be asserted that among the general population of the country there is to be found anything like as much nerve disorder as among men of genius of the first rank. For the purposes of comparison in this respect I fortified myself, while writing the book, with the health-record of a number of average men of my acquaintance, but I thought it safer on the whole to take the wider basis afforded by the Registrar General's returns, in which, be it observed, the dolts and dunderheads are thrown into the scale against me, since they tend to make the total amount of neuropathy greater than that existing among average individuals. Some of my critics have sapiently inquired why nothing was heard of neuropathy in Homer's time, or in Shakespeare's, forgetting that the very anatomy of the body, to say nothing of the causes of the nervous ailments, was not then discovered; others, with as little justice, have commented adversely upon the very slight evidence offered at the close of the different chapters as to the ailments or the causes of death of the eminent men who flourished from two or three centuries ago. With regard to the latter I would observe that my reason for mentioning them in the lump is to show that although only the slightest evidence is procurable respecting them, that evidence, as far as it goes, tends to support my view. The whole strength of the case

for the insanity (i.e. the unsoundness) of genius lies in the lives of the great men of the past few generations, about whom nearly everything is known. And it is worthy of remark that, as a rule, in their case the greater the genius the greater the unsoundness.

September 1891.

CONTENTS

CHAPTER I

CHAPTER II

CHAPTER III

CHAPTER IV

CHAPTER V

CHAPTER VI

CHAPTER VII

THE

INSANITY OF GENIUS

CHAPTER I

THE PHYSICAL BASIS OF GENIUS—MIND AN UNBROKEN MATERIAL CHAIN OF CAUSES AND EFFECTS—STRUCTURE OF THE BRAIN—ITS ACTION—SENSORY AND MOTOR AREAS—THE SUBDIVISION OF FACULTY—MENTAL ASSOCIATIONS AND ACQUISITIONS—ILLUSTRATIONS OF DEFECTIVE ACTION IN THE VARIOUS CENTRES—HYPNOTISM AND ITS LESSONS—EFFECTS OF DRUGS AND ALCOHOL—NON-EXISTENCE OF THE WILL—DEPENDENCE OF MENTAL FUNCTION UPON BRAIN STRUCTURE—DEGREES OF MENTAL DEVELOPMENT IN INDIVIDUALS—THE KEY TO GENIUS

MUCH of the uncertainty prevailing with respect to the nature of genius and the conditions of its appearance, is due to a habit of looking upon the human mind as an intangible something, a spiritual essence, associated in some way with the body, but not governed by the laws of matter. Upon reason, judgment, imagination, and other abstract terms of a like degree of vagueness, there have been endless disquisitions by eminent men of past ages, who have never succeeded in establishing among themselves a definite or incontrovertible basis of agreement. While there has been but one truth requiring exposition, there have been many different and opposed schools of philosophy professing to expound it. The cause of so much divergence of opinion is plain. Until the anatomy of the brain and nervous system was as closely studied as it has been within the past twenty years, all reasoning as to the processes of sensation and thought was necessarily as unsound as the methods of treating disease which obtained before the discovery of the circulation of the blood. The Lockes, the Dugald Stewarts, the Benthams, the

Humes, and other distinguished writers of a bygone day, who discussed the operations of the mind, were somewhat in the position of a man who should presume to lecture upon the steam-engine without knowing anything of its internal arrangement of valves and pistons. Happily the inquirer into the mysteries of thought is no longer constrained to wade, as in the past, through a bottomless quagmire of speculation; he has now something like a solid footing to go upon, and the relations of mind and matter have become like other branches of science, the subject of exact investigation.

It is to physiology more particularly that the world owes its deliverance from the long reign of error or misconception as to the operations of the mind. The development of the brain and nervous system is traced from the most rudimentary beginnings. In the lowest living forms nerve does not exist. We see merely a sensitive pulp moving without any apparent organs of sense, though possibly in its seemingly homogeneous substance there may be differentiated tracks—the rudiments of nerves—along which sensation travels. The earliest appearances of a nervous system as we ascend the scale of life are a few filaments connected by a nerve cell or a group of nerve cells. These, by-and-by, show a tendency to cluster at one point, to lay the foundation of a brain, but we get as high as the fishes before discovering any more complicated structure than sensory ganglia and nerves. The rudimentary brain consists of the cerebellum and the medulla oblongata, those portions of the brain substance which are in immediate connection with the spinal column, and where the various organic and automatic functions of the body appear to be carried on. Many grades of the animal creation get on very well with no other mental equipment. In the higher animals, including man, there is found, superposed upon the cerebellum, the cerebrum, which fills the upper portion of the skull in the shape of the right and the left hemispheres, and where, in a manner presently to be indicated, sensory impressions are received from the outer world, ideas formed, and orders given for transmission to all parts of the muscular system.

All mental processes are now shown to be an unbroken

material chain of causes and effects. As in the analogy of the steam-engine, there are no doubt certain ultimate facts in materialism—facts beyond which it is impossible to go. The force of the steam-engine and the force of the nerve cells of the brain are alike mysterious in their origin; both are manifestations of the unknown and unknowable Power underlying the universe. Nevertheless, if we do not know what force primarily is, we can at least tell the conditions under which it is exercised, whether in the case of the steam-engine or in that of the brain, and an investigation of genius and other forms of mental faculty consequently resolves itself into an investigation of our cerebral mechanism.

The hemispheres of the brain consist mainly of a mass of white substance overlaid with a thin coating of gray matter. This outer layer varies in thickness, averaging, however, about one-tenth of an inch, and extends to upwards of 300 square inches, its surface being enormously increased by being thrown into numerous folds or convolutions. On microscopic examination the gray matter proves to be thickly charged with nerve-cells of various shapes—round, oval, pear-shaped, tailed, and star-like, or radiated—each having two or more slender threads or nerves connected with it, while the internal white substance is made up entirely of nerves. Both cells and nerves are excessively minute, and form an extremely complicated network. The cells are evidently the sources of some power which the fibres conduct, and may be roughly compared to galvanic batteries generating electricity, which is carried by wires wherever it may be wanted. Indeed, this analogy holds good to a remarkable extent, inasmuch as the conducting nerves, like the electric wires, appear to be insulated by sheaths or coverings. In the interior of the brain are two large ganglia containing a certain amount of gray matter, and known as the optic thalamus and the corpus striatum; these are both connected by fibres with the outer gray coating, and are evidently important centres for the generation, collection, and distribution of nerve force. The radiating fibres from the central ganglia bear but a small proportion, however, to the fibres passing from one portion of the surface to another. The different convolutions and

areas of the brain are very extensively connected, and it is obvious that a disturbance in one region is liable to be communicated to all adjacent regions, and even to distant ones. The hemispheres being the counterparts of each other, the brain is double, but uniformity of action seems to be ensured between its two sections by a broad connecting band of fibres called the corpus callosum. The cerebellum differs in appearance from the hemispheres, but nerve-cells and fibres are its main constituents; its connection with the hemispheres appears to be chiefly through the motor paths.

So much for the general structure of the brain. How does it act? The phrenologists conceived that each portion subserved a special faculty, and that the mental aptitudes of an individual could be read from the greater or less development of the bumps on his skull. Their system was based upon the comparison of a man's known character with the size and shape of his head; it was necessarily a very loose and untrustworthy system, and modern physiologists do not speak of it with respect, though, as we shall see in a subsequent chapter, it contains a basis of truth which is considerable and in some degree unsuspected. Whatever may be said of the overweening confidence of Gall and Spurzheim in their method, they are entitled, at all events, to the credit of perceiving or divining a fact which has only been conclusively proved in our own day, namely, that the brain is a sort of mosaic, and that its various parts are charged with special functions. The discovery of the true state of the case was very gradual. Long after Gall formulated the phrenological doctrine, Flourens found that removing slices of the cerebral substance caused loss of function in the animal operated upon; Schiff afterwards discovered that different portions of the cerebral substance were raised in temperature by different sensations; and it was observed that disease of certain regions of the brain had more or less definite results. In 1870 a flood of light was thrown upon the subject. It would have been a sad shock to the eighteenth century philosophers to be told that the true science of thought was to be initiated by experiments upon the brain of a dog. Nevertheless, when Fritsch and Hitzig bared a dog's brain upon their dissecting-table

and found that an electric stimulus applied to certain convolutions caused spasmodic movements of the opposite side of the animal's body, they laid the foundation of the modern system of metaphysics. Since then Ferrier, Horsley, Schäfer, Goltz, and a host of investigators have been in the field and have reaped a rich harvest of observations.[1]

Broadly speaking, the hemispheres of the brain have been mapped out into centres of sight, hearing, touch, smell, taste, and muscular movement. Upon the main lines of these all physiologists are agreed, though observers differ as to the precise limitations of each area. Considering the methods employed in the localisation experiments a slight diversity of opinion is not surprising. The operator first applies the electric stimulus to a given convolution of the brain and notes the muscular or other results produced. With a knife or the electric cautery he then destroys the same convolution and notes the animal's corresponding loss of muscular power or sensation. It is clear, however, that the electric stimulus cannot be rigidly confined to a small region, and that the shock of the knife or the cautery may likewise have a disturbing effect for some distance around. Hence, no doubt, the tendency of the various spheres in the reports of different observers to overlap or encroach upon each other. Besides, as already remarked, there exists between all the areas a most intimate system of intercommunication, a sensation in any one region reacting at once upon various other regions so as to produce a highly complex and co-ordinated series of effects in the feelings, ideas, or action of the individual. It is found that each hemisphere of the brain controls the movements and sensations of the opposite side of the body, the nerves crossing over before entering the spinal column. Thus an injury to the motor area for the leg or foot in the right hemisphere causes paralysis in the left limb and *vice versâ*.

At first sight it would appear that the phrenologists have

[1] Ferrier: *The Functions of the Brain*, 1886; and *Cerebral Localisation*, 1890; *Philosophical Transactions of the Royal Society*, 1887–8. Bastian: *The Brain as an Organ of Mind*. Luys: *Le Cerveau et ses Fonctions, etc.*

been ludicrously wide of the mark in their reading of the bumps. Injury to, or stimulation of the gray matter along the upper portion and sides of the hemispheres where they locate self-esteem, firmness, benevolence, imitation, wonder, hope and ideality, paralyses or excites muscularly the entire opposite side of the body, the area in question being subdivided into centres for controlling the movements of the feet, legs, arms, hands, head, face, mouth, and eyes. This motor region is now very well defined, partly by observation of the results of disease in the human subject, partly by experiment upon the brains of monkeys, which are constructed on the same plan as the brains of human beings. On the left temple is a centre roughly corresponding to the 'constructiveness' of the phrenologists, whence the movements for speech are controlled. Destruction of this centre produces the condition known as aphasia, in which a person understands perfectly what is said to him, and thinks an answer without being able to utter it. Habit, which seems to be the cause of our right-handedness, is probably responsible for the location of the speech centre on the left side, for in left-handed individuals it is found on the right side of the brain. Hard by is the centre for agraphia, or the condition in which one is unable to express oneself intelligibly in writing. When it is destroyed the patient loses control over the movements of his hand.

