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LECTURES

ON

DISEASES OF THE NERVOUS SYSTEM

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LECTURES

ON DISEASES OF THE

NERVOUS SYSTEM

DELIVERED AT GUY'S HOSPITAL

BY

SAMUEL WILKS, M.D., F.R.S.

SECOND EDITION

LONDON
J. & A. CHURCHILL
11, NEW BURLINGTON STREET
1883

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PREFACE TO SECOND EDITION

In offering to the profession a new edition of my lectures it may be necessary to state that the work has been much enlarged, both by a fuller description of some forms of disease and by a more copious illustration of cases. During the last few years considerable attention has been given to the study of some special kinds of nervous affection, such as hemi-anæsthesia and its treatment, by the French school. A fresh interest has thus been necessarily created in this and kindred subjects, and has obliged me more fully to discuss them in reference to recent theories, to many of which, however, I cannot assent. Again, the classification of spinal diseases by Erb and other German authors has been so closely followed by English writers that I have felt compelled to rearrange my own section on this subject in deference to the general adhesion to German nomenclature. It will be seen, however, that this change has reference rather to pathological considerations than to any greatly advanced clinical knowledge; for example, under the new designation of lateral sclerosis and its varieties will be found cases which appeared formerly under meningitis and other headings. The alteration, therefore, observable in this section is not so great as it might appear.

I have always advocated the opinion that the nomenclature of disease should be founded on clinical facts rather than on pathological considerations. Names were originally given to various groups of symptoms which were easily recognisable by all, the nature or cause of these symptoms being left for further investigation. No theories can overthrow any terms of this kind used merely as tokens whose value all understand. There may often be no disagreement about the case which two practitioners are treating, although they may dissent widely about its pathology. I am speaking more especially of diseases of the nervous system, but I believe my opinion is strictly applicable to disease of all kinds, even should the terms in use clearly and admittedly designate an organic lesion in expressions such as phthisis or morbus Brightii. For should it be agreed that certain morbid changes are uniformly found in fatal

cases, such conditions can only be safely foretold in very marked and protracted instances. In recent affections, where we foresee a tendency to terminate in an organic lesion, we are not justified in the adoption of an expression whose very terms almost preclude hope of recovery. Moreover, it is undoubtedly true that there is not a single organic disease of the nervous system which may not be simulated by a functional and curable one. The evil attendant upon all such expressions as indicate serious organic pathological change is intensified by such a rash term as *progressive*, which is perfectly useless if it merely implies that all disease has a tendency to advance, and is actually mischievous if it means that that particular disease to which "progressive" is applied is exceptionally hopeless and incurable. I have therefore endeavoured, in order to avoid such objectionable terms, to use clinical rather than pathological designations.

I must remind the reader that the first edition of this work was a reproduction of lectures given several years before. Many terms, therefore, expressive of time, persons, and events, have reference to the very earliest period of delivery.

To Dr Horatio Donkin I scarcely know how to express my indebtedness for the invaluable services which he has rendered me. After I had sought for time at the instigation of my publisher during the last three years, in order to issue a new edition, Dr Donkin kindly came to my assistance, and taking all the fresh notes which had accumulated in the interval, arranged them in order, materially assisting thus in the development of the present work. He has, moreover, further lightened my labours, although adding to his own, by revising these new sheets as they passed through the press.

SAMUEL WILKS.

GROSVENOR STREET;
May, 1883.

PREFACE TO FIRST EDITION.

In presenting this work to my readers, I may fairly be expected to preface it with a few words of explanation. In the year 1868 a part of my course on "Medicine" delivered at Guy's Hospital relating to nervous diseases was published in a periodical form. Ever since that time the lectures have been frequently perused by my pupils, who have constantly demanded of me their reprint in a separate form. To this appeal, so often made, I now respond in the present volume. It contains my original lectures with the additional matter which ten subsequent years have enabled me to accumulate. Much of this has already appeared in the 'Guy's Hospital Reports,' but its repetition in this volume was inevitable, since it is evident that the cases which have been thought of sufficient importance to publish separately would necessarily be the most valuable ones with which to illustrate my lectures.

The order of the subjects which I have found useful for lecture cannot be justified on scientific grounds, but I may console myself with the conviction that with our present existing nomenclature it is impossible to frame a systematic view of nervous diseases on any rational basis whatever, be it anatomical, pathological, or clinical. I have therefore endeavoured to make the best of a heterogeneous system.

Had I in other circumstances believed that there was room for such a work as this, I should have prepared to sit down and write a systematic treatise, which would thus have enabled me to omit many of the explanations now offered expressly for the instruction of students, and to add more precise scientific material than the present occasion demands. I might then also perhaps have attempted in my descriptions of disease to approach nearer to a scientific method. Time might then have permitted me to make appropriate references to the various authors whose works would have surrounded me, and to mention more emphatically the original observers in this department of medicine. The form of a lecture, however, does not admit of a reference to the source of information from which the instructor draws. He offers what he has in his possession, but how much of his wealth has been acquired by his own

digging, how much delivered over to him by his predecessors, and how much he has been unconsciously acquiring from his contemporaries, is unknown even to himself. From whatever sources my own knowledge has been obtained, I have endeavoured thoroughly to assimilate it before adapting it to the use of others; at the same time I have always endeavoured to remember the name of any observer who has added a new fact to the general stock. In saying this I cannot but feel how indebted we all are to such men as Hughlings Jackson, who are always pouring out their best thoughts before the profession, and who therefore assist us in a greater measure than we ourselves are aware of in forming our opinions.

As regards myself I have offered my contributions to the profession from time to time, and were I asked what amount of originality may have been displayed in the lectures when published ten years ago I should point to the general view I took of cerebral physiology and pathology, the truth of which all observations and experiments have since tended to confirm. Indeed, from my earliest days as a teacher, and whilst controversies were still warm as to the interpretaton of a double brain, and the text-books of physiology were throwing no light upon it, I taught that the two hemispheres were necessary complements to the separate ganglia with which they were associated, and that the distinction of the latter was a necessary accompaniment of the independent action of the limbs. The pathological facts of hemiplegia, of hemispasm, as well as physiological considerations, all combined to prove the correctness of this position.

I might also express a belief that my lecture on migraine or sick headache gave at that time an impulse to the further study of that malady; at all events I was prompted to give the lecture by failing to find any description of this complaint in the best-known works on medicine.

Nor am I aware that any account had previously been written of alcoholic paraplegia, or the effects of alcohol in producing a myelitis or meningitis. Some other minor matters relating to nerve pathology in which I have been interested I need not mention.

Finally, I must express my fear that the somewhat disorderly arrangement of notes for lectures has caused the description of cases to be a little more informal than I should have desired.

SAMUEL WILKS.

Grosvenor Street;
January, 1878.

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* This subject and the three which follow have been erroneously placed under subordinate (black letter) titles in the body of the work.

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LECTURES

ON

DISEASES OF THE NERVOUS SYSTEM

PART I—BRAIN

INTRODUCTORY REMARKS ON THE PHYSIOLOGY OF THE NERVOUS SYSTEM

Gentlemen,—Those who attended here last year will remember that no lectures were delivered on diseases of the nervous system. The session, indeed, is too brief to allow of any approach to such a complete course of medical lectures as was attempted at one time to be given. It is very true that our distinguished predecessors, Bright and Addison, were enabled to take up the whole series of subjects in their nosology, and, by the force of their genius, to shed upon them a light which illumines us to the present day; but at the same time it must be confessed that a quarter of a century has done much to expand the brief system with which they dealt. We shall see, for example, how the physical diagnosis of the chest has wonderfully unfolded the subject of thoracic disease, and the physiology of the nervous system enlarged our knowledge of nervine ailments. It were almost impossible, therefore, to embrace all subjects in one short course. At one time an inflammation of the brain or a paraplegia might be all that held the attention of the lecturer and his class; now, although nerve pathology is still in its infancy, we have to dilate on a variety of nervous affections. These are so highly important that I beg your serious attention to the disorders which I may bring before your notice, and must also insist on this because it is only by a close observance of the symptoms that cases of nervous disease can afford any interest to you. To many students, I know, they constitute the driest and most repulsive forms of malady, and for this reason—that, wishing rightly to store your minds with as many facts as

possible, you would rather listen to a discourse where you could note down special facts such as I have to offer you in considering the physical diagnosis of disease of the lung or heart; for then you could carry away something positive in your memories or note-books, whilst in many of these nervous diseases the symptoms are so various, sometimes so inexplicable or shifting, that you fear that you are never grasping a reality. Look, however, more intimately into these affections, give them a little close attention, and you will find them amongst the most interesting of the disorders you have to treat. Remember this, moreover; you cannot ignore them; when you get into practice they will be coming before you daily, and it will require all your acumen to distinguish one form of disease from another, and the appropriate treatment. Look what the last year has shown us in yon electrifying room—that a careful discrimination of cases enables us to recommend one form of galvanism rather than another; and we are delighted to find that cases which we might have pronounced hopeless are now perfectly cured by a better understanding of their nature.