Impressions of sight are received in the occiput—in plain English, the back of the head—the region appropriated by the phrenologists to self-esteem, approbativeness, inhabitiveness, adhesiveness, and even, in part, philo-progenitiveness. The hearing area is over the ear, where phrenology places acquisitiveness and secretiveness, while smell, taste, and touch are centred in the lower convolutions. If these different centres are injured or destroyed the faculty concerned suffers accordingly. The frontal lobes of the brain are supposed to play some part in arranging or co-ordinating the material of thought. Electrical excitation of this region yields no results, but as the stimulus is directed towards the motor region at the temples, movements of what Ferrier calls 'attention' are observed.

The frontal lobes reach their highest development in man, and an ample forehead is, no doubt, the general indication of a clever mind. Intellect, however, is not the product of the frontal lobes alone, or indeed of any one region of the brain; it is rather the outcome of all the cerebral centres, sensory and motor, in combination. If nothing more could be said of the different cerebral centres than has been done in the foregoing pages we should still be far from understanding the mechanism of thought. But we are not solely dependent for our knowledge of the brain upon the results of the electrical stimulus or the cautery as applied by the physiologist. Where experiment or direct proof ends, induction begins. The line of active research known as the localisation of the functions of the brain suggests where the truth lies if it does not bring us to the truth itself.

What happens when we receive a sensory impression, say, through the eye? There is a disturbance of the nerves of the eye in the first instance. The impression is then conveyed to the visual centre of the brain by what, for want of a better term, is called a nerve-current. When a nerve is excited there is a change in its substance, probably chemical. This change, once begun, propagates itself along the nerve at the rate of ninety feet a second. Nothing is really known of its nature, but exercise is seen to exhaust the carrying power of the nerve, while repose and the circulation of healthy blood restore it. We are temporarily deafened by a loud noise and blinded by an intense light, because, for the moment, the energy of the nerve cells is exhausted by the strain put upon them. From the eye the nerve-current duly arrives in the visual area of the brain, and, according to its character, throws the nerve-cells of that area together with their extensive network of fibres into activity. The impression conveyed from the eye to the brain is most likely of a twofold character, optical and muscular. While one set of nerves conveys the shades of light and colour, another takes note of the muscular adjustments of the eye which are concerned with form, so that every object seen calls into play certain groups of nerve-cells and fibres in the visual and motor areas: and it is probable that every group thus

formed is capable of being revived under an appropriate stimulus.

Herbert Spencer reduces all mental action to a sense of likeness and unlikeness in the things perceived—change or no change in consciousness.[1] A red light, for example, affects our nerves in a certain way. We then pass to the contemplation of some other object. By-and-by the red light comes again; the result in our minds is a flash of recognition, a renewal of the first experience, together with a feeling of identification; and the repetition of this enables us to class redness as a definite sensation. We next see a green light, which affects our nerves differently from the red. It brings about, let us say, a different grouping of nerve-cells. There is now a shock of difference or change, and we discriminate between the past impression and the present one.

So with all impressions conveyed to us from the outer world through the various channels of sight, hearing, touch, taste, and smell. The grades of discrimination are many. The eye distinguishes an immense variety of shades; a fine ear is sensible to a small fraction of tone. In sight and hearing there are probably thousands of grades of discrimination; in touch, taste, and smell they are fewer though still numerous. To the perception of likeness and unlikeness, Bain adds as one of the fundamentals of thought the faculty by which a past impression, that is to say, a past combination of nerve-cells, is revived under an appropriate stimulus.[2] This is the principle of memory. 'Working together,' observes Bain, 'our sense of agreement and our sense of difference exhaust the meaning of what we call knowledge. To know anything as a tree is to discriminate it from all differing objects, and identify it with all agreeing objects. We are perpetually reminded of objects by the presence of something of a resembling kind.' On this point the conclusions of Bain and Herbert Spencer are identical. 'Our reason,' says Bain, 'essentially consists in using an old fact in new circumstances through the power of discerning its agreement or disagree-

[1] Herbert Spencer: *Principles of Psychology*.
[2] Bain: *Body and Mind*.

ment with them.' 'Our various states of consciousness,' says Herbert Spencer, 'are elaborated out of our perceptions of change, kind of change, degree of change, facility of change, arrangement of change, etc., all running together in larger and larger groups and series until they embody to us what is called the outer world.'

It is the power of associating one impression with another that makes the difference between the richly endowed and the poorly endowed mind. How does one impression just received arouse another impression previously received? Evidently by the passing of a nerve current from one group of cells and fibres to another group. If the passage is easily effected, and if the nerve-cells of the second group are lively, the revived impression will be strong; if the connection is uncertain, if the bridge, so to speak, is in a bad state of repair or the nerve-cells sluggish, the revived impression, in other words our memory of the past fact or sensation, will be weak and partial. There is no doubt that a constant repetition of this process of association tends to make the connection easier. In the nerve-cells, where the currents meet and join, there is, in consequence of the meeting, says Bain, 'a strengthened connection or diminished obstruction, a preference track for that line over other lines where no continuity has been established.' Whether in these established connections or groupings the nerve-cells increase in activity, or whether the conducting power of the fibres improves, it is impossible to say. Probably both causes operate. Some authorities suppose that as the cell-junctions of the fibres are the places where a great many independent nerve-circuits come into close neighbourhood, these affect one another by a process in the nature of electrical induction.

Both our sense of likeness and our sense of unlikeness in the objects perceived have their bases in memory, which is the power of continuing or recalling impressions no longer stimulated by the original agent. 'If we suppose the sound of a bell striking the ear, and then ceasing,' observes Bain, 'there is a certain continuing impression of a feebler kind, the idea or memory of the note of the bell, and it would take some very good reason to deter us from the obvious inference

that the continuing impression is the persisting (although reduced) nerve currents aroused by the original shock. And if that be so with ideas surviving their originals, the same is likely to be the case with ideas resuscitated from the past—the remembrance of a former sound of the bell. All observation confirms this doctrine. The mental recollection of language is a suppressed articulation ready to burst into speech. When the thought of an action excites us very much, we can hardly avoid the actual repetition of it, so completely are all the nervous circuits repossessed with the original currents of force. The lively remembrance of a pleasant relish will produce the same expression of countenance, the very smack of the reality. In strongly imagining a kick, we can scarcely refrain from giving one. As we rehearse in thought the movement of a dance, we almost join in it. It has even been shown by experiment that the persistent imagination of a bright colour fatigues the nerves of sight.'

A curious experience related by Wigan, who, fifty years ago, wrote about the functions of the brain, illustrates the revival under morbid excitation of a special nerve-grouping in the auditory centre. 'I remember hearing a bell,' says Wigan, 'at Mola di Gaeta, with a very peculiar sound; it probably was a musical note of an exact pitch which had never struck my ear before from any instrument, or it might have been something in the quality of the tone independent of its position in the musical scale. I happened at the moment to be in the midst of a long train of painful emotions, and the two things became associated in my mind. I never heard the same bell again, but in passing Mont Cenis I encountered one of those whirlwinds called a *tourmente*, and felt that I had taken cold in my ears, which began to be slightly painful, when I suddenly heard the peculiar sound of the bell of Mola di Gaeta. I was entirely convinced that I heard a bell; I looked round for a campanella in vain, and tried, with a little success, to persuade my companions of the truth of my convictions. All the way thence to Beauvoisin the same sound continued in my ears, renewing all the painful impressions connected with my first hearing it, and it was not till I had sat for some time in a very hot room at Martigny that

it ceased to annoy me. On resuming my journey the sound was renewed, and it was not till after a hot bath and free injection of the ears with warm water at Lyons that I finally got rid of the distressing delusion.' 'The comparative feebleness of remembered states or ideas,' says Bain, 'is, we may presume, an exact counterpart of the diminished force of the revived currents of the brain. It is but seldom that the re-induced currents are equal in energy to those of direct stimulation at first hand.' Formerly it was believed that the brain was a sort of storehouse for ideas which were docketed and put away in pigeon-holes for future use. With our present knowledge of its structure this is no longer a tenable hypothesis. 'It must be considered as almost beyond a doubt,' says Bain, who, in this matter, is fully supported by Ferrier, 'that the renewed feeling occupies the very same parts of the brain and in the same manner as the original feeling.'

What is implied by this modern anatomical theory of the intellect? This, that for every act of memory, every exercise of bodily aptitude, every habit, recollection, train of ideas, there is a specific co-ordination of nerve-cells and fibres in the brain resulting in a specific set of sensations or movements. That is to say, every stimulus from the outer world conveyed through sight, hearing, touch, taste or smell, actuates in the brain some group of fibres and cells between which connections have been established, partly by inherited structure and partly by custom. The instincts of the lower animals are the outcome of an inherited structure, a permanent grouping of nerve-cells which always respond in a given way to a given stimulus. Many of our own bodily functions are similarly regulated. In the case of acquired knowledge, lines of preference for the nerve-currents seem to be determined by circumstances. It is in this manner that the social instincts—the general habits, the likes and dislikes, the morals of a community find a physical embodiment. They are the outcome of established methods of brain action which, as I have shown in a previous work,[1] vary as between one community and another, and even in the same com-

[1] *Marriage and Heredity.*

munity as between one period and another. In proportion as acts become habitual, they cease to be conscious and tend to become instinctive. Tricks of habit are a result of the tendency of certain nerve-groupings to be revived, for it seems to be a law of nerve tissue that what it has done once it is prone to do again.

On the principle here laid down it will be seen that every sensory area of the brain has its own memories or cohesive nerve-groupings, each liable to be revived directly through its own centre, or indirectly by nerve-currents from other centres. Our ideas of the commonest and simplest objects are made up of the impressions derived from many centres, sensory or motor; and the due co-ordination of such impressions is only effected by practice. As we have been sorting our impressions from childhood we have ceased to become aware of the complexity of the process which is gone through. With regard to the acquirement of voluntary movements Ferrier observes: 'Some particular object held before a child recalls by sight a pleasurable sensation and excites desire (which is the ideal persistence of a sensation and its tendency towards repetition); but, instead of inducing as yet a definite action for its gratification, it excites only vague and undefined movements of arms, legs, and facial muscles—the expression of general excitation of the motor centres. In process of time the centre of the special differentiated movement necessary to the gratification of the desire can be thrown individually into action, and thus a definite act of volition is for the first time fairly accomplished. . . . And it is curious and interesting to observe in a child how, in the growth of volition, the first action fairly differentiated in response to any particular sensation or desire is repeated in response to desire in general, however ludicrously insufficient to accomplish the desired end. The individual activity of the various motor centres having once been fairly established, at first in response to particular sensations and desires, voluntary acquisition proceeds apace, the centres being free to form new associations. The associating fibres between the one motor centre and the various sensory centres may thus become innumerable. Complex and intricate movements are longer in being

acquired than those which are simple or reflex, and already hereditarily organised. Hence, the movements of articulation in combination with those of vocalisation are longer in being acquired than those of the arms and legs.'

To persons who have been born blind and who have afterwards gained their sight, an object seen for the first time appears to touch the ball of the eye and is not recognised as what it is, say a stick or a stone. The optical effect of the stick or the stone comes gradually to be associated with the muscular adjustment of the eye to particular distances, to form, etc., and with its weight, hardness, coldness, and other qualities ascertained through the sense of touch, and when all these sensations and associations are completed by practice, then, and not till then, do we arrive at a perfect conception of the object before us. To vary the illustration, we see a carving-knife. Its optical effect is produced in the visual area. Instantly by the multitudinous lines of communication which exist, other nerve-groupings in other areas are aroused by association and offer suggestions as to the weight, hardness, smoothness, cutting, and pain-producing qualities of the knife, all based upon experience tactile and motor; the memories of taste and smell stimulate the glands of the mouth and the action of the jaws, they even react upon the visual area, calling up the picture of a dinner-table set with articles of food and drink. Perhaps the auditory centre is aroused to furnish impressions of something that has been told about a carving-knife, or, if the story has been read in a book, the visual and motor centres are once more called into play to reproduce the impressions originally derived from a succession of printed pages. In short, the sight of the carving-knife causes a nerve-thrill to spread over the greater portion of the cerebral hemispheres, arousing trains of impressions, or, in other words, reviving cohesive nerve-groupings in the various centres as it passes. A powerful stimulus throws all our centres into activity. When a man is angry, his features, limbs, and body are all agitated.

If one centre is incapacitated, the other centres form cohesions of their own. A person born blind has ideas from which every visual impression is excluded. He knows, let us

say, a pair of scissors by touch, and instantly names them. When he gains his sight and the scissors are held up to him he does not at first know what they are. The optical effect has, as yet, formed no associations in his brain. A lady shown a tea-cup under such circumstances could not tell what it was until she had felt it; only after repeated experiments with sight and touch combined could another patient distinguish, at a distance, a cat from a dog. The form, size, and weight of objects are slowly discovered by similar means. Colour is necessarily learnt by the association of a particular impression with a name. Five and twenty days after gaining the use of her eyes, a lady, operated upon by Waldrop, had constantly to be informed of the meaning of objects around her, whether in or out of doors. 'What is that?' she would ask, 'A soldier.' 'And that thing which has just passed us?' 'A man on horseback.' 'And that bright thing on the pavement there?' 'A lady in a red shawl.' The same training has to be undergone by the other centres of hearing, taste, smell, and touch. A rat's tail was cut off and engrafted in its back, where it took root. After the nerve-connection had been formed the animal could feel a pinch in its new tail, but was unable at first to locate the sensation. In about three months it learnt to turn and try to bite the offending object.[1]

Our knowledge of men and things is made up of an incalculable number of cohesive nerve-groupings in the different centres. Persons are associated with places, occupations, amusements, property, age, rank, and position, and with the many attributes that make up character and reputation. The links of association are almost infinite, and, if one set fails us, another will be found to hold good. In trying to remember a thing it is usually sufficient to be able to alight upon some limb or fragment of the necessary cohesion; the entire group of associated impressions is then revived. Persons who tie a knot on their handkerchiefs in order the better to recall some fact at a given time unconsciously avail themselves of this cerebral mechanism; they associate the tactile and motor centres with the thing to be remembered, and

[1] Taine: *De l'Intelligence.*

when accidentally pulling out their handkerchiefs they come upon the knot the whole set of impressions hanging upon it is liable to flash upon them. Acquisitions of knowledge are the formation of nerve-groupings in endless variety, the most richly endowed mind being that in which such groupings are most numerous, most extensive, and most easily revived.

In man, the visual, auditory, motor, and tactile centres appear to be the chief spheres of cerebral action; he has very little cohesive faculty in the centres for smell and taste. Perhaps the visual and the motor centres are the chief, and it is an anatomical fact that, between these, in the human brain, the nerve communication is very extensive. Great bands of fibres also extend from these areas into the frontal convolutions, which, being larger in man than in the monkey or the lower animals, are believed to be a sort of intellectual-centre, or centre for the sorting of impressions. Many animals have acuter senses than man, but they are not so well able to found abstract ideas upon them. The dog's sense of smell is much keener than ours, and the corresponding portion of its brain is larger, showing that some relation exists between the development of an organ and its efficiency. In cats and rabbits, as well as dogs, the olfactory bulbs and tracts are very large; in amphibious animals they are small; in fishes they are rudimentary or nil. In the monkey and man, where smell is good but subordinate to other faculties, the olfactory apparatus is small though distinct. Some animals use their noses to investigate the nature of substances which man would examine by means of sight or touch; and, as every sense has its memory, we need not be surprised at a dog, for example, finding his way back over long distances by smell alone. He is guided by a train of smells as effectually as we are guided by a train of sights, or, in other words, a succession of objects impressed upon our visual centre.[1] Yet, acute as he is, a dog cannot reason abstractedly upon impressions derived through his nose as a man does, for example,

[1] In man the memory of smells does exist in a certain degree. Maudsley says of himself: 'There are certain smells which never fail to bring back to me instantly and visibly scenes of my boyhood, though I was not in the least thinking of them at the time.'—*Physiology of Mind*.

with reference to the smell of sewer gas, and the chances of its being followed by typhoid fever. The animal's reflective mechanism is defective, and does not enable him to do more than put together a few general ideas. Savages, whose frontal lobes are smaller than those of civilised man, show a similar incapacity for abstractions, their speech containing only such phrases as are required to describe the most striking objects of nature and the experiences of their daily life.

Contrary to the belief of Gall and his disciples, the cerebellum is most assuredly not the seat of 'amativeness.' Experiment shows it to be the centre of those automatic movements whereby our equilibrium is maintained. A bitch, mentioned by Ferrier, in which only a small fragment of the right lobe of the cerebellum existed, showed 'heat,' became impregnated and bore young, but could not stand erect or move from place to place except by 'butting forward, and proceeding by force of her falls.' Men who sustain injuries to the cerebellum reel as if intoxicated, though if the affection be of slow and partial growth, they are able to accommodate themselves to it, probably by an adaptation of the faculties of sight and touch. Hitzig placed the poles of an electric battery behind a man's ears. The patient experienced a feeling of giddiness, and the direction in which his equilibrium was disturbed depended upon the direction of the current. With his eyes closed he felt as if he were being whirled from left to right, or from right to left, or as if the basis of support on one side were withdrawn. With his eyes open, he saw objects whirling round him in one direction or the other. In experiments upon monkeys, it has been found that injury to the after part of the middle lobe of the cerebellum causes a tendency in the animal to fall backwards. If one of the lobes on either side is affected, there is a disturbance of equilibrium on that side amounting to constant rotation of the body. Electric stimulus of the cerebellum causes spasmodic movements of the eyes and limbs, showing the relation of ocular movements to those required for the adjustment of the equilibrium. The mechanism of the cerebellum is, perhaps, largely independent of the hemispheres. Nevertheless, these interest themselves in all, or nearly all,

automatic movements. The main seat of the sexual feeling is probably the centre of touch, with extensive connections in all the other centres except that of taste. No feeling is more widely diffused or more powerful. It is capable of throwing the whole of the hemispheres into activity, not excepting the purely intellectual regions, and the shock produces extensive exhaustion of the nerve-cells, which then require sleep or rest.

If not only every thought and feeling, but every fragment of a thought and feeling, is the outcome of a certain grouping of nerve-cells and fibres, the number of such nerve-cells and fibres available in even the poorest brains must be enormous. Yet, in point of variety and complexity, the nerve elements of the brain would appear to be by no means disproportionate to the intricacies of mental function. The following calculation is given by Bain: 'Allowing for intervals, we may suppose that a line or row of 500 cells occupies an inch of the gray matter of the brain, thus giving a quarter of a million to the square inch for 300 inches. If one half of the thickness of the layer is made up of fibres, the cells, taken by themselves, would be a mass one-twentieth of an inch thick; say sixteen cells in the depth. Multiplying these numbers together we should reach a total of 1,200 millions of cells in the gray covering of the hemispheres. As every cell is united with at least two fibres, often many more, we may multiply this number by four for the number of connecting fibres attached to the mass, which gives 4,800 millions of fibres. Assume the respective numbers to be (nerve-cells) 1,000 millions and (fibres) 5,000 millions, and make the comparison with our acquisitions as follows: With a total of 50,000 acquisitions evenly spread over the whole of the hemispheres, there would be for each nervous grouping at the rate of 20,000 cells and 100,000 fibres.

'With a total of 200,000 acquisitions of the assumed types, which would certainly include the most retentive and most richly endowed minds, there would be for each nervous grouping 5,000 cells and 25,000 fibres. This leaves out of account a very considerable mass of nervous matter in the spinal cord, medulla oblongata, cerebellum, and the lesser

gray centres of the brain, in all of which there are very large deposits of gray matter with communicating white fibres to match. Such an estimate, confined to the hemispheres of the brain, is enough to show that, numerous as are the embodiments to be provided for, the nervous elements are on a corresponding scale, and that there is no improbability in supposing an independent nervous tract for each separate acquisition.'[1]

In the process of waste and repair that goes on, the molecules of the system are constantly renewed, but each new set takes the stamp of its predecessors, and thus the continuity of our personality is assured. That all kinds of sensorial and motor activity depend upon the soundness of the nerve-connections existing between the different areas of the brain, is shown by some curious results of brain disease. Spoken language is carried on between the auditory centre and the motor centre for articulation. It is in the auditory centre that the nerve-groupings which constitute the memory of words are formed, and upon the efficiency of this centre depends our faculty for remembering things we have heard, for learning languages by ear, for appreciating music. A word, whether spoken or written, is only a symbol. It is custom that associates the word bread in English with something to eat. The French adopt *pain*, the Germans *Brod*, to signify the same thing.[2] Before a word is learnt a nerve-connection has to be formed between the nerve-group embodying it in the auditory centre, and the nerve-group required in the motor centre for giving it articulation. Now, suppose this nerve-connection were to break, either through the decay or the imperfect nutrition of some set of nerves, what might be expected to happen? Surely this, that the patient would know perfectly well a word when he heard it, but that he would not be able to say it. He would be suffering from the well-known malady called aphasia. Some-

[1] Bain: *Body and Mind.*

[2] Dr. Samuel Wilkes says his parrot associated things with words. It never caught, however, the word nuts; but, when nuts were on the table, it uttered a peculiar squeak, which the members of the family fully understood to mean nuts.—*Journal of Mental Science*, 1879

times the nerve-connection between the auditory and the speech centre is not broken but only deranged. In that case the patient speaks freely, but his words are wrong—he calls pills 'potatoes,' a stick a 'cord,' and so on. The nerve-group of the auditory centre throws into action the wrong nerve-group of the motor centre. If the derangement is great the patient's attempts to speak will result in an unintelligible jargon, as in the case of the French lady (mentioned by Trousseau), who, wishing to bid a visitor take a chair, said, 'Cochon, animal, fichu, bête.' Sometimes the patient knows, sometimes he does not know, that he has wrongly used a word. In the worst cases, short of absolute dumbness, only one set of nerves between the auditory and the articulatory centres are open; the patient then uses one word for everything, sometimes not even a word, but a sound.