The cases which we may style nervous are without number—in fact, a very large part of all diseases which are called functional are indeed nervous. You have only to remember that every function of the body is regulated by nerve force, and you will perceive that the study of nervous diseases must embrace affections of every organ and tissue of the body. If this be so, their study must be considered to be still in its infancy. For example, a heart is beating irregularly, palpitating, or its force is being reduced; this, we know positively from experience and experiment, may arise from a nervous influence. But suppose that the heart should altogether cease to beat, and on post-mortem examination the dissector should pronounce it healthy—he would mean only as regards its muscular tissue and valves; but how about its nerves? Just think of those beautifully dissected hearts at the College of Surgeons, which look more like bundles of thread, so closely are they covered with nerves; and then remember the experiments which you have had shown to you of the movements of the heart when it is out of the body, as well as of the contractions of its segments which contain the ganglia; you will perceive the importance of the nerve supply to the heart, and the consequence of derangement or disease of its nervous elements. How many cases of dyspepsia, constipation, liver disorders, are due purely to a nervous cause! Think of the sympathetic nerves surrounding the blood-vessels! the vaso-motor nerves (if they be not the same), and how they influence necessarily the supply of blood to the tissues and thus exert a power over the processes of nutrition. Think of

those large semilunar ganglia and the solar plexus with their supply to the vessels and viscera, and you cannot but suppose that their influence is all-potent. We get some kind of hint of the importance of these structures when, as in Addison's disease, we see all these nerves matted together and the patient die out from sheer exhaustion, while all the organs of the body are perfectly healthy. In peritonitis and strangulated intestine, also, we perceive a similar prostration. No wonder it has been suggested that in these ganglia lies the *fons et origo mali* of the disease known as cholera, since, in a few short moments, a healthy body may be reduced to almost the condition of a corpse. I have very little doubt that the influence exerted by this solar plexus has much to do with the fact of the frequency of cancer in the neighbourhood of the stomach. Surely, then, we have much to learn about this important centre of our bodily solar system. Considerations of this kind prompt me to the belief that there yet may be a wide field of therapeutics open to us in which we may employ remedies that may alter the nutritive processes through the agency of the vaso-motor nerves.

No doubt such considerations have led to the belief that in the application of heat and cold there may at last be found the universal medicine; that as the dilatation or contraction of the blood-vessels is thought sufficient to rule all other changes, and, as these vessels are altered in calibre by the influence of the nerves, so a depressant or stimulant acting on the ganglionic or other centres might be the means of regulating all nutrient processes. Speaking generally, there can be no doubt of the power for good or for evil of heat and cold. Consider the value of drugs from this point of view. Look at opium, which has so striking an influence on the nervous system, and then go into the surgical wards and see a large sloughing sore heal under its use; this will give some idea of the value of this class of remedies, and show how nutrition is modified under their employment.

Lectures on diseases of the nervous system might be made to include nothing less than a consideration of the disturbances which arise in all the organs and tissues of the body. Putting this application aside, we shall deal more especially with the brain and spinal cord. Now these structures are so complex in their composition that we learn little by taking each in the mass, as we do with the other organs of the body, and then considering their individual diseases. In the lungs, for example, which are uniform throughout, the term pneumonia or pulmonary abscess has a definite meaning and includes certain defined symptoms; but softening of the brain, or abscess of the brain, cannot be described in so many given terms with their distinctive effects. For abscess in one part would

be productive of one set of symptoms, and in another part of another set of symptoms. Effusion of blood shows a totally different class of phenomena as occurring on the surface or in the centres of the cerebral hemispheres. We must, therefore, of necessity, consider the physiology of the nervous system before we pass to its pathology, and you will, I know, pardon me for recalling to your remembrance some of the main points which physiology has taught us. In possessing this knowledge we shall be prepared for the occurrence of those symptoms which we are sure morbid changes in certain regions of the brain must produce, and we shall also save much time by the avoidance of their repetition when we come to treat of distinct diseases.

Look, for a moment, at the constitution of an animal body; here is the framework, or skeleton, held together by ligaments, and covered by muscles for the purpose of moving one bone on another. The action of the muscles necessitates wear and tear, and consequently a fresh supply of nutrient material. With this object there is blood sent to them through vessels and propelled by the heart; there are also other vessels to carry away the débris which is got rid of by lung and kidney. For a fresh supply of blood the abdominal organs are required to manufacture it from the food. Since these organs have certain definite functions to perform, they are regulated for the most part by nerves called the sympathetic, which convey a power originating in certain bodies styled ganglia. I apprehend that a creature so constituted might exist or live. There is not such a one, I know, for the very presence of parts I have mentioned would be useless without a higher organisation; but there are animals of the molluscous kind which seem to have very little higher nervous development than this—an arrangement for the regulation of their simple animal machinery. Now, remember, what the lower animals possess we possess also, and that which we have in common with them is not to be regarded as an inferior portion of our nervous system, but, on the other hand, the more important. I shall have to show you that our very existence depends on the integrity of the sympathetic system of nerves, and not necessarily on the brain.

The creature we have contemplated having muscles to be stimulated to action requires nerves to proceed to them which originate in ganglia, or centres of force. These latter are collected together in a chain constituting the spinal cord. These centres are excited through the influence of other nerves which have their origin over the whole surface of the integument of the body, so that if the surface be touched, a stimulus is conveyed along one of these sensitive nerves to the spinal centres, a reaction takes place, and a

corresponding effect is seen on the muscles by an influence conveyed back by the motor nerves.

We have now a higher class of animal which can be excited to movement by an external stimulus. Now, bear in mind that we also have this system, the spinal or excito-motor, in common with the lower animals, and do not ignore it because we have still some further development of our nervous centres.

Thirdly, imagine the vertebræ developing into a skull case at the same time that the spinal marrow itself expands and terminates in two large ganglia, known as the central ganglia of the brain—the "head-centres," or the thalami optici and corpora striata. These are the termini which become subsequently influenced by higher powers acting upon them, and through them on the whole spinal cord; but whether they possess other properties, independent of those of the cord, I cannot, from my own clinical experience, positively declare. It is believed, however, that an animal possessing these bodies has a sensorium, and a kind of perception, and thus, when these are stimulated, evinces what are styled emotions; that a human being in possession of these structures, without any further cerebral development, might display, for example, such emotions as laughing or crying. I think myself that these are merely reflex actions and that the ganglia are nothing more than the superior terminations of the cord which come immediately under the influence of the cerebral hemispheres.

Fourthly, suppose, proceeding from these bodies which constitute the upper part of the cord, a number of white fibres passing towards higher ganglia, and we have still another system. These ganglia in a mass form the cineritious part of the brain, a region where fresh sensations are received and fresh powers are developed. This is the largest mass of grey nervous substance in the body, and would form a layer as large as this table, were it not folded up so as to be packed in a small compass. Herein the sensations conveyed from the surface of the body, and from the special senses, become to the recipient as perceptions and ideas: the animal has become a reasoning being. The power here produced reacting on the body is spoken of as the will, and the animal has become a voluntary agent. The amount of reasoning power and the strength of volition depend, I have no doubt, mainly upon the development of the cerebral hemispheres—small but not absent in the lower animals, most perfect in such a splendid head as that of the late Surgeon Lawrence or of the first Napoleon. The quality of the brain, however, or its texture, no doubt varies considerably, and thus some idiots have had enormous heads.

You perceive, then, that the machinery of the body is worked or

ruled by the ganglionic nervous forces; you may witness the fact daily in the wards of the hospital, in patients whose brains and spinal cords are irretrievably diseased. You see also how many operations of the human body are due to forces residing in the spinal cord; and that this cord is again overruled by the large cerebral hemispheres. All these systems are intimately united; even the sympathetic is closely joined to the spinal to regulate the functions of the viscera, and therefore you might infer that some of the operations going on in the organism within might at times be made perceptible to us. This relationship between the two systems is so important that I shall have to refer to it again.