Similar defects are found in connection with the visual and other centres. The patient sees properly, but loses the power of naming objects. With a horse before him, he cannot remember what to call it. He will ask for a glass of ——, without being able to recall the name of the drink required. A friend will offer him beer. 'No,' he will answer. 'Water?' 'No.' 'Milk?' 'No.' 'Whisky?' 'Yes.' He knows the thing when he sees it, but cannot mention it by name. There is a derangement of the nerve-connection between the centre for sight and that for speech. Abernethy tells an amusing story of a friend who could not recollect a person's name, and who dragged him into a neighbouring street to show it him on a door-plate. The printed word is as much a symbol as the spoken one, only it appeals to the eye instead of the ear. Consequently, a defect in the visual centre, or in the ocular adjustments that convey the form of the letters, causes inability to read, while the faculties of hearing and speaking remain. It will thus be seen that learning to read a foreign language is a wholly different process from learning to speak it; in the one case the visual centre, with its muscular adjustments of the eye, in the other the auditory centre is employed. In both cases extensive nerve-groupings have to be established and linked with each other. For the reading of ordinary literature in Chinese,

some 10,000 separate characters have to be learnt and remembered. The nerve-groupings in connection with language generally will be much greater than this, though their intimate association with each other will cause them to be easily revived. In language, as in our acquisitions generally, the various centres act and re-act upon each other. The student will frequently remember a word by sight, that is to say, by its place in some printed page, when his auditory centre is powerless to recall it. It is also a common experience that a fact read in a book is forgotten, but remembered if we make a note of it. The reason is that, in the latter case, two centres instead of one are brought into play; a double memory is established, that of sight and that of muscular movement. It is like the tying of the knot on the handkerchief. Letters, especially initial letters, cohere in the memory independently of words. Hence, a person may recognise individual letters when whole words are Greek to him. W. W. Ireland knew an aphasic patient who could not read written-out numbers, such as 'thirty-seven' or the corresponding Roman numerals 'XXXVII,' but who could read the ordinary figures '37,' while perfectly understanding all that was said to him. His age was 32; when this was written 42, he corrected it.

Applying the same principle to the malady called agraphia, many things that perplexed the wisest of our forefathers become as clear as day. A woman, who has somehow lost the faculty of writing, consults a specialist. He asks her to write her name. She takes a pen, and in all good faith scribbles:—

Sunnil Siclaa Satreni,

adding by way of an address,

Sunesr nut ts mer tinn lain.

The defect here is similar to the misuse of words in speech. There is something wrong with the nerve-groupings and their connections employed in the movements for writing. As in the case of speech, the defect may be great or small. Sometimes a patient can begin writing a word correctly, but

inevitably lapses into meaningless combinations of letters like 'ffg' or 'ndend.' Asked to spell cat, a patient so affected will say, properly enough, c, a, t, and then write 'candd.' In extreme cases, one meaningless group of letters is written for all words. Persons unable to write their own thoughts, or perhaps to think coherently, may still be able to write correctly to dictation, though unable to read afterwards what they have written. In this case the connection between the auditory centre and the writing muscles is good, while that between the writing muscles and the visual centre is impaired. It may happen that a person to whose visual centre a written word makes no appeal, will learn what the word is by tracing with his hand the outlines of the letters, thus bringing a motor centre with its memories into play. It is on the same principle that comparatively illiterate people help themselves to understand a printed page by audibly or silently articulating the words.

Thought, like our impressions of the outer world, is necessarily the product, not of one centre but of many centres combined. A blind man learns to read with his fingers, a nerve-connection being formed in his brain between the centre for touch and that for articulation. The often-quoted deaf-mute, Laura Bridgman, was observed during thought, or when dreaming, to execute unconsciously the same movements as she was accustomed to make in the actual exercise of her manual speech. The paralysis of the first Lord Denman was accompanied by total inability to form letters into words, or words into sentences. He could only sign his name by seeing it written out and copying it. But his intelligence seemed to be unaffected; law reports and parliamentary debates interesting him then as much as ever. Men could play chess without knowing the names of the pieces, or even the name of the game. And it is surely a common experience to elaborate ideas before, and sometimes without being able to express them in words. John Hunter, although a great thinker, had a poor command of words, and Turner was wholly unable to express his ideas of art in intelligible language. Still, there can be no doubt that speech powerfully supports thought. Lordat, the distinguished professor of

medicine, lost his power of speech after a fever, understanding what was said to him, but being unable to express himself except in writing. During his malady he professed to combine abstract ideas as freely as before, but his friends noticed a deterioration of his intellectual faculties. Ferrier, Bastian, and other specialists, note that aphasic patients lose their powers of abstract thought, or think with difficulty.

Music, like speech, resides in the auditory centre, with an executive faculty in the motor centres. An impairment of the nerve-connection between the auditory and the motor centres gives rise to the same sort of disabilities as we have seen existing in the case of speech. Kussmaul mentions a patient who could compose music, write musical notes, and recognise an air which he had heard, but who could not play from notes. Another had lost the value of musical notes, but could play an air after hearing it. Frederick Clay, the composer, who died, in 1889, of paralysis, from which he had suffered for some years, presented curious symptoms. He lost the art of reading music, but when a piece of his own composition was played in his presence, and played inaccurately, he stopped the performance at the faulty passage. His speech was mainly confined to monosyllables. When asked to name his favourite opera, he replied 'Don,' meaning 'Don Giovanni.' Along with the faculty of reading music, he had also lost that of ordinary reading and writing, but he could recall the names of Derby winners for many years back.

All partial disorders of memory and impairment of intelligence or modes of feeling will be understood from the foregoing pages. Linné forgot his own works and read them with pleasure as the writing of a stranger. Walter Scott forgot a novel which he had dictated. The poet Rogers had to ask his servant whether he knew the people he met. Wycherley's memory played him tricks in his old age; if anything was read to him over night he would rise next morning full of the ideas and expressions he had heard, and write them down in the full belief that they were his own. After an attack of apoplexy a patient of Brown-Sequard's lost all memory of events that had occurred during a period of five years, this period, which comprised his marriage, finish-

ing about six months before the attack. As the result of a knock on the head a man is said to have forgotten his Greek but nothing else. Abercromby relates that a surgeon whose head was injured by a fall from his horse, could give instructions for treating the wound, but completely forgot the existence of his wife and family for three days. Sharpey tells of a young woman who, after an irresistible tendency to sleep, forgot everything she knew, recognising nobody, not even her parents, and had to begin to learn reading and writing like a child. Amid the wreck of her acquisitions only some knowledge of music remained, but she was not conscious of how or when she had studied music. Double personality is not unknown. There is a recorded case of an hysterical woman who, in her normal state, was 'grave, reserved, and laborious,' but who, after recovering from a fit of unconsciousness, was 'gay, turbulent, imaginative, and coquettish,' this continuing until she was seized with torpor, when she became as before. Forbes Winslow tells of a young married woman who, after a period of debility, lost all sense of the time that had elapsed since the day of her marriage. She remembered with remarkable vividness every previous event of her life; but when her husband approached her she repudiated all knowledge of or relation to him. She acted in the same way with regard to her child. Her parents and friends by their authority succeeded in persuading her that she was in reality married, and had given birth to a son, but she beheld her husband and child without being able to imagine how she had come by them. Men have been known to forget their own names, and to beg their friends to tell them from time to time who they were. As the result of shock to their nervous system, people in danger of death by drowning or otherwise find memories revived which previously would have seemed to be entirely obliterated from their minds. The long-forgotten languages and prayers of youth return to them, together with pictures of the scenes of their childhood.

Luys lays claim to have solved the uses both of the optic thalamus and the corpus striatum. From an anatomical examination of the radiating nerves in connection with these organs, he holds that the optic thalamus collects the sensory

impressions arriving from the outer world as well as from all parts of the body and nutritive system, and launches them into the appropriate areas of the gray matter; and that the corpus striatum is, inversely, an intermediate station for sensory impressions passing into muscular action. If these conjectures are well founded, a disturbance of faculty, sensory or motor, will be produced by disease in the optic thalamus or the corpus striatum as well as in the various outer centres. Records of cases seem to bear out Luys's view. Thus, a young woman, mentioned by John Hunter, successively lost smell, sight, hearing, and touch. After death it was found that her optic thalamus in both hemispheres had been progressively destroyed by disease. Stimulation of the corpus striatum in one hemisphere, again, causes a general contraction of the muscles on the opposite side of the body, as if the whole motor area were being excited at once. Hæmorrhage into the brain commonly proceeds from the rupture of small arteries passing through these internal ganglia; hence, a very small derangement here produces extensive paralysis and loss of sensation, precisely as the traffic in all parts of the city of London is deranged by a block at the Mansion House.

In hypnotism certain areas of the brain seem to be stimulated in an extraordinary degree at the expense of others. When the body is torpid the senses are excessively acute. The ticking of a watch, the smell of a flower, can be detected by the patient at incredible distances. Through a layer of cotton wool placed upon his eyes he can read a newspaper, and colours influence him through a wooden screen one-fifth of an inch thick. The emotional areas, also, become extraordinarily susceptible. The picture of a merry face makes the patient laugh, a gloomy one makes him cry. The memory is enormously quickened. 'I once heard a young married lady,' says Luys, 'who had listened to one of my lectures, repeat the lecture several months afterwards in a state of somnambulism, with the utmost accuracy, reproducing, like a phonograph, the very tones of my voice, using every gesture that I used, and adapting, too, in a remarkable way, her words to her subject. A year afterwards this lady had still the same capacity, and displayed it every time she was put into a state

of somnambulism. And, extraordinary as it may seem, when once awakened she was utterly unable to repeat to me a single word of the lecture. She said she did not listen to it, she understood not a word of it and could not say a single line.'

An unequal distribution of blood in the brain would seem to be the more immediate cause of the hypnotic condition. The operator's first step is to fatigue one of the senses, usually the sight, by causing the patient to gaze fixedly at a bright object; sometimes the hearing, by a regular beating of the notes of the scale; more rarely the sense of touch, by gently rubbing a particular part of the body. By this means seemingly a disturbance of the circulation is set up. There is probably an excessive flow of blood to the fatigued region, which then becomes unduly sensitive. When there is a full supply of blood in the brain all the senses are active; when the circulation is feeble the functions are depressed or suspended. Sleep is caused by a withdrawal of the blood-supply of the hemispheres; dreaming arises from a partial circulation through the various centres; in sleep-walking the motor centres are thrown into activity. Brain disease is sometimes indicated by an unusual delicacy of the centres of sight and hearing—the result of an excessive blood supply; and defects in the speech centre have been found to be due to the plugging of an important artery in that region. A sudden excitement in one centre seems to draw away the blood from other centres, whose efficiency is thereby reduced. The physical process of digestion hinders intellectual activity. An idea occurring to us makes us cease any bodily exercise in which we may be engaged until the new excitement subsides. The fear of shipwreck, or any violent emotion, checks sea-sickness. The poet Moore, in crossing the Irish Channel, was sea-sick when news was brought to him of his father's death, whereupon his disorder left him.

Drugs and poisons taken into the blood produce various intellectual disturbances, as does also the vitiated circulation caused by malignant fevers. Of alcohol most people have some experience. Its first effect is to loosen the connecting links of the different centres, producing a want of harmony between sensations and motor acts and impairing the various

kinds of memory. It is for this reason that a drunken man is reckless and irresponsible. Finally, alcohol paralyses all sensation and movement. The staggering gait of a drunken man is probably due to a disturbance of the cerebellum, for which alcohol would seem to have a special affinity, like that of strychnine for the spinal centres. In drunkenness the weak points of the character are thrown into relief, one man becoming morbidly irritable and quarrelsome, another ludicrously affectionate, a third stupid, a fourth obscene, a fifth sordidly avaricious, a sixth profusely generous, a seventh vain, an eighth silly, a ninth superstitious. In hypnotism it has been observed that the patient's faculty for falsehood is largely if not wholly suppressed; in drunkenness there is the same deficiency in the organic cohesions of the different centres where a lie might be concocted. Whence the proverb, *In vino veritas*. Opium, according to De Quincey, does not affect the equilibrium, its action being apparently confined to the hemispheres, where it stimulates past and forgotten 'memories' into great activity. Chloroform, in addition to paralysing the hemispheres, like alcohol, acts upon the medulla oblongata, affecting chiefly the breathing power—an important fact established by the Hyderabad Commission of 1889. Hashisch, with which interesting experiments were made upon himself by Moreau (de Tours), produces errors of sense and false convictions. 'The mind has a tendency to exaggerate everything, and the slightest impulse carries it along. By a word or gesture our thoughts may be successively diverted to a multitude of different objects with a rapidity and a lucidity which are truly marvellous.'