The nervous system, as generally described by physiologists, is made up of two parts, the force-producing elements and the conducting cords, analogous to a galvanic battery and its connecting wires. The grey or ganglionic substance is the generating material and the nerves are the conductors; the former is the seat both of the active power, which is exhibited as the motive force, and also the highly vitalised receptacle for impressions from without. As regards the nerves, it would appear, from experiments lately made, that those for motion and sensation are structurally alike, and therefore would convey equally well sensory or motor vibrations. The grey or generating matter in the spinal cord can be stimulated to action from any irritation on the skin, and a movement be reflected back to the part touched. This occurs equally well or better where the spinal marrow has no connection with the sensorium above; but, of course, under these circumstances, the animal has no sensation (or feeling in the ordinary sense of the term), nor voluntary power over the body. The brain, when connected with the cord, receives impressions from it, and elaborates them in a manner so that they become to us mental phenomena; but the latter do not free themselves from the impressions which caused them, but continue ever after to be intimately associated with these impressions; or, in other words, to be composed both of sensations and movements. This is established by the late experiments of Hitzig and Ferrier, who found not only, as the older experimenters had already discovered, that irritating the corpus striatum and brain over it would produce movements, but that irritation of particular convolutions would cause uniform and definite actions on certain muscles of the animal, as, for example, movements of the front and hind leg or ear respectively, according to the parts operated on. This would lead us to the belief that the various actions of the body are not merely set agoing by the voluntary power exerted on the spinal cord by the brain, but that each portion of the brain has its own separate function in relation

to the several movements, and even that the mental conceptions which we possess are intimately associated with, if not the actual products of, the material impressions which caused them. The material world is on one side of the mirror, and our feelings are like the reflected image which glances off on the other; so that running parallel with the sensori-motor impressions on the brain are our own mental states.

This doctrine was pretty clearly seen many years ago by Dr Gull, and enunciated in his 'Gulstonian Lectures for 1849,' where he says, "The combination of sensation and voluntary muscular movements has by Volkman been shown to be the source of our knowledge of locality and direction. It is not my purpose here to consider how he has applied this to visual directions and positions of objects, but I may just mention that it has long seemed to me obvious, and I have so long taught it in lectures, that as it is by the muscular movements of the upper extremity that we test the direction of any force acting upon the sensitive senses of the fingers, so it is by the contraction of the muscles attached to the eye that we tell the position of any object which sends its rays to the retina." "There is a close subjection of motion to sensation in the action of the muscles of expression. The movements, which are called emotional, are as directly *excito-motor* as any, with this peculiarity, that emotion or sensation form a necessary part. If we style the spinal movements *mechanical*, they are *psychico-mechanical*."

The intimacy of our mental relations with the external world is therefore of the closest; mental operations cannot be dissociated from the material objects which originated them. When the metaphysician attempts to do this he is only studying the human mind in part; his department of knowledge may be called the science of consciousness, but is not coextensive with psychology. The doctrine of Locke had already been expressed in the Aristotelian maxim, "Nihil in intellectu quod non prius in sensu;" and the same idea may be frequently found floating in the mind of Shakspeare,[1] as, for instance, in the following: "Oh! now I see; Queen

[1] A consideration of the genius of Shakspeare tends to confirm the belief in the doctrine that the brain can be operating upon phenomena derived from without, and only when the thonghts are committed to paper becoming conscious of them. I cannot otherwise understand what is meant by the inspiration of Shakspeare, or how he came to speak of the centre of gravity before Newton, or the circulation of the blood before Harvey, or the various doctrines of mental philosophy before Locke. The following quotation from Carlyle is much to my purpose:—"Shakspeare is what I call an unconscious intellect; there is more virtue in it than he himself is aware of. His dramas are products of Nature, deep as Nature herself. It is Nature's highest reward to a true simple great soul that he gets thus to be a *part of herself*. Such a man's works,

Mab hath been with you; she gallops, night by night, o'er courtiers' knees that dream of courtesies straight; o'er lawyers' fingers, who straight dream of fees; o'er ladies' lips, who straight on kisses dream."

You will see that the impressions conveyed from the cord, which is in connection with the outer world, produce these higher or more elaborate qualities in the brain. The brain, therefore, stands, as it were, superior to the spinal cord; the latter is its servant to supply it with wants, and to be governed by it. The governing power of the brain is well worthy of our consideration, for the general doctrine is one which is applicable to a great many instances of natural and morbid conditions, although perhaps not rigidly proved by a scientific method, experimenters having differed in their results. It was, however, long ago shown that the action of the spinal cord was greater when the brain was removed; and it has been said that if a pigeon's head be cut off, and the spinal cord be still active enough to move the wings, its power is at once stayed by application of a galvanic current. We know, too, that in the human subject if the foot be touched, there is not the same reflex action as in a case of paraplegia when the communication between the cord and brain is severed. And, moreover, the tendency to movement can be overcome by the will of the individual, as in resisting the effects of tickling, or in the instance of coughing or sneezing, where the involuntary act, arising from some irritant to the glottis or nose, is much more violent than could be produced by any effort of the will. There are cases where the larynx is paralysed, and the patient unable to cough when directed to do so, and yet sometimes a violent explosion will occur when some mucus or foreign body irritates the glottis. Darwin mentions how his friends at table declared they could not take a pinch of snuff without sneezing, but on the expression of his disbelief, and their consequent endeavour to sneeze, not one of them could accomplish it. It may be that this controlling power of the brain over the spinal cord is not only analogous to but is the very material foundation for the influence which the mind exercises over the body, or the reason of the superiority of the higher faculties over the lower animal appetites and passions. For example, cannot we say that the material facts and the moral teachings correspond when we see a parrot, whose first impulse is to bite,

whatever he with utmost conscious exertion and forethought shall accomplish, grow up withal *un*consciously from the unknown depths in him, as the oak tree grows from the earth's bosom, as the mountains and waters shape themselves. How much in Shakspeare lies hid—much that was not known at all, not speakable at all, like roots, like sap and forces working underground. Speech is great, but silence is greater."

by a simple reflex act, control the impulse when educated to obey a higher law; and do we not see the same in the taming of all animals, and in children who are taught to subdue their passions? If this be so, cannot we also say that the strongest minded men and women are those who govern their lower natures, and in forming a scale of mental capacity amongst human beings, graduate it according to the influence which one mind has over another. An idea of this kind will throw a light upon such a disease as hysteria, where the cerebral power is so weak that the whole organisation seems for a time under the control of the spinal system; here, the will and regulating power being gone, reflex acts reach so high a pitch that the body is thrown into a paroxysm of convulsions. Again, in various other mental derangements, where we say the intellect is disordered, a close analysis of the case will often show that all the strange phenomena are at once accounted for on the supposition of the temporary abeyance of the controlling power. The strange acts and behaviour of the patient are not mental vagaries or new vices, but simply the animal instincts and passions in full swing, without any controlling power present to restrain them. In intoxication this is very evident, and the saying "in vino veritas" receives its interpretation from this view of the physiology of the cerebro-spinal centres; for in the inebriate the innate propensities appear full blown as soon as the brain has become paralysed. And, what is even a sadder spectacle, when the brain decays in old age many long hidden follies or vices again make their appearance. If we wished to take a higher flight of thought in this matter, we might argue that a man's responsibilites are in direct proportion to the power which his brain or higher powers can exert over his lower spinal or animal life, and try to understand the saying that "though the spirit is willing the flesh is weak." A man cannot raise laughter or tears at will, but he may go and see a comedy or tragedy which will produce them. I am not mixing up material, mental, and moral questions which have no relation, for I regard them all as intimately related, and that in fact the only true interpretation of man's higher nature must be found in the physiological basis on which it rests. Such questions as the freedom of the will, which have been argued from all time by divines and moralists, cannot be solved without a knowledge of physiology.

We are in the habit of saying the brain is the organ of the mind. Within this skull, "the dome of thought, the palace of the soul," sits the mind enthroned. Here are perception and thought and judgment. Here originates the will or volition which starts the levers for setting in motion many mechanical movements of the body, the vital processes proceeding under their own independent forces. Our

movements appear like direct acts of the will, for we are unconscious of the machinery which intervenes, and the mental power seems to originate in the brain. We have, however, only to feel ill, to know that consciousness is associated with the whole composite being. The mind, looking upon itself, cannot see the mechanism through which it works, much less the mechanism of which it may be the resulting force, and thus, of necessity, rational beings are obliged to place the "ego" behind or anterior to all physical events. The term "mind," or "will," however, must still be used in medical lectures, being the only word in common use to represent the feeling of effort on the part of the individual. The term mind I use here as intimately associated with the cerebral hemisphere and man's organisation. The question how far this mind, or what portion of it, is a distinct immaterial principle, worthy to be called the soul, cannot be discussed on scientific grounds, for we have no data to work upon. The arguments for there being a spiritual part of man, which can remain after the body decays, depend upon moral and religious considerations; and there are some who think that these convictions are almost equal in cogency to mathematical demonstrations, since they depend, like the latter, upon axioms which the mind cannot further analyse, but must receive as true. Believing, however, as most of us do, that there is an immortal spirit, there is no reason to suppose that any such immaterial influence is operating in our organisms as a perfectly independent guiding principle, and this is the reason why I allude to the subject and depart apparently from my province. The belief in a soul operating through the brain can have no significance in our physiological inquiries, since its presence would be lost in the acts of the physical organism. We may, therefore, if we choose, without renouncing scientific methods, regard the brain as the soul's frail dwelling-house, or the mind as the resultant force of the two instruments working together.

> "My brain I'll prove the female to the soul,
> My soul the father; and these two beget
> A generation of still breeding thoughts."