In the modern theory of brain-function above set forth there is no place for that bugbear of the older metaphysicians, the will. If it be admitted that what men call mind is only the working of a sensitive mechanism called the brain, which is acted upon by stimuli from the outer world, through the senses, pretty much as a weather-cock is acted upon by the wind, it follows that in speaking of the will as an agent in our mental processes we mistake a word for a thing. A railway engine is not thought to exercise will, when, in obedience to the force of the steam generated in its boiler, it

moves backwards or forwards, slowly or quickly, according to the setting of its gear for the time being. It is not responsible for the steam or the mode of its action. A ship, again, is not credited with volition when it sails before the wind or obeys its rudder. Equally with the locomotive and the sailing vessel, man is moved hither and thither by external influences acting upon an organisation with which he has been endowed at birth or, rather, at conception. At every step in life he is driven one way and another by different impulses, all having relation to the general question of pleasure or pain, profit or loss, to the individual. He is required, as he thinks, to make up his mind as to which way he will go. The forces acting upon him are numerous and subtle, some obvious and material, others purely ideal, many hereditary and unconscious. There is a multiplicity of motives counteracting and reacting upon each other in the various centres of his brain. To all, he is more or less responsive, just as the memories, or experiences, or hereditary predispositions concerned in the conflict, are strong or weak. In the end, one impulse or set of impulses proves itself the strongest, and he is carried along by it. Meanwhile he flatters himself that he has made an effort of will in this direction; in reality, he has been as passive as a musical instrument that is played upon. He thinks he commands whereas he only obeys. 'Will,' says Herbert Spencer, 'is spoken of 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. Will,' he adds in a forcible metaphor, 'is no more an existence separate from the dominant feeling than a king is an existence separate from the man occupying the throne.'

Some men are as rash as others are cautious. The rash man has imperfect links of association between one centre and another, or one set of impressions and another; when, therefore, a pleasurable object is presented to him in the form of a sensory impression, past impressions of an opposite character in the same or in other centres are not aroused. He is in the position of a judge arriving at a decision upon

incomplete evidence. The cautious man, on the other hand, is one in whom a long series of impressions, recorded in different centres, link themselves together and become successively revived, the strongest finally asserting itself and passing into the motor area. Both men believe that the course they take is volitional ; in reality they are unconsciously governed by the mechanism of their brain-centres, which may be good or bad, efficient or inefficient. Honesty, therefore, is no guarantee that we shall hold sound views or do wise deeds. To go one step further, no man can be said to be responsible for his opinions. Everyone expresses himself according to the manner in which he has been impressed, and this depends altogether upon the state of the cerebral organisation with which he happens to be endowed. Obstinacy arises from conditions similar to those of impulsiveness, one set of impressions being more readily and vividly aroused than others ; and selfishness, benevolence, vanity, in fact all the varied characteristics of human nature, are to be explained on the same principle.

All extreme or fanatical views are attributable to defective comparison, that is to say, to a defective revival of counteracting memories in the brain. The delusions of insanity would also seem to have defective comparison as their chief basis. The morbid excitability of a sensory centre produces an effect appropriate to that centre—an hallucination of sight, hearing, smell, touch, or taste. If the cohesive memories aroused in the other centres by this action, memories of time, place, touch, movement, etc., are sufficiently extensive and vivid, they correct the false impression ; the patient knows that what he sees or hears is an hallucination. If, on the other hand, through the destruction or the inactivity of certain areas, the cohesive memories are poor, so that the individual has but a slender basis of comparison whereon his judgments may be formed, the hallucination begins to wear the aspect of reality ; the sight or the sound is accepted as a fact, and the patient is mad. Fixed ideas, rooted and unreasonable prejudices, general narrowness of view, are minor manifestations of the same infirmity. Each half of the brain appears to be capable of elaborating thought, as instances are recorded of

men exercising their intellectual faculties after one of their hemispheres has been destroyed by disease. In ordinary health, the hemispheres no doubt act in unison, owing to the extensive system of fibres binding them together. Some of the forms of insanity may be due to an impairment of these connecting fibres, especially when the patient has insane impulses which his reason seems to hold in check. Not infrequently patients feel a desire to murder somebody, but have sense enough to control it, and even to place themselves voluntarily under restraint lest the impulse should overpower them. In such cases we may suppose one hemisphere to be morbidly active while the other is sound, or nearly so.

The dependence of will upon physical conditions of a purely hereditary kind is curiously exemplified by the experience of twins. A close physical resemblance between twins is often accompanied by a similarity in their ideas. No less than eleven out of thirty-five cases examined by Galton [1] testify to this. The twins make the same remarks on the same occasion, begin singing the same song at the same moment, and so on. 'An observer and friend,' adds Galton, 'graphically described to me the effect produced on her by two such twins whom she met casually. She said, "Their teeth grew alike, they spoke alike and together, and said the same things, and seemed just like one person. . ." One twin, A, who happened to be at a town in Scotland, bought a set of champagne glasses which caught his attention, as a surprise for his brother, B; while, at the same time, B, being in England, bought a set of precisely the same pattern as a surprise for A.' Upon this theory of the will, which, by the way, abolishes that freedom of judgment upon which men are accustomed to plume themselves, and which forms the basis of so many religious systems, it is possible with the exercise of a little patience to explain even the most trivial volitional acts, so called, of one's daily life. An ingenious writer,[2] in a passage too long to quote, shows how absolutely conditioned is such an apparently free act as the determination to touch, *by accident*, some one of the squares of a chess-board.

[1] Galton: *Inquiries into Human Faculty*.

[2] Jonathan Edwards.

Hypnotism throws an instructive light upon the so-called operations of the will. The operator obtains control over the sensory and motor faculties of his subject, who then has no sensations or desires that are properly his own, but performs extremely complicated and apparently rational acts in obedience to suggestion. If told that he is hot, he takes off his coat and fans himself; he accepts a candle as a cigar and smokes it; if a knife is put into his hand, a train of muscular associations is aroused, and he cuts with it; an umbrella being given him, he opens it and believes he is in a shower of rain; dance music makes him dance, and if the tune is suddenly changed to a religious one, he falls on his knees in the attitude of prayer. A suggestion conveyed to the patient while he is in a hypnotic state may remain latent in his mind after he is restored to himself, and in due time be translated into action. He is told, for instance, that in ten minutes he is to get up and open the door. He is thereupon restored to consciousness and remembers nothing of what has been said to him, but when the ten minutes have elapsed he gets up and opens the door. On being asked why he does so he says he does not know; he obeys an unconscious impulse, communicated to his muscles by the automatic mechanism of the brain. At Nancy, where extensive experiments in hypnotism are carried on, a suggestion is said to have been latent in a patient's mind for 172 days. To a hypnotized subject, Mdlle. A. E., the operator, Beaunis, said: 'At ten o'clock on the morning of New Year's Day you will see me appear in your room. I shall wish you a happy New Year and disappear again.' This was in July. On waking, the lady remembered nothing and no more was said. At the given date Beaunis happened to be in Paris, but at ten o'clock the lady, being then busy in her room, heard a knock at the door, and said, 'Come in.' To her astonishment Beaunis entered, dressed in his *summer clothes*, wished her a happy New Year and retired. She looked out of the window, but did not see him leave the house. Soon afterwards she went downstairs and told a friend Beaunis had paid her a visit. Nor could she be persuaded that he had not actually been there in person.

Whence, then, comes the common delusion that will is an integral part of our mental equipment? The belief seems to have its root in consciousness. Of consciousness we can only say that it is a fact in connection with our nervous system. It appears to come into existence only when a variety of nerves are stimulated. The power of discriminating between successive sensations has already been described as one of the fundamental conditions of knowledge. Now, discrimination is but another word for consciousness, a necessary element in this being a change from one nerve-state to another. If we could conceive the weathercock as being endowed with a discriminating faculty, we should perceive that whatever might be its belief as to the voluntary nature of the movements it was executing, these movements would in every case have been entered upon before it began to discriminate them. This is precisely what happens in the case of our own so-called volitions. They are begun before they come within the sphere of consciousness at all. When actions are so often repeated that the requisite nerve-groupings become closely organised in the brain-centres, such actions cease to be conscious. Memory, reason, feeling, and will simultaneously disappear in proportion as mental changes become automatic. We act then from force of habit. Much of our mental action takes place thus unconsciously, as when a man goes to bed with his head in a state of muddle and gets up in the morning with a clear perception of the course he ought to take; or when, after he has been vainly trying to remember a thing and has apparently ceased to think of it, it flashes upon his consciousness. As Taine remarks, there are many stages or platforms where our mental action is carried on, though only one may be lighted up at a time. It was force of habit, with perhaps some hereditary tendency, which constituted the Greek Nomos, or custom having the force of law, as described by Grote—the established fact and condition of things which each new member of the community is born to and finds subsisting, the aggregate of beliefs and predispositions to believe, ethical, religious, æsthetical, and social, respecting what is true or false, holy or unholy, honourable or base in all the relations of life.

The identical modes of feeling and judgment that prevail among masses of human beings are the result of brains of similar organisation being acted upon by similar stimuli; and it is in accordance with this principle that an author, an orator, a painter, or a musician, counts upon producing his effect. Common-sense is the established groove of thought in a community. It varies with time and place. The social virtues of to-day are not those of 500 years ago. Our English common-sense is not the common-sense of the Zulus. It is not even that of our near neighbours the French, in some particulars. Much of this effect is educational, but the special grouping of nerve-cells, the persistent nerve-thrill which is involved in the operations of common-sense, must be such as falls within the capacity of the average brain of the community. Special susceptibilities, or want of susceptibilities, in the individual will always lead to deviations from common-sense, that is to say to originality. Most minds have little bents of their own. A person will be found at a given moment repeating a given thought. Examiners put the same questions year after year. In conversation we unconsciously drift into our favourite subjects. The efficiency of a musical instrument does not more depend upon its construction than does the scope of the mind upon the cerebral organisation.