But there are some in our profession who, perplexed with the various phenomena of the human mind have considered it necessary in their lectures to introduce into the problem of life a perfectly independent force, and to ask if we do not admit this how we can, for example, account for memory, and how the mind of man, having a material source, can gaze into futurity, and have thoughts of infinite space and eternity. Now, I mention this to warn you against such a belief as this, or if you hold it, to give up the

study of physiology and the pursuit of medicine. What purpose can we gain by studying the phenomena of the nervous system if some unseen or extraneous force is pulling the strings? It is of no use physiology informing us that the Welsh fasting-girl, in order to keep up her temperature 40° above the surrounding atmosphere, must be supplied with food, and that if she does not eat she will die, if some subtle immaterial agency may come in and supply the force required. For once admit such an extravagant notion, and you may believe that an unseen power may carry you up in the air, that flowers may float in at your window, or that you may read a newspaper by sitting upon it. If we allow of such an independent power we do not know where we are, and a study of the physiology of the animal economy becomes a useless labour. What we, as physiologists have to do is to take the bodily machinery as we find it, and endeavour to unlock its recesses and discover how the hidden wheels work; but it seems to me absurd to introduce some extraneous and independent agency because we have not yet arrived at this knowledge. To do this seems to put us on a par with the savage who, terror-stricken with the report of a gun, and not understanding its mechanism, declares it to be the work of his gods.[1] Milton said, "Man is a living being, intrinsically and properly one individual, not compound or separable, not according to common opinion made up and framed of two distinct and different natures as of soul and body, but the whole man is soul, and the soul man, that is to say, a body or substantive individual, animated, sensitive, and rational."

When it is said that the human mind can grasp infinity, it is really only attributing a negative quality to the mind and declaring that we are incapable of conceiving any object without the idea of something beyond it, or of a particle of matter that is indivisible; and when it is said we can grasp eternity, it means that the human

[1] In a review of these lectures I am "charged" with being a materialist. The word "charge" not being used in scientific phraseology must mean that I am guilty of an offence against morals. Those who, like myself, have been styled materialists, have never denied the existence of a future world, or the continuance of our being in another state, and therefore the term can be applicable only to the question of the independent existence of an immaterial principle operating in our human bodies. That this is the issue, I think, is evident from the fact that one of the writers who so charged me explained to a quasi-scientific society, that people could do very well without brains, of which he gave examples. The same people, who, in their childhood of knowledge believe this, also naturally feel a horror at the word "automatism," which implies that the mechanism of the body has a power of working itself, whereas they consider it more intelligible or rather more moral to suppose there is some independent principle always pulling the strings.

mind cannot conceive of time with an end. For my own part, I do not see in these so-called vast conceptions of the human mind any other than the necessary attributes of a conscious being on an earth like ours. Then, again, memory is a quality of the human mind, which to some seems almost to necessitate the belief of a spiritual essence, for how, otherwise, they argue, can it stretch over years of time and hundreds of miles of space.

The mode of connection between mind and matter has by the world at large been generally regarded as an insoluble problem, for the very terms employed to designate the phenomena of each are as opposed as subjective and objective, and therefore not translatable into one another. The words expressive of our feelings are of so different a kind from those by which we describe outward objects, that this mere absence of a common language for the two is not only indicative of the total inability hitherto existing to cross the gulf, but in itself makes a sufficient barrier to any one who tries to make the attempt. All explanations involve us in contradictions in terms or in simple assumptions. In spite of this, if there be any truth in physiological researches, the intimacy after all between mind and matter is of the closest, and possibly the material process and the metaphysical expression may be more allied than we imagine. It is impossible for us to see a physical process, as of a motion in our brain cells, changing into a mental one, but it does not follow that there is not a material movement of the kind, which results in what we call consciousness. I think it possible to imagine a higher being looking upon the active brain of man, and seeing both the material changes in operation and the resultant forces which are mental, and regarding them as one. The difficulties are in part common to all questions of organisation and functional activity, quite apart from mind and brain. For example, no one, looking at the bile, could predicate the liver from which it came, or looking at a mass of liver, would know that one of the products of its activity was the biliary fluid. I cannot conceive by what method of the minutest microscopic examination such a knowledge of the function of the liver could be ascertained. If with material substances the connection between organism and function are difficult to ascertain, how much more difficnlt when the product of the function is not material? All attempts, therefore, to explain the association of mind and matter must be given in words which are in themselves as diverse as the subjects of which they treat; in fact, to some persons any expressions used to designate material changes by metaphysical names and the converse are simply absurd. The attempt, however, I think, is good, if it be only to show that physiologists will continue to endeavour to explain mental pheno-

mena by a regard to the material organisation, instead of leaving them equally inexplicable in the hands of the metaphysician. Instead, therefore, of saying that memory necessarily implies an immaterial agency in man's nature, see what speculation may do for us on the material side; and such speculation will go on with every fresh advance in scientific discovery until the goal be reached. I quote from two American authors of whom their country may be justly proud. Dr Draper says that impressions made upon the brain may lie like the photographic picture on glass, unseen or unknown, until developed. "Thus I have seen landscapes and architectural views taken in Mexico developed, as artists say, months subsequently in New York, the images coming out after their long voyage in all their proper forms and in all their proper contrasts of light and shade. The photograph had forgotten nothing. It had equally preserved the contour of the everlasting mountains and the passing smoke of a bandit fire. Are there then, contained in the brain more permanently, as in the retina more transiently, the vestiges of impressions that have been gathered by the sensory organs? Is this the explanation of memory—the mind contemplating such pictures of past things and events as have been committed to her custody? In her silent galleries are there hung micrographs of the living and the dead, of scenes that we have visited, of incidents in which we have borne a part? Are these abiding impressions mere signal works, like the letters of a book which impart ideas to the mind? or are they actual picture images inconceivably smaller than those made for us by artists, in which, by the aid of a microscope, we can see in a space not bigger than a pin-hole a whole family group at a glance?" "During a third part of our life in sleep we are withdrawn from external influences; hearing and sight and the other senses are inactive, but the never-sleeping mind, that pensive, that veiled enchantress, in her mysterious retirement, looks over the ambrotypes she has collected, for they are truly unfading impressions, and combining them together as they chance to occur, constructs from them the panorama of a dream."

Oliver Wendell Holmes takes up the same illustration, and says, "I need not say that no microscope can find the tablet inscribed with the names of early loves, the stains left by tears of sorrow or contrition, the rent where the thunderbolt of passion had fallen, or any legible token that such experiences had formed a part of the life of the mortal, the vacant temple of whose thought it is exploring. It is only as an inference aided by an illustration, which I will presently offer, that I would suggest the possible existence, in the very substance of the brain tissue,

of those inscriptions which Shakspeare must have thought of when he wrote—

> "Pluck from the memory a rooted sorrow;
> Raze out the written troubles of the brain."

It must be remembered that a billion of the starry brain cells could be packed in a cubic inch, and that the convolutions contain one hundred and thirty-four cubic inches. My illustration is microscopic photography. I have a glass slide on which is a minute photographic picture, which is exactly covered when the head of a small pin is laid upon it. In that little speck are clearly to be seen by a proper magnifying power the following objects: the declaration of Independence, with easily recognised facsimile autographs of all the signers, the capital at Washington, and very good portraits of the Presidents of the United States, from Washington to Mr James Polk. These objects are all distinguishable as a group with a power of fifty diameters; with a power of three hundred, any one of these becomes a visible picture. You will see, if you will, the majesty of Washington in his noble features, or the will of Jackson in those hard lines of the long face, crowned with that bristly head of hair, in a perpetual state of electrical divergence and centrifugal self-assertion. Remember that each of these faces is the record of a life. Now, recollect that there was an interval between the exposure of the negative of the camera and its development by pouring a wash over it when all these pictured objects existed potentially but absolutely invisible and incapable of recognition in a speck of collodion film which a pin's head would cover, and then think what Alexandrian libraries, what congressional document loads of positively intelligible characters, such as one look of the recording angel would bring out, many of which we can ourselves develop at will, or which come before our eyes unbidden, like "Mene, mene, Tekel, Upharsin," might be held in those convulutions of the brain which wrap the talent entrusted to it too often as the folded napkin of the slothful servant hid the treasure his master had lent him. Memory may, therefore, be a material record, and the brain, scarred and seamed with infinitesimal hieroglyphics as the features are, engraved with the traces of thought and passion."

Of course, this is all speculation, and almost as unintelligible as any other theory which attempts to explain mental processes by physical changes, but if there should be any truth in it, we might further observe that there are reckoned 600 million grey cells in the brain, which would allow fifty every minute in a long life to receive impressions.