While there is a pretty general level of intellect in communities, individuals differ widely from each other in mental development. 'I was present,' says Forbes Winslow, 'at the post-mortem examination of the body of a gentleman who died of visceral disease at the advanced age of eighty-four. Up to this period he had been remarkable for great vigour of intellect and for extraordinary elasticity and retentiveness of memory. He appeared to have forgotten no impression that had ever been made upon his mind, in early as well as in advanced life. During the examination of the brain I was repeatedly struck with its anatomical appearance. The gray matter was by no means diminished in quantity or consistence. The fissures were well marked, and both as to volume, character, and depth of its convolutions, the brain presented an aspect similar to what a pathologist would expect to detect

in a person dying in full intellectual power at the age of thirty or forty. In another case I examined the brain of a gentleman whose mind had become prematurely enfeebled for six years previously to his death. He died at the age of fifty-six. The convolutions of the brain had greatly diminished in depth as well as in complexity, and the encephalic mass also presented a general shrunken or atrophied appearance.'[1]

Insanity in all its degrees is to be ascribed to a lowered or heightened susceptibility of brain tissue. If a morbid change is not always visible after death, it does not follow that it has not existed, for in the groupings of nerve-cells and fibres in the brain, we have to deal with phenomena transcending the highest powers of the microscope. Violent mania and imbecility are probably due, the former to an excessive susceptibility of the nerve-cells, the latter to their decay. In the one case, hallucinations of the senses occur, according to the area affected, with imperfect reasoning powers, arising from insufficient comparison; in the other, the perceptive faculties as well as memory in its various forms cease to act, the brain gradually becoming an inert mass, incapable of responding to any external impressions whatever. In acute delirium the exciting cause is usually found to be inflammation of the brain or its membranes. 'Cases of chronic insanity, in which all anatomical lesions are wanting' observes Maudsley, 'are rare. Many of the more advanced cases exhibit some degree of atrophy of the brain, especially of the convolutions, effusion into the subarachnoid space, discolouration of the gray matter, and general hardening of the white substance.' Insanity attended by symptoms of depression is often due to a deficiency of blood in the system, in which case the patient is pale and emaciated, with little or no sensibility.

Among individuals of the same race, a greater or less capacity of mind may be attributed with perfect confidence to a greater or less development or susceptibility of the different areas of their brain. There are persons with poorly constituted brains in which a sight or sound—an impression from the outer world—arouses few cognate or secondary

[1] Forbes Winslow: *Obscure Diseases of the Brain.*

impressions—few memories, that is to say. Dolt and block-head are the words commonly applied to these unfortunates who are governed almost wholly by the sensory impressions of the moment. The possessor of a well-endowed visual centre in conjunction with a poor auditory one, will remember things he has seen better than things he has heard. He will have a good memory for faces, and a bad one for related facts. He will have a clear perception of surrounding objects, with their colours and their relations to each other, but he will be a poor hand at remembering a tune. He may be a painter, he will never be a musician. In the musician the auditory centre is necessarily the most susceptible, since it is here that his memories are the most cohesive and the most easily revived.

In intellectual or artistic pursuits of every kind, the power of concentrating one's thoughts is of great importance. Upon what does this power depend? As sensory impressions tend to call up appropriate movements, so induced movements call up the sensory impressions commonly associated with them. So much is clear. By throwing himself into the physical attitudes of joy or sorrow, the actor contrives to bring his sentiments into a corresponding state. In view of this, Ferrier offers the ingenious suggestion that a person whose motor centres are highly developed may, by the agency of these, be enabled to control his ideas, just as one may call up a state of grief, more or less pronounced, by assuming the physical expression appropriate to it. He concludes that, as the motor centres are not merely the basis of sensori-motor cohesions and acquisitions, but also the basis of the powers of concentration and control of ideation, a relatively high development of the motor centres, as compared with the sensory centres, will be found in those animals and individuals capable of the highest intellectual achievements. There is no necessary contradiction here to the theory, above adopted, of the will. The highly developed motor centres spoken of by Ferrier are but the means whereby a communicated impulse from the outer world is carried into effect. Will still remains essentially a matter of cerebral organisation, which the individual is powerless to alter.

That persons are born with richly or poorly organised brains is beyond all question. The fact is as indisputable as that they are born potentially tall or short, stout or lean, dark or fair, and although education helps to increase their mental acquisitions, it cannot add to, nor can anything but disease or accident take away from, their native capacity. Rudolph Wagner, an authority on the physiology of the brain, observes: 'Between the convolutions of different individuals there are remarkable differences, so that one may distinguish richly convoluted and poorly convoluted brains. These relate only to more numerous divisions and to bendings, etc., of the primary convolutions, which retain the same number and essential position in all normal brains of whatever race. The most notable differences occur in the convolutions of the frontal lobes. There are to be found brains of adults which in this respect resemble the brain of a seven months' fœtus, and of which it may truly be said that, in their outward configuration at least, they have remained in a fœtal condition. The slighter development of the frontal convolutions occurs more especially in female brains, so that it may be said that they resemble in this respect the fœtal brain in its later stages of development, before the final evolution of the frontal lobes. There are to be found also male brains of the same character, which may, therefore, be said to belong to the female type, and female brains which in their richness of convolution approach the male type. As a rule, however, the convolutions and fissures are better developed in all the lobes when the frontal convolutions are especially complex.' As Ferrier and others have shown, there are many grounds for believing that the frontal lobes form the substrata of these physical operations which lie at the foundation of the higher intellectual processes, and their varying degrees of development in individuals is a matter of common observation.

Diversity of brain mechanism necessarily produces diversity of function. It is not alone the poet who is born, not made. As much may be said of the painter, the musician, the commander, the administrator, the philosopher, the man of science or the inveterate criminal. Macaulay, before he

was eight years old, wrote a Compendium of Universal History. Reynolds began to paint and Handel to compose without instruction; Napoleon studied war in the playground; Samuel Taylor Coleridge, before his fifteenth year, was immersed in metaphysics and theological controversy. Environment may do much for the species, but it does little for the individual. All special aptitudes and predispositions depend upon the preponderance of certain areas of the brain possessing more enduring records, more vivid recollections, a greater supply of nerve force, active or latent, than other areas, and thus providing a richer store of material together with a more efficient means of utilising that material for intellectual or artistic operations. Here we have the key to genius in all its forms, creative and destructive, nay, to all the diversities of human faculty, whether in the direction of *plus* or *minus*. We have now to discover how the inequalities of brain structure, underlying these diversities of faculty, arise.

CHAPTER II

ORGANIC FUNCTIONS REGULATED BY THE BRAIN AND SPINAL CORD—ALLIED NERVE DISEASES—INSANITY, IDIOCY, PARALYSIS, EPILEPSY, CONSUMPTION, GOUT, ASTHMA, DEFORMITIES, BLINDNESS, DEAFNESS, ETC.—ILLUSTRATIVE TABLES—DRINKING HABITS, CRIMINAL INSTINCTS, NE'ER-DO-WELLISM, PIETY, AVARICE, PHILANTHROPY, AND OTHER MORAL CHARACTERISTICS IN RELATION TO THE CEREBRO-SPINAL SYSTEM—THE VARIATIONS OF HEREDITY—THEIR PROBABLE CAUSE

THE operations of the brain are not purely sensory, motor, or intellectual; they are also, and to a very large extent, administrative as regards the living body. For all practical purposes the brain and spinal cord are one. Not only does the spinal cord convey the impulses of the cerebral hemispheres to the trunk and limbs; it is in itself an organ of nervous activity, as is shown by the persistence of reflex action in the lower portions of the body after their connection with the brain has been cut off. Many important functions are regulated by the medulla oblongata, the bulbous head of the spinal marrow, situated just inside the skull. If an animal is deprived of its brain above the medulla oblongata it loses the faculties of sensation and of voluntary motion, but it still lives and breathes. Under due stimulation the eyelids will close, the muscles of the face and tongue contract, and the ear twitch; if food is put into the mouth the act of swallowing is performed; the placing of the nipple to the lips excites sucking. What is still more remarkable, the animal so mutilated utters a cry as of pain when pinched; yet it cannot feel anything, the cry being only a result of the reflex action of the larynx and the lungs. When the medulla oblongata is destroyed the animal can emit no sound, though pinching may still produce reflex action in its limbs; and respiration also ceases. The movements of the heart are caused by the

intrinsic ganglia of the heart itself, for it will beat even after its removal from the body, but over the heart's action and the state of the blood pressure the medulla oblongata exercises a controlling influence. By the gray matter of the spinal cord, the tone of the muscles, the secretions of the skin, and the nutrition of the tissues are regulated. All the functions necessary to life, indeed, are organised in the cerebro-spinal system independently of consciousness; this is shown by the simple fact that they are carried on during sleep. The hemispheres, when active, take note of much that is done by other portions of the cerebro-spinal system; it is in them, as we have seen, that memories of various kinds are stored up to serve as the fabric of thought. Without hemispheres, no animal, we may suppose, can have any conscious thought, and in proportion as the cerebrum is organised will the mental powers, apart from the instincts, which are purely reflex, be developed. But although the hemispheres may look on, so to speak, at the organic functions, they have comparatively little to do with them. We cannot hold our breath for any length of time; we cannot voluntarily stop the heart's action. If we had this power, suicide would be a much easier matter than it is. To a limited extent respiration is under our control, and it is not improbable that the Indian fakirs who feign death so successfully are able to weaken the action of the heart. Practice enables an actor to turn pale at will. The influence of the hemispheres in the organic functions is also shown by the fact that in hysterical or epileptic subjects like Louise Latour hallucinations may so affect the nutritive system as to produce in the body and limbs a semblance of the wounds of Christ. The result of hypnotic suggestion in the cure of disease and in the production of morbid symptoms in a healthy body point to the operation of similar causes.[1]

What is more particularly to be noted in connection with the present inquiry, however, is the broad and indisputable fact that the growth, nutrition, and maintenance of the body depend upon the efficiency of the cerebro-spinal system, and that defects in this may be productive not only of deformities

[1] Tuckey: *Psycho-therapeutics.*

but of a whole group of constitutional diseases, comprising scrofula, rickets, gout, rheumatism, consumption, asthma, diabetes, and even dipsomania, as well as intellectual and motor disorders. This subject has been zealously studied of late years by Charcot, Bouchard, Möbius, Féré, Dejerine, Revington, and others, and from their investigations [1] the whole neuropathic family of diseases would appear to be but different manifestations of a single evil, namely, an instability of some sort in the nervous system, betraying itself in one form or another according to its seat in the body. If the brain is deranged, the various forms of hallucination or insanity ensue; if, on the other hand, the seat of the evil is the spinal centres, an impairment of the nutrition and vital forces of the body takes place.

In these varying complications, heredity plays an important part; for the origin of all the nerve diseases from insanity downwards probably lies in that common physical condition known as 'lowness,' or 'being out of sorts.' This is induced in a man by fatigue, exposure, or unsuitable diet; he marries a woman suffering from the like weakness, and the evil becomes aggravated in their children. That it should have been reserved for the science of the present day to discover the family relationship of a number of maladies as old as mankind, is not surprising when we consider how diverse in their symptoms these allied diseases are. Until the functions of the brain and the nervous system came to be as fully understood as they have been of late years, it was naturally impossible for any observer, however shrewd, to discover the relation say of insanity to 'club-foot.' For the problem is complicated by the indirect operation of heredity. The nerve-diseases seldom descend in a simple and direct form from parent to child; they become metamorphosed in passing from one generation to another, and even assume different forms among members of the same family. Ignorance of the subject, be it remarked, is still very wide-spread. People are not unwilling to confess to having gout in their

[1] Dejerine: *L'Hérédité dans les Maladies du Système Nerveux*, 1886. See also 'The Neuropathic Diathesis,' by G. T. Revington, *Journal of Mental Science* 1887–88.

family, but they scrupulously hide the existence of insanity. Yet, at bottom, the one disease is no more respectable than the other, and may indeed claim it as a near relative. The connection of diabetes with the neuropathic group was discovered by the merest accident. It was found that puncture of the fourth ventricle of the brain produced the diabetic condition, sugar appearing in large quantities in the urine; and further investigation showed the formation and excretion of the sugar to be the result of vaso-motor paralysis of the liver, the immediate consequence of the injury in question.