ANATOMY AND PHYSIOLOGY OF THE BRAIN

I will recall to your memories the main facts in the anatomy and physiology of the cerebro-spinal system, so that we may be assisted in determining the seat and symptoms of the various diseases of which we shall treat. There are the sensory nerves proceeding from all parts of the surface of the body towards the spinal cord; some of these clearly pass at once into the ganglia; others apparently proceed directly upwards through the bulb and crura towards the thalmi optici, whence fibres spread out again to the posterior parts of the hemispheres. In a corresponding manner, *mutatis mutandis*, their physiological direction being in an opposite course, run the motor nerves, connected with the grey centre of the spinal cord and forming strands of fibres which pass to the corpora striata, and then again by the radiating fibres to the anterior portions of the hemisphere.

The motor tract begins in the central convolutions, passes through the white medullary matter as the corona radiata, then between the nuclei of the corpus striatum as the internal capsule, and so through the anterior portion of the peduncle or crus and pons to the pyramids, where it crosses and descends along the cord to meet the anterior cornua of the grey matter. From the latter proceed the anterior roots and motor nerves to the muscles. Whether there be a direct connection between the brain and the muscle, or whether the connection must always be through the grey centre, is a question still open. It is interesting to note that the cells of the anterior and motor regions of the brain are very large, and resemble those of the anterior cornua of the grey matter of the cord, whilst the cells of the posterior part of the brain are much smaller. The sensory tract passes upwards along the posterior part of the crus cerebri or tegmentum towards the outside of the optic thalamus and to the posterior part of the brain. You will observe that the corpus striatum contains two nuclei of grey matter. The intra-ventricular, or caudate nucleus, and the extra-ventricular or lenticular nucleus. Now, passing down between these nuclei is a tract of white fibres coming down from the motor convolutions, and it is this tract which is supposed to be injured in cases of hemiplegia arising from disease of the corpus striatum. These fibres pass down, and then bend as they descend between the lenticular ganglion and the thalamus. This bend is called the knee, and the white tract is styled the internal capsule; the anterior two thirds only are closely connected with the corpus striatum, and have a motor function, whilst the posterior third nearer the optic thalamus

appears to be sensory in its function, or probably the tract called the internal capsule contains in the posterior part of its course, between the optic thalamus and the lenticular nucleus, both motor and sensory fibres. As they pass into the periphery of the cerebrum these fibres separate from each other, the motor ones bending forwards and the sensory backwards. Luys believes that the thalamus is the recipient of impressions from all the senses, and maintains that this body is composed of a series of small isolated ganglia of grey matter situated one behind the other, four in number, the anterior being the olfactory nucleus, the second the optic, the median for common sensation and the posterior for hearing. Herein, he believes, lie special nerve centres, which are excited by the external senses, and cause in their turn an activity in the cortical substance. They are the gates through which all stimuli from without pass. They transmit the impressions radiating from without in an intellectualised form to the cortical substance. The elements of the corpus striatum, on the contrary, have an inverse influence upon the stimuli starting from the cortical substance. They absorb and materialise them and project them in a new form in the direction of the different motor ganglia of the spinal axis, where they are destined to bring muscular fibre into play.

It is evident, then, that there are fibres passing upwards and downwards in the spinal cord, and that these are connected, as well as the fibres proceeding from the grey centre, with the spinal nerves. It is an important question, however, whether there be any direct connection between the higher ganglia in the cranium and these nerves, or whether the connection be only through the grey centres. It is evident, from the smallness of the cord compared with the aggregate of all the nerves of the body, that the former cannot contain any great number of the latter, and therefore, in all probability, the nerves proceeding from the cord have their origin principally within it, *i. e.* arise and terminate therein, and the connection between the cord and the brain is by other and distinct fibrillæ. The general belief is that there are spinal centres which rule over sets of nerves for particular objects or complex operations, and that the cerebral ganglia set these centres in action by connecting nerve fibres between them; in breathing, for example, a number of parts all work together in unison, being supplied by several nerves proceeding from the respiratory spinal centre, and all that is required is, when a voluntary effort is made to breathe or to stay respiration, that this centre should be influenced from the brain by a single fibrilla. Inasmuch as we cannot direct so complex a process as breathing by any act of the will, there is no need for all the individual nerves to pass to the supreme central ganglia. In the

case of the limbs, not only is there a prearranged order of cells whence the nerves arise, but a further blending of the nerves after they leave the cord, as seen in the brachial plexus, and this is no doubt for the purpose of associating together the action of several muscles for the production of the complex movements of grasping, pronating, supinating, and the like. The consequence is that it is impossible to discover the origin of a nerve supplying any particular muscle, except in the case of the so-called cranial nerves. You will find that a nerve, for example, which, arising in the upper part of the spine, goes to contribute to the brachial plexus, divides into a number of filaments, and sends its branches to various muscles of the arm. Or, on the other hand, a nerve traced upwards from the arm will proceed to this plexus, which then enters the spine at different intervertebral foramina. Consequently, although probably each fibrilla has its distinct origin in the cord, the fibres become so blended that injury to the nerve at its exit cannot answer to paralysis of one individual muscle. Whether every distinct fibre supplying its own portion of muscle may not have its origin in particular cells of the cord, and whether disease in the latter may not affect that portion of muscle solely, is another question. The facts observed in progressive muscular atrophy, where we see a group of muscles paralysed quite independently of nerve distribution, would rather favour this conclusion. The arrangement I speak of has for its object, no doubt, the grouping together of certain movements; and thus we cannot will the action of any one muscle separately. In walking, when we use the flexors and extensors of the leg, we use them as a whole; we have no separate power over any particular muscle. There is some centre, therefore, which is controlled or put in action by the brain through our volition, and that stimulates the whole group of muscles by means of the nerves. An apparatus of this kind is already made or is born with us, and once set in action will continue in operation without fresh voluntary effort on our part; and in like manner a centre of force may become educated so as to perform a regular system of movements, as for example, in the playing an air on the piano, which may be performed when the mind is not "willing," showing that the centre has become educated to perform certain work; or as in the simple act of walking; hence the meaning of the common expression that use or habit is second nature. Just in the same way as the organic system of nerves can keep the viscera in play, so the spinal cord, by means of the properties with which it is endowed, can, through its nerves, produce various complex movements, these having been either acquired by the cord or arranged by a natural organisation. I need not mention the case of the jumping of the frog or the flying of the bird when

decapitated, but will only remind you of the anencephalous or brainless infant sucking at its mother's breast.

It would appear from this that the nerves may have their origin in various grey centres possessing their own functional peculiarities, so that each centre may rule over groups of muscles, and each muscle may have more than one nerve supply. For instance, if I use the facial nerve for talking or laughing, I am probably setting in operation different centres in the two cases; the nerve, therefore, must have more than one origin, and dissections are showing that this reasoning is founded on fact. The nerve arrangement may be likened to an apparatus where a dozen bells are pulled by a dozen strings, but where each string does not ring a separate bell, but by the interchange and combination of the cords each string may ring a particular series.

We, as physiologists, have to deal with men as animals, and, in spite of the prejudices against the notion, man must be studied as an animal. Thus we see many of our actions are, in common with other animals, in some way dependent on the spine. They may be regulated, excited, or arrested by cerebral influence, and a hard case it would be for us if in dressing ourselves, for example, or in eating, every necessary movement were dictated by volition acting on a particular muscle. Now, the whole grouping is to a certain extent arranged, and what is not arranged is brought about by education. Thus the spinal centres, like the brain, as I shall presently show you, become educated; and, therefore, I verily believe that the spinal cords of two different persons, although apparently alike, are functionally very unlike, and that an adult man's cord is a very superior organ to a child's. So educated to a particular purpose may the spinal cord become that in using our microscopes we pass the slide from right to left, and *vice versâ* when we want to examine it at exactly the opposite end, and I have known the following circumstance occur:—A gentleman going up to his room to dress for dinner had forgotten altogether the purpose of his visit until he found himself in bed. I think it is Professor Huxley who relates the case of an old soldier being observed by a former companion crossing the street with his Sunday dinner; his friend called out "Attention," whereat the man's hands fell to his sides, and the mutton and potatoes into the gutter. No better example could be given of the character of our spinal cord. The word entered the ear, impressed the ganglia within, touching the old key, and the stimulus was carried down the arms before the cerebral hemispheres could bring their superior influence to bear on its arrest.

I am impressed with this idea of the automaton-like action of

the spinal system almost every day when I come to the hospital by the train. I observe at the Charing Cross railway booking-office the passengers asking for tickets for only two or three places, as the line is short, and almost before the name of the station is completed the ticket is delivered to them by the clerk; there is no time for thought, and often, indeed, he is conversing with his fellow. So instantaneous is the word and action between the passengers and the clerk, that I regard the whole operation as reflex, and I quite believe that if it were possible to remove his cerebral hemispheres the whole process of delivering tickets might go on as before. It is true that the process was first directed by the action of the superior cerebral ganglia, but now I have no doubt the impulse from his ear to his arm takes a shorter and more direct cut through the medulla. In the case of the French soldier, whose case occupied the attention lately of the savans in Paris, the man, after falling into a kind of torpid state, might be played upon like a musical instrument. The case is very interesting, and I give it as copied from the newspaper:

A Living Automaton.—A curious patient is just now an inmate of Dr Mesnet's ward at the Hôpital St Antoine. His profession was that of a singer at the Cafés Chantants. During the war 1870–71 he was hit over the left ear by a musket bullet, which carried off about 2½ inches of the parietal bone, and laid bare the brain on the left side. This led to a temporary paralysis of the members on the opposite side, as is always the case; but he was eventually cured of this, while the tremendous wound on the skull began to heal, so that after a time he could resume his professional duties at the cafés to the satisfaction of the public. Suddenly, however, he was seized with nervous symptoms, lasting from 24 to 48 hours, and of such an extraordinary nature that it was considered safe to take him to the hospital. His malady is easier to illustrate by examples than to define. When he is in his fit he has no sensitiveness of his own, and will bear physical pain without being aware of it; but his will may be influenced by contact with exterior objects. Set him on his feet, and, as soon as they touch the ground, they awaken in him the desire of walking; he then marches straight on quite steadily, with fixed eyes, without saying a word, or knowing what is going on about him. If he meets with an obstacle on his way he will touch it, and try to make out by feeling what it is, and then attempt to get out of its way. If several persons join hands and form a ring around him, he will try to find an opening by repeatedly crossing over from one side to the other, and this without betraying the slightest consciousness or impatience. Put a pen into his hand; this will instantly awaken in him the desire of writing; he will fumble about for ink and paper, and, if these be placed before him, he will write a very sensible business letter; but, when the fit is over, he will recollect nothing at all about it. Give him some cigarette paper, and he will instantly take out his tobacco-bag, roll a cigarette very cleverly, and light it with a match from his own box. Put them out one after another, he will try from first to last to get a light, and put up in the end with his ill-success. But ignite a match yourself and give it him, he will not use it, and let it burn between his fingers. Fill his tobacco-bag with anything, no matter what—shavings, cotton, lint, hay, &c.—he will roll his cigarette just the

same, light and smoke it without perceiving the hoax. But, better still, put a pair of gloves into his hand, and he will put them on at once; this, reminding him of his profession, will make him look for his music. A roll of paper is then given to him, upon which he assumes the attitude of a singer before the public, and warbles some piece of his repertory. If you place yourself before him he will feel about on your person, and, meeting with your watch, he will transfer it from your pocket to his own; but, on the other hand, he will allow you, without any resistance or impatience whatever, to take it back again.—*Galignani.*

The difficulty which many have in accepting these views is owing to the dislike they feel to the idea of the machinery of the body being able to act by itself; their inclinations leading them to the belief that the fact of consciousness implies an immaterial principle which is pulling the strings and regulating our bodily movements. Physiologists, however, are obliged to renounce this, since they know that acts are performed without consciousness, as when a person walks in his sleep or passes through the streets in a reverie. Certainly a large number of operations go on in our body without any knowledge or will on our part. The spinal centres and ganglia take cognisance of the proceedings of the viscera over which they rule, and this with so much method that, did the stomach exist as an independent animal, its operations would be regarded as due to instinct, or to its having an "unconscious will." Not only the spinal system but the brain itself will act when we are not conscious of its operations, as in sleep. Numerous instances could be quoted of both scientific and literary men who have discovered on rising the results of operations which had been performed silently during sleep. Sir Thomas Brown said, "Sleep is the waking of the soul; the ligation of sense, but the liberty of reason." If this be so, what becomes of consciousness as the basis of all mental philosophy? No one who has cared to examine the operations of the human body can hold to the doctrine "cogito ergo sum," as meaning that consciousness and existence are identical expressions. Probably Des Cartes never intended it to bear this meaning. He merely intended to take as a basis the assumption of man's individuality and power of thought.

Now, it is very clear that any injury to the cord which severs a part of the body from the sensorium above and the centre whence volitionary acts proceed must produce paralysis of sensation and motion. We look, therefore, to the spinal marrow as the seat of all paralysis, and it cannot be too distinctly remembered that the division into spinal cord and brain is not in correspondence exactly with that of the vertebral column and cranium; for just as the bones of the face are transfigured vertebræ, so the spinal cord within the cranium is the same organ merely altered in form, and the nerves it gives off true spinal nerves. It therefore follows that in perfect paralysis

of all kinds there must be some lesion of the spinal system, between the intra-cranial ganglia above and the termination of the cord below. You must not, therefore, use the term cerebral paralysis in the old-fashioned way, as if disease of the brain proper could produce paralysis of the limbs, for this has not yet been proved to be true. This, which I have always taught, needs but little modification from the recent researches of Hitzig and Ferrier, nor from the few facts which appear to show that an inflammation of the brain or injury of the cortex will produce weakness of some of the muscles. The latter, probably, is not a paralysis in the ordinary sense of the term; and as regards the experiments made by the observers just named, although it is clearly shown that the various motor fibres of the cord proceed to the corpus striatum, or to the white tract lying between its nuclei, and again spread out to pass to the convolutions of the brain, so that irritation of particular convolutions will set in action a particular group of muscles, yet it has not been clearly proved that a lesion of a convolution will produce paralysis of any part of the body while the ganglion below is healthy. This statement is founded on the fact already well known—that portions of brain may be removed after fracture of the skull with impunity. The two views will probably be reconciled by showing that the motor region is limited in extent, and therefore loss of motility can only be looked for in lesions of a circumscribed spot. It is a question, therefore, which will, no doubt, soon be solved.

I might take this opportunity of saying that these experiments of Ferrier have more fully confirmed the doctrine which I have for many years taught at this school relating to the interpretation of the *double nature of the brain.* You know that physiologists and metaphysicians have puzzled over the question, some thinking that the one hemisphere was appropriated by certain faculties of the mind, and the other hemisphere by other faculties; some thinking the one side of the brain was the seat of the good qualities and the other of the bad; some also, again, suggesting that one was the receptive part of the mind and the other the active part. Now, it has always seemed to me that there was no purpose in propounding these fanciful theories when the plain facts were before us. The body, you see, is made up of two halves, joined together in the mesian line, each supplied by its own nerves proceeding from their individual ganglia; now, as the trunk is made up of these halves closely approximated, the ganglia are fused together and act as one in the various movements of the chest and abdomen, and thus it is that we cannot move one side of the chest independently of the other. But you perceive, also, that besides the trunk we have limbs which are used independently, as well as the muscles

of the face and the tongue ; from this it necessarily follows that the ganglia ruling over them must be distinct and not fused together ; the cord ought, therefore, to split or be divided into two halves in that region which rules over the limbs and those parts which have an independent action. This separation does take place at the summit of the cord after it passes into the cranium, where it terminates in two large ganglia whose isolation is made more complete by the lateral ventricles of the brain. That the separation of the cord into its two distinct halves has this object is made clear by the fact that disease of either of them produces paralysis only of those parts on each side which have an independent action, and more especially of the limbs. This division of the cord, necessitated by or associated with the independent action of the limbs, requires also that the superior ganglia or cerebral hemispheres which govern them should be independent and distinct also. I say a consideration of the mechanism of the human body seems to necessitate the idea of a double brain. For if the movements of the trunk as a whole require a fusion of ganglia, so, if there be any independent movement of limbs on either side, a separation of the ganglia which rule over them is also necessary, and so, again, a separation of the higher cerebral spheres which govern these. The proof of the intimacy existing between the convolutions and the ganglia below, as I have been in the habit for many years of showing, lies in the results of experiments made for us by an injury, or a disease like syphilis, which involves a portion of the convolutions of the brain. In these cases it has long been observed that if the patient had fits the convulsive movement occurred on the opposite side of the body to that of the disease. A step further in this direction was made by Hughlings Jackson, and proved to be true by the experiments of Ferrier, that irritation of particular convolutions would produce corresponding and special convulsive movements in the muscles of the face or limbs. Ferrier, by using electric stimuli, proved that the excitation of certain convolutions was followed invariably by the same movements, and concluded that the anterior portion of the brain was for voluntary movements and the active outward manifestation of intelligence. He found that irritation of certain convolutions corresponded to definite muscular movements, and as these parts of the brain are now all carefully mapped out and named, it will be as well to remind you of those of the greatest importance and most scientific interest.