Morbid heredity follows the same lines as normal heredity; it is direct or indirect, it may throw back, appear collaterally, or occur in parent and child at corresponding periods of life. There is no ascertained law governing the alternations in the form of the disease; the insanity of a parent may be metamorphosed in the child into general ill-health, dyspepsia, liability to neuralgia or headache, or even excessive physical activity; it may, on the other hand, descend directly, so that the son becomes as mad as the father. The importance of a proper selection of partners in wedlock can hardly be overrated. If the members of a family in whom nerve-disorder prevails marry into families similarly affected, the chances of a healthy offspring being born to them are exceedingly remote. Nerve-disorder in one parent is, however, counteracted by the soundness of the other, and the children in such a case are likely to show a mixture of healthy and unhealthy tendencies. Many unsound families are saved from extinction by the accident of one of their members selecting a healthy partner. In families suffering from nerve-disorder, some members die young, while others attain a great age. If the evil happens to affect any important seat of organic life, the patient succumbs early; if, on the other hand, the intellectual regions alone are impaired, he may complete, and in consequence of excessive stimulation of his vital functions, even exceed the ordinary span of human life. Both short life and long life in excess are, therefore, symptoms of the neuropathic condition, as, indeed, is every marked departure from the mean of existence. It has been remarked that while

certain unions are sterile, the same parties, differently united, are prolific enough. The explanation of the fact must be sought in the neuropathic condition of the couples. Suffering from the same nerve-disorders they make an unwholesome blend; if they are not childless, their children, unfit to live die young. There is another important fact to be noted. Like long and short life, irregularities of growth, such as excessive stoutness or leanness, great height or dwarfishness, may also be looked for in families where nerve-disorder prevails.

Practical illustrations of heredity in mankind bear out to the full the variation theory. Möbius gives the following family table: A drunkard dies of delirium tremens at fifty, leaving a daughter who is a 'little excitable' in temperament. This woman marries an apparently sound man, and has a mixed offspring, namely:

1. Daughter. Melancholic, with suicidal tendencies. Marries a man suffering from tuberculous disease. Of this union are born a daughter who dies of a puerperal disorder, a son who is tuberculous, a daughter who dies in infancy of convulsions, and a son who dies at twenty-six of spinal disease.

2. Son. Melancholic and suicidal. Marries a healthy woman and has several children, apparently sound.

3. Son. Melancholic, and actually committed suicide. Married a woman of unknown character, and leaves eight children, of whom two die of convulsions, two suffer from neuralgia, and one is epileptic. Others apparently well.

4. Son. Suffers from neuralgia. Marries a woman of 'nervous temperament.' Leaves a son with a deformed ear, a daughter who dies of convulsions, a second daughter who is six-fingered and slightly hydrocephalic, and a third who is apparently sound.

In 1884, a Calabrian soldier named Salvator Misdea shot several of his comrades in cold blood, and was sentenced to death by court-martial. His pedigree was investigated by Lombroso, Blanchi, and Basilei, who tabulate the result as follows:

Grandfather unintelligent, but of very active habits. Of his sons, the eldest was extremely hot tempered, and died of asthma; the second was eccentric, the third lame, irascible and

family, but they scrupulously hide the existence of insanity. Yet, at bottom, the one disease is no more respectable than the other, and may indeed claim it as a near relative. The connection of diabetes with the neuropathic group was discovered by the merest accident. It was found that puncture of the fourth ventricle of the brain produced the diabetic condition, sugar appearing in large quantities in the urine; and further investigation showed the formation and excretion of the sugar to be the result of vaso-motor paralysis of the liver, the immediate consequence of the injury in question.

Morbid heredity follows the same lines as normal heredity; it is direct or indirect, it may throw back, appear collaterally, or occur in parent and child at corresponding periods of life. There is no ascertained law governing the alternations in the form of the disease; the insanity of a parent may be metamorphosed in the child into general ill-health, dyspepsia, liability to neuralgia or headache, or even excessive physical activity; it may, on the other hand, descend directly, so that the son becomes as mad as the father. The importance of a proper selection of partners in wedlock can hardly be overrated. If the members of a family in whom nerve-disorder prevails marry into families similarly affected, the chances of a healthy offspring being born to them are exceedingly remote. Nerve-disorder in one parent is, however, counteracted by the soundness of the other, and the children in such a case are likely to show a mixture of healthy and unhealthy tendencies. Many unsound families are saved from extinction by the accident of one of their members selecting a healthy partner. In families suffering from nerve-disorder, some members die young, while others attain a great age. If the evil happens to affect any important seat of organic life, the patient succumbs early; if, on the other hand, the intellectual regions alone are impaired, he may complete, and in consequence of excessive stimulation of his vital functions, even exceed the ordinary span of human life. Both short life and long life in excess are, therefore, symptoms of the neuropathic condition, as, indeed, is every marked departure from the mean of existence. It has been remarked that while

certain unions are sterile, the same parties, differently united, are prolific enough. The explanation of the fact must be sought in the neuropathic condition of the couples. Suffering from the same nerve-disorders they make an unwholesome blend; if they are not childless, their children, unfit to live die young. There is another important fact to be noted. Like long and short life, irregularities of growth, such as excessive stoutness or leanness, great height or dwarfishness, may also be looked for in families where nerve-disorder prevails.

Practical illustrations of heredity in mankind bear out to the full the variation theory. Möbius gives the following family table: A drunkard dies of delirium tremens at fifty, leaving a daughter who is a 'little excitable' in temperament. This woman marries an apparently sound man, and has a mixed offspring, namely:

1. Daughter. Melancholic, with suicidal tendencies. Marries a man suffering from tuberculous disease. Of this union are born a daughter who dies of a puerperal disorder, a son who is tuberculous, a daughter who dies in infancy of convulsions, and a son who dies at twenty-six of spinal disease.

2. Son. Melancholic and suicidal. Marries a healthy woman and has several children, apparently sound.

3. Son. Melancholic, and actually committed suicide. Married a woman of unknown character, and leaves eight children, of whom two die of convulsions, two suffer from neuralgia, and one is epileptic. Others apparently well.

4. Son. Suffers from neuralgia. Marries a woman of 'nervous temperament.' Leaves a son with a deformed ear, a daughter who dies of convulsions, a second daughter who is six-fingered and slightly hydrocephalic, and a third who is apparently sound.

In 1884, a Calabrian soldier named Salvator Misdea shot several of his comrades in cold blood, and was sentenced to death by court-martial. His pedigree was investigated by Lombroso, Blanchi, and Basilei, who tabulate the result as follows:

Grandfather unintelligent, but of very active habits. Of his sons, the eldest was extremely hot tempered, and died of asthma; the second was eccentric, the third lame, irascible and

homicidal, the fourth semi-imbecile, the fifth (Salvator's father) eccentric, drunken, and extravagant, married to an hysterical woman, who had one brother a brigand, and another a thief. Salvator, the offspring of this ill-starred union, was himself epileptic, hypochondriacal, feeble in memory and intelligence, and drunken. He had brothers and sisters, of whom one was epileptic, another sound, a third impetuous and hot tempered, a fourth obstinate and unteachable. One of his uncles (the second) had a family of idiots and imbeciles.

Among the children of epileptic parents the mortality is enormous. About half the number born die in childhood, principally of convulsions. They have so great an instability of nerve-element that convulsions result from the slightest irritation. Indeed, any sort of disease of the nervous system in the parents seems to dispose to this ill condition of the child, the acquired deterioration of the parent becoming the inborn organic feebleness of the offspring. Convulsions, as Maudsley remarks, are the sure sign of a weakness or lowered vitality of nerve-element—a defect which implies an unstable equilibrium of its organic constitution. Of the children of epileptic parentage who survive the perils of infancy only one in seven, apparently, inherits directly the complaint of its parents; the others are hysterical, paralytic, idiotic, insane, cross-eyed, or subject to St. Vitus's dance, pretty much in the order named. Among the morbid conditions which, in parents, lead to epilepsy in the children, Dejerine enumerates alcoholism, persistent headache, suicidal tendencies, neuralgia, deafness, blindness, club-foot, paralysis, and ataxy. Other observers have noted in addition melancholia, somnambulism, apoplexy, nervous excitability, meningitis, softening of the brain, and lock-jaw.

The mixed conditions resulting from healthy blood on one side, and a morbid taint on the other, are well illustrated by the following family history: An 'eccentric' man marries a healthy woman, and has three sons and a daughter. The eldest son is sound, the daughter is weak-minded, the second son is also weak-minded, and the third is eccentric and ailing. This third son, who, in spite of his ill-health, lives to be seventy-one, marries an intelligent and apparently

sound woman, and has a large family with the following characteristics:

1. Alexander: imbecile; dies at sixty-nine of peritonitis due to congenital hernia.
2. Ellen: sound and long-lived.
3. Mary: imbecile; dies at twelve.
4. William: idiot; alive at sixty-eight.
5. John: idiot; dies at fifty-six.
6. Robert: imbecile; dies at sixty-one of debility, due to disease of bones of the foot.
7. Joan: consumptive; dies at forty-four, leaving a daughter who also dies of consumption.
8. Thomas: a sufferer from chronic bronchitis with nervous exhaustion; marries a sound woman and has an imbecile son.
9. Anne: imbecile; dies at forty-four of consumption.
10. James: well and long-lived; marries and has eight healthy children.
11. Charles: imbecile; dies at four.

In this singularly corrupt and numerous family, two children, and two only, escape the hereditary taint on the father's side. Morbid heredity in both parents seems to leave almost no loophole of escape for the offspring, judging from the following table by Möbius:

A man who has suffered from St. Vitus's dance in his youth, and is intelligent but rather singular in his habits, and deformed, and who has a sister subject to nervous attacks, marries a woman belonging to a neuropathic family. Their children are one and all morbidly affected as follows:

1. Daughter: deformed and hysterical; marries a sound man, and has hysterical, nervous, or tuberculous children.
2. Son: suffers from St. Vitus's dance; is cross-eyed and melancholic, marries a sound woman, and has a child subject to convulsions.
3. Daughter: deformed and hysterical: marries a sound man, and has four daughters—the first, scrofulous and nervous; the second, deaf; the third, scrofulous and deformed; the fourth, nervous.
4. Son: intelligent, but of extremely variable temper;

marries a woman who is sound mentally, but tuberculous, and has a scrofulous, nervous, hysterical, ailing, and melancholic family.

5. Daughter: subject to St. Vitus's dance and hysterics.

None of the family tables yet given shows an access of any particular faculty along with general morbid conditions, but the case is not rare. I quote again from Möbius. A medical man of position, gay and active, marries a woman of unknown characteristics and has a family:

1. Son: small, deformed, of mediocre intelligence; marries a sound woman and has, *a*. son: deformed and weak-minded; unmarried. *b*. daughter: of quick intelligence, a little deformed; married but childless. *c*. daughter: bright and witty, exhibits some mental derangement at the age of puberty; marries a sound man and has four children, three of whom die in infancy, and one is idiotic. *d*. daughter: indolent, suffers from pains in the head, eccentric.

2. Daughter: of unknown characteristics; has a son *superior morally and intellectually*, who marries his cousin (*b*) and is childless.

3. Daughter: also of unknown characteristics; has a son of *vigorous intellect*, but melancholic, who is married to his cousin (*d*), and has a nervous, epileptic, and melancholic family.