With respect, then, to these convolutions, you remember the division into the different lobes; also that the fissure of Sylvius, beginning at the base of the brain and running up the side, divides into two portions. Then, commencing above and running downwards and forwards, is the

great central fissure or fissure of Rolando which divides the frontal from the parietal lobes. Behind this again is the parieto-occipital fissure. The frontal lobe is that portion of the brain which lies under the frontal bone, and herein are some of the convolutions which of late years have had most interest for us. In front of the fissure of Rolando is a very constant convolution; it is called the anterior central or ascending frontal convolution. Proceeding forwards from this, along the margin of the hemisphere, is the superior frontal convolution. Below this is the middle or second frontal convolution, and below this again is the third or inferior frontal convolution. The latter forms the superior boundary of the front of the fissure of Sylvius; it is the well-known convolution on the left side which is associated with speech and called Broca's convolution. Besides these convolutions there are sulci, which have received special names at the hands of Ecker and others. As regards the parietal lobe, you may remark that behind the fissure of Rolando is a convolution called the posterior central or ascending parietal convolution. From this convolution others pass backwards divided by the inter-parietal fissure; one of these is called the superior marginal convolution, and another, one of the most important of this lobe, turns round at the end of the Sylvian fissure, and is called the angular gyrus. It is thought to be peculiar to man. Then there is the occipital lobe, which also has its named convolutions and sulci. Then, also, the temporal or temporo-sphenoidal lobe, separated from the frontal and anterior part of the parietal by the fissure of Sylvius, but less defined posteriorly.

Ferrier found that irritation of the postero-parietal lobule caused movements of the opposite leg and foot. Irritation of the convolutions bounding the fissure of Rolando caused complex movements of the arms and legs. Irritation of the posterior extremity of the superior frontal, at its junction with ascending frontal, caused extension of the arm and hand. Irritation of the posterior extremity of the middle frontal, near ascending frontal, flexion of the forearm; irritation of ascending frontal convolution, movements of mouth; irritation of posterior extremity of third frontal convolution, where it joins ascending frontal, opening of mouth and protrusion of tongue; irritation of posterior half of superior middle frontal convolution, lateral movements of head and eyes; irritation of ascending parietal convolution, movement of hand and wrist. Up to the present time no one has positively demonstrated the exact locality of the perceptive centres of the senses, and I have already alluded to the opinions of Luys; but Ferrier has found in his experiments that all these are probably situated within a circumscribed area, for he has observed that the senses are lost by the destruction of certain

convolutions ; for example, destruction of the angular gyrus impairs the sight on the opposite side, and this he therefore is inclined to regard as the visual centre ; in the same way destruction of the superior temporo-sphenoidal lobe causes deafness, and this he would regard as the auditory centre. A destruction of the hippocampal region impairs the sense of touch or common sensation, and this he calls the tactile centre. As I shall presently tell you, the experiments made for us by disease on the human subject tend to show that lesions external to the thalamus produce anæsthesia, but this is explained by Ferrier on the supposition that disease merely interrupts the path of transmission to the true centre. The lower part of the temporo-sphenoidal lobe he considers to contain the centres of smell and taste. Experiments on the anterior lobes are quite in accord with the results of injury, showing that no special consequences follow.

The intimacy between the convolutions towards the front and sides of the brain and the motor tract, therefore, is very great, both anatomically and physiologically, as well as in a mental aspect. The pathological relation was shown several years ago by Flourens and others, who had remarked that spots of softening in the convolutions very often corresponded to similar spots in the corpus striatum. Although I have spoken only of the motor tract and the anterior part of the hemisphere which rules over it, the same laws prevail with reference to the sensory tract, the thalamus, and posterior part of the hemisphere. Here we believe sensations are received from the outer world ; the double set of special senses necessitating distinct perceptive centres, and, therefore, two hemispheres. The uniformity in respect to sensations and perceptions may be the reason why a large portion of one hemisphere may be removed without any apparent destruction of any mental faculty. Indeed, it is clear that each hemisphere is complete in itself. Probably in accordance with anatomical relations the posterior hemispheres are receptive, and the anterior active ; and in reflex mental acts a process occurs between them corresponding to that in the spinal cord, the ganglia in the latter case being more developed and differentiated. It may be that in ordinary quiescence and contemplation some parts of the brain only, as the posterior lobes, are at work, while in active thought, especially in writing and speaking, the anterior portions are mainly in operation. We may obtain some kind of clue to the parts of the brain which are at work by an example like the following. Since aphasia is due to destruction of a certain convolution, and spasmodic affections of certain muscles may be produced by irritation of other neighbouring convolutions, we may conclude what parts of the brain are employed

in speech and in particular kinds of movements; when, therefore, we observe a child in a picture gallery examining its contents and all the time speaking (or thinking) aloud and pointing to the objects which please him, we seem to see how the impressions are conveyed by the eyes to the perceptive centre, and so excite to action special organs of the brain. Even if impressions on the two sides of the brain are not alike, it does not follow that injury to one hemisphere would deprive the person of his mental faculties in any more evident manner than destruction of one eye would deprive a person of sight; for just as in vision the two eyes, by means of the optic chiasm, allow a more perfect and full appreciation of the object, as, for example, its solidity, and the two hands give an idea of extension, so the two hemispheres, receiving different impressions, may combine them by means of the corpus callosum to form a single but complete mental picture. I might allude to the case of hallucinations of sight or hearing by one eye or one ear only, as showing that one of the perceptive centres of a double sense may be affected and not the other, the perceptive centre being in the hemisphere. I believe that late observers have discovered a marked difference in the number as well as in the form of the cells in the grey substance of the anterior and posterior portions. Both Trousseau and H. Jackson have stated their belief that there is more mental disturbance when the posterior lobes of the brain have been affected, and they have found this to be the case when associated with cases of hemiplegia, where, contrary to rule, the arm has recovered before the leg. I see no *à priori* objection to the belief that the higher intellectual faculties may be more associated with the posterior and receptive parts of the brain; for there is the striking confirmatory fact of the greater development of the posterior lobes in man so as to cover the cerebellum, and I believe their size is always regarded as a sign of advancement in the scale of cerebral development.[1]

[1] A study of physiognomy would lead one to the belief that the higher faculties are as much associated with the posterior as the anterior parts of the brain. The best observers, I believe, are the artists of 'Punch' and the comic journals. In turning over the pages of these periodicals one will observe how the picture of a man intended to be foolish-looking is made with a good expanse of forehead, but with no back to his head; and, on the other hand, the configuration of an intellectual cranium is shown by a curve sweeping out behind from the neck. We have only to look at the head of a person with his faculties well developed to see a considerable projection behind, whilst in a person of low development the neck and head are in one line. Agreeing with Herbert Spencer that a strict morality and power of abstract reasoning are intimately associated, there is no reason why a high forehead should not be associated with a very low morale. Thus, in the public gallery of Basle there is a picture by Holbein, in which he marks out

You will see, then, that the duality of the brain is as much a necessity as the duality of the body, or rather that the two are coextensive; the brain is one as far as the body is one, and double as far as the body is double. If the limbs could have been separately governed by the brain as a whole, it would probably have formed one mass instead of being double. The counterpart of this is probably seen in the optic nerves, which are in part united and in part distinct, an arrangement expressed in the idea of the two retinæ overlapping, so that an object formed on parts of both may be but one, while the remainder of each surface has its own independent action.

There will be less difficulty in embracing this view when it is remembered that the limb is an exponent of the character of the whole animal; that the movements which the hemisphere rules over are associated with its entire instincts and habits. The foot of the lion and its mechanism implies a certain condition of teeth or stomach, and the same applies to all other creatures in the world, so that the palæontologist can, from the small bone of a limb, build up the entire framework of the animal. Indeed, much of the naturalist's classification depends on the form of the extremity, implying that its peculiarity carries with it a corresponding set of functions in the whole body. Sir Charles Bell, in his work on the 'Hand,' dwells upon the fact that throughout creation the limbs and the general organisation correspond; and then, as regards the hand of man, he says, "With the possession of an instrument like the hand, there must be a great part of the organisation which strictly belongs to it conceded. The hand is not a thing appended or put on, like an additional movement in a watch, but a thousand intricate relations must be established throughout the body in connection with it, such as nerves of motion and nerves of sensation; there must be an original part of the composition of the brain which shall have relation to these new parts before they can be put into activity." We need not, therefore, say with some of the ancients, "Quia manus habuit propterea est sapientissimum," nor with others, "Quia sapientissimum erat, propter hoc manus habuit," but rather declare with Sir Charles Bell, "that with respect to the superiority of man being in his mind, and not merely in the provisions of his body, it is, no doubt, true; but we shall find how the hand supplies all instruments, and by its correspondence with the intellect gives him universal dominion." We might even go further than

Judas Iscariot by the most villainous formation of head which is conceivable. This is done by making it immensely high, in sugar loaf shape, so that there is a lofty forehead, but, at the same time the back of the head is in a perfectly straight line with the neck.

this writer, and, entering the domain of physiognomy in its larger sense, show how the outward form of the hand itself corresponds to the character, as, for instance, the small hand with delicate tapering fingers which is seen in members of families who have done no manual work, whether they be aristocrats or gipsies, and the large hand with big fingers and thumb of the man who possesses great manual skill and dexterity. The word I have just made use of—dexterity—has become an epithet for special ability in manipulation, and is generally associated with much force of will and energy of character; it is an attribute of some of our best surgeons.