4. Daughter: intelligent, but gluttonous; childless.

5. Daughter: quick and imaginative, a little eccentric and capricious; marries a sound man and has, *a*. son: *intellectually vigorous*, but hypochondriacal and capricious; marries a sound woman, and has six children, three of whom die young, while one is an invalid, and two well. *b*. daughter: nervous; marries a nervous man, and has an extremely nervous daughter, a son of feeble intellect, and another son who dies young of brain disease. *c*. son: *intellectually vigorous*, *gay*, *imaginative*, but capricious and hot-tempered; marries a sound woman, and has four daughters, three of whom die young, while the fourth is nervous, and a son who is an invalid.

In a family table given by Vizioli, there appears to have been born to a neuropathic couple (the husband gouty and

apoplectic, dying at seventy-five, and the wife dying of gangrene at seventy-two), no fewer than sixteen children, the majority suffering from paralysis, impediments of speech, apoplexy, ataxy, hypochondria, dipsomania, or deformities. In two cases there occurs *remarkable intelligence* combined with apoplexy, ataxy, heart disease, hypochondria, and early death. There are also two cases in the same family of *extraordinary sexual power*. Concerning the latter characteristic it may be noted that whereas, formerly, medical authorities were wont to attribute paralysis and kindred affections to the sexual excesses that so often precede them, they are now disposed to reverse the order of matters, and to recognise such excesses as a mere symptom, an effect and not a cause of the morbid state of the nervous system. As much may be said of the extraordinary weakness or total absence of the faculty observed in certain cases, and also of the perversion of the sexual instinct.

The frequent occurrence of alcoholism in the group of allied nerve diseases is remarkable. It would appear that the drunkard's vice is not solely acquired by the unhappy individual himself, but is due to hereditary predisposition. No authority who has lately studied this question entertains any doubt as to the persistence of the alcoholic taint in families, or as to its metamorphosis into other forms of nerve disease in passing from parent to child. It is found in close family connexion with insanity, epilepsy, violent temper, paralysis, imbecility, suicidal tendencies, deaf-mutism, and kleptomania. '*N'est pas alcoolique qui veut*,' observes a well-known medical authority; and, indeed, it is a matter of common observation that there are not only people who have acquired no excessive liking for drink, whatever their opportunities or temptations may have been, but to whom alcoholic liquors are positively distasteful. Dejerine gives details of a case in which a man of alcoholic tendencies, marrying a sound woman, engendered an hysterical daughter and a son who was dipsomaniac and epileptic. On the authority of Charcot, the same writer publishes the pedigree of a family whose members suffered variously from St. Vitus's dance, paralysis, hysteria, impaired sight and

speech, and other affections. The father was epileptic, the mother subject to headaches and attacks of nerves. The grandfather was eccentric, and had a sister who suffered from asthma, and who had a son alcoholic and irresponsible; the grandmother was of violent temper, and had a nephew who committed suicide. Magnan has observed epilepsy and alcoholism existing side by side in the same individual. It sometimes happens that a man becomes a settled drunkard at forty, and that his son, born twenty years before, develops in due time the same habit. What the father transmits to his son in such a case is not the vice of drunkenness itself, but the physical condition which conduces to it. Some authorities endeavour to establish a distinction between alcoholism and dipsomania—between acquired and inherited habits of drinking. The line of demarcation is one very difficult to draw. Both evils are the result of a craving of the stomach, due to some perversion of the gastric sensibility, and both in extreme cases are accompanied by affections of the brain and organic disturbances, particularly of the liver.

Similarly it may be said that consumption or tuberculosis is not transmitted directly, but is the result of a transmitted physical condition. There is no doubt but that tubercular disease propagates itself in numerous families from generation to generation, and that such families show a special susceptibility or tendency to it in one or other of its forms. At the same time there is reason to believe that the structural disease itself is not hereditarily transmitted, but that it is directly excited in each individual in whom it appears by a process of external infection due to the action of the tubercle bacillus. In other words, if the disease itself is not inherited, a particular temperament which renders the constitution liable to be attacked by it is capable of hereditary transmission, and is found alternating with diseases of the nervous order.

Ne'er-do-wellism, profligacy, or general good-for-nothingness, is as much the product of a defective brain organisation as insanity itself, of which, indeed, it is a variety. Only to be found in families where there is a neuropathic taint, it is a frequent concomitant of genius, if not in the individual,

at all events in his near relatives; and its physical basis is to be sought, partly in an excess of sensual appetites, partly in the same order of nerve-groupings as caution, caution and ne'er-do-wellism being due, respectively, to an excess and a deficiency in the revivability of those past impressions which serve as a guide to present conduct.

'Crime, vice, and insanity,' says Féré, 'are only separated by social prejudices, they are united by their character of fatality.' The hereditary nature of crime has been maintained by Maudsley, Jacoby, Lombroso and other writers; and the case of the infamous Jukes family in America, whose criminal pedigree has been made out for seven generations, and who now number over 600 individuals, lends much support to the theory already well established by the frightful ravages of epilepsy and other nerve diseases among the criminal classes. Gluttony figures among Dejerine's tables as a vice of the epileptic order; so do avarice and excessive piety. Here is the family history in which the latter characteristics occur:

A man of eccentric habits, very intelligent, but opposed to the education of his children and extremely avaricious, has a family of seven. Of these the eldest is violent in temper and has a child insane; the second is obtuse, avaricious, and devout, having one child obtuse, and another deaf-mute and imbecile; the third, a daughter, is avaricious and devout, is attacked by puerperal mania, has a tuberculous daughter, two other children who have died of meningitis and convulsions respectively, and two sons of defective intelligence, one being a somnambulist; the fourth is maniacal and devout; the fifth devout; the sixth insane, and the seventh imbecile.

As piety is a frequent symptom of the epileptic condition, and as vanity and many faculties of a simple or complex character are occasionally found in an inordinate state of development when the cerebro-spinal system is unsound, it is not surprising that avarice should be a member of what Féré calls the 'neuropathic family.' Philanthropy itself may be placed upon the same footing. Howard, the prison reformer, was a tyrant in his own house and had a son who was insane. So also with selfishness. The explanation of

these facts, so subversive of the current notions of morality, will be found in what has been said concerning the operation of the will. Owing to the non-receptive or the irresponsive action of one or more centres of the brain—a question of cell or nerve-nutrition—certain sets of ideas maintain themselves in the field of consciousness to the exclusion of others, or certain impulses independently of consciousness obtain the upper hand. There are people who, as the saying goes, do not listen to reason, who are insensible to all save their own interests; others, again, may be so self-sacrificing as to denude themselves unreasonably of their comforts and possessions for the benefit of their neighbours or possibly of the heathen. Both classes may be as truly neuropathic as the dyspeptic or the sufferer from tic-douloureux. Intense convictions of all kinds, including the most bigoted professions of religion, will generally be found associated with an ailing, sickly, or nervously unsound constitution. On the other hand, the man of robust health is of necessity tolerant and many-sided in his views.

There are various physical or mental defects of a minor character arising from anomalies of the nervous system which it is hardly necessary to enumerate. They will occur to the intelligent reader on a moment's reflection. Stuttering, due to a defect in the motor centres of articulation, bad teeth, excessive hairiness or baldness, albinoism, all arising from defects in the nutritive process, together with writer's cramp, which is known to occur in people who do not write, are as truly nervous in their origin as congenital blindness and deafness, or physical malformations.[1]

Gout, popularly believed to be the result of good living notwithstanding its frequent occurrence in poorly-nourished people, is an important member of the group of nerve diseases now under consideration. With its kindred affection of rheumatism it is perhaps more liable to transmission in a direct form than some others. Dyce Duckworth, the latest English authority on gout, states that in those families whose histories are the most complete and trustworthy, the influence is strongly shown, and occurs in

[1] Féré: 'La Famille Nevropathique,' *Archives de Neurologie*, 1884.

from fifty to seventy-five per cent. of the cases; further, that the children of gouty parents show signs of articular gout at an age when they have not assumed those habits of life and peculiarities of diet which are commonly regarded as the exciting cause of the disease. But gout also alternates with neuropathic troubles. Bouchard, a French authority, is clear upon this point; he finds it intimately associated with insanity, epilepsy, hypochondria, asthma, St. Vitus's dance, etc. Various examples of this kind are given by Dejerine. A man suffering from rheumatic gout, gravel, neuralgia, and headaches engenders three children, of whom the first dies at thirteen from meningitis, the second suffers from headaches and fainting fits, and the third is subject to convulsions and hysterical crises. In another case, the father, suffering from eczema, dies suddenly (presumably from brain or heart disease, the common cause of sudden death), the mother is hysterical, and their children suffer from diabetes, consumption, sciatica, hypochondria, and other evils. *Per contra*, any one of the nerve diseases enumerated, from insanity downwards, may be accompanied or followed in members of the same family by gout or rheumatism. Suppressed gout may cause paralysis, hallucinations, or attacks of mania. These troubles cease when the gout returns to the joints. Gairdner, Lynch, and other writers note affections of speech alternating with gout. Féré has had under treatment a gouty subject in whom fits of hypochondria preceded attacks in the joints and ended as these began; a son of the same patient escaped gout, but was subject to hallucinations. Another individual known to Féré suffered from violent explosions of temper, headaches, and sciatica; at thirty-three he was attacked by gout which was followed by shaking palsy. In other cases gout is attended by intellectual torpor, imbecility, or malformations. Asthma is also of frequent occurrence in gouty families.

The interesting question remains: By what process is the transformation of one nerve disease into another effected? Of late years the labours of Van Beneden, Hertwig, Weismann, and others, have thrown some light upon this mystery and have furnished a plausible explanation of the variations of heredity. It is now well established that a young animal

arises from the fusion within the female ovum or egg of an extremely minute particle derived from its male parent. The ovum is much larger than the male germ or spermatozoon, but it contains a nucleus which is believed to be the bearer of the hereditary characteristics. Technically, these particles are termed the male pro-nucleus and the female pro-nucleus, the body formed by their fusion being known as the segmentation nucleus, which is, properly speaking, the starting-point of every individual organism.

If the male and female particles were always combined in equal proportions, and in precisely the same way, the young animal would, no doubt, be an exact reproduction of its parents in equal parts. But this is not so. There is a certain amount of variability to be observed in the transmission of characteristics, the young animal taking more after one parent than another, and even throwing back in a greater or less degree to more distant ancestors. The highest power of the microscope does not reveal the exact composition of the pro-nucleus supplied by each parent, though it has been established that the double nucleus of the fertilised ovum is accurately composed, half of female and half of male elements. At this early stage the segmentation nucleus is not a homogeneous, structureless body, but is built up of different parts. It contains extremely delicate threads, which are either coiled up or intersect each other to form a network, the meshes of which are filled up by a viscous substance; and these various parts evidently consist of molecules having, like those of other matter, the property of self-adjustment. By a process of division, cells, similar to those already existing, arise, and these in turn also multiply by division. In course of time the various cells arrange themselves into layers, and from these are derived all the tissues and organs of the body. Whether in the embryonic or the adult stage of life, therefore, every cell in the body is derived by descent from the segmentation nucleus through repeated divisions.

It is clear that the segmentation nucleus embodies the characters of both parents, and, in a lesser degree, of their immediate ancestors, and observation of the offspring points to the conclusion that in each successive act of generation