Much has been written with respect to the almost universal use of the right hand in various manipulative acts; whether there be a tendency to use one hand rather than the other, arising from some physiological necessity, or whether it has not arisen from the general consent of mankind to employ the right hand. It is evident that were not the custom universal, innumerable difficulties would be constantly arising in reference to the simplest mechanical contrivances, ast he inserting of a screw, which is always made with the thread running in one direction. It has been thought that although in the first instance the use of the right hand was purely artificial, it has grown into an hereditary natural tendency. That left handedness was exceptional we may judge from a passage in the Bible which speaks of the children of Benjamin gathering themselves together to go out to battle against the children of Israel, and numbering 26,000 men—"Amongst all this people there were seven hundred chosen men left handed; every one could sling stones at a hair's breadth and not miss."

I am sorry to say that my acquaintance with Mr Herbert Spencer's writings is limited, but I believe that his opinions are in general accord with the views I have propounded. He shows how the sense of touch is the only perfect sense, and into this, impressions derived from other senses must be translated. Feeling or handling is the sense which gives us most information, and this is the reason why, I suppose, animals like to touch us before they make friends, or little children like to stroke a lady's dress before they can fully appreciate its value. This is the common sentiment of mankind: for example, if a person had an illusion and thought he saw a ghost, he would endeavour to grasp it to make sure, and thus Macbeth, when he asks, "Is this a dagger which I see before me?" and fails to clutch it, says, "Art thou not, fatal vision, sensible to feeling as to sight?" and then knows it is a "dagger of the mind, a false creation, arising from the heat oppressed brain," and declares his "eyes are made the fools of the other senses."

Mr Herbert Spencer, I think, explains on the superiority

of the sense of touch the intellectual capacity of many animals, and has elucidated in this way the great intellectual capacity of parrots:—"If we examine in what they differ most from their kindred, we find it to be in the development of the tactual organs. Few birds are able to grasp and lift up an object with the one foot while standing on the other. The parrot, however, does this with ease. In most birds the upper mandible is scarcely at all moveable. In the parrot it is moveable to a marked extent. Generally birds have the tongue undeveloped and tied down close on the lower mandible. But parrots have it large, free, and in constant employment. Above all, that which the parrot grasps, it can raise to its beak, and so can bring both mandibles and tongue to bear upon what its hand (for practically it is a hand) already touches on several sides. Obviously no other bird approaches to it in the complexity of the tactual actions it performs and the tactual impressions it receives."

Although it is not difficult to perceive the advantages which accrue to us from the existence of a double brain and two sets of senses, yet one must desist from dwelling too much on this in a teleological sense, seeing that the development of the human body is merely following a law which obtains in the lowest animal life, and even in the vegetable, where the double character of the fruit originates in the folding-in of the leaf, the latter itself being made up of two symmetrical halves. In a very particular and special sense one cannot but be forcibly struck with the resemblance between the human head and a walnut. There is first the pericranium and skin, then the bone and the shell. Within, a dura mater and thick membrane lining the shell of the fruit; then the pia mater and a delicate membrane covering the kernel, which again is made up of convolutions in two masses joined together by a commissure or corpus callosum.

The Vascular Supply of the Brain.—In considering the anatomy of the brain it is important to bear in mind its vascular supply, since obstruction of any vessel produces necessarily disturbance or disease of the part to which it is distributed. The vascular distribution corresponds in some cases to distinct physiological areas, and thus disease of a blood-vessel is often attended with very definite symptoms. The supply of blood is by means of the carotids and vertebrals, which at the base of the brain form the circle of Willis; and it is worthy of note that the brain receives a disproportionate amount of blood compared with other structures, and that the grey matter is four times as vascular as the white part. This coincides with the great activity of the organ and its power-producing qualities. The importance of a good supply is shown in the experiments of

Sir A. Cooper, where, after tying the vertebral arteries in a dog, he placed ligatures on the carotids; on tightening these the animal fell senseless, but immediately recovered when the blood was allowed again to flow. Mr Bryant relates that Mr Key once put a ligature on the carotid artery, and the man died immediately on the operating table. It was afterwards discovered that the opposite carotid had long been occluded. You yourselves must have witnessed the result of tying the carotid in the production of a hemiplegia, which is sometimes speedily recovered from and at other times ends in softening. The varied results following on ligature have given rise to the suggestion that they depend not so much upon the immediate deprivation of blood as upon the implication of the nerves in the sheath of the vessel, whereby the smaller arterioles become paralysed, and so devitalise the tissue; I think, however, the proofs of this are wanting. You should know, however, that the effects of ligature on or obstruction of the cerebral arteries are sometimes very remarkable for the fact that they do not exhibit anæmia, but congestion or sanguineous stagnation. It seems as if the sudden stoppage of the blood, by exhausting the part for a time of its fluid, caused it subsequently to suck back, as it were, blood from other channels until it became choked with it. This is constantly seen where a small artery of the brain has been blocked and the part beyond it is found congested, instead of being anæmic as might have been expected. A very remarkable case occurred here some time ago, where the carotid artery was tied and death occurred three days afterwards. The brain on the ligatured side was of a deep purple colour, whilst on the healthy side it was pale and natural. This colour was due to the plugging of the whole of the arteries in that hemisphere as well as the veins, so that on opening the sinuses clots were seen projecting into them. It seemed as if the blood had passed backwards along the sinuses and so filled the smaller veins and arteries. The contrast between the dark purple soft hemisphere and the healthy white one was most striking.

It is important, also, to remember the arrangement of the vessels in connection with the nerves, since the latter might be involved by aneurysmal tumours.

In any anatomical work you will read how the circle of Willis is formed. From this, small vessels are given off which penetrate to a slight depth the substance of the base of the brain, the pons Varolii being supplied by the basilar. The larger arteries which come off from the basal supply the mass of the brain and the convolutions. The anterior cerebral passes to the anterior lobes and to a small portion of the anterior surface of the corpus striatum.

The middle cerebral supplies the corpus striatum by a vessel dividing into two branches, the one going to the external and the other to the intra-ventricular portion; it also supplies the anterior and outer part of the thalamus opticus, and then passes up to supply the outer side of the middle lobe. The posterior cerebral arteries supply the posterior lobe and mainly the thalamus. The cerebellar arteries, of course, supply the cerebellum. The posterior cerebral and superior cerebellar supply the corpora quadrigemina, a fact of importance in connection with the function of the optic nerves. Most interest is attached to the middle cerebral, because it is one very likely to be diseased or affected by embolism, and in consequence, by damaging the corpus striatum, productive of hemiplegia. The vascular distribution to the corpus striatum is, indeed, three times as likely to be affected in various ways as that to the thalamus.

Minute Anatomy.—The nervous substance is composed of fibres and ganglionic cells. The latter constitute the bodies whence are supposed to originate the nerve forces, whilst the latter are looked upon as their conducting cords. The grey cells are found on the surface of the brain, in various internal parts, and in the spinal cord. They are surrounded by a sheath which is connected with the nerves. They are of various shapes and sizes, being unipolar, bipolar, and multipolar. They are more numerous in the anterior than posterior parts of the brain, also larger and of a pyramidal shape; in the posterior smaller and rounder. The nerve-fibres are composed of an axis-cylinder, which is looked upon as the conducting cord; this is surrounded by a peculiar matter, called myeline, or the white substance of Schwann, and around this again is a sheath of fibres or neurilemma. In a large nerve many of these fibres are bound together by cellular tissue. They vary in different parts, and in the character of the investing sheath. The axis-cylinder is well shown by adding carmine to stain it. Uniting the cells and fibres together is the neuroglia or nerve-glue, of whose exact nature there is still a diversity of opinion, but it appears to consist of a network of fibres. In this branched cells are found, the large ones called "Deiter's cells." It is of interest to us clinically as being probably the seat of most of the inflammatory processes which go on in the brain, especially those of a chronic nature. It is a fibro-granular material, containing nuclei.

Morbid Anatomy.—The cerebro-spinal centres, together with the nerves, are all subject to various morbid conditions; of these I shall have to speak separately, but they may be spoken of as a whole as follows:—There are the accidental affections of the brain arising from injury, and those due to rupture of blood-vessels,

where the organ may receive a severe and fatal laceration. The diseases beginning within, of an inflammatory kind, are acute cerebritis, leading to softening, and chronic cerebritis, tending to the same result and sometimes to the formation of new products of connective tissue, causing hardening or sclerosis. There is also atrophy of nerve structure and the production of amyloid bodies. Then, there are special changes in the brain-cells, or vesicles, whereby they become altered in form, lose their connecting processes, are filled with a dark pigment, or even become chalky. Of late much has been said of the morbid changes in the brain in connection with the perivascular canals or spaces around the blood-vessels from their supposed identity with the lymphatics; herein is the seat of tubercle and other inflammatory products. Some pathologists, however, attach little importance to the changes found in connection with the vessels, since it seems that long-continued congestions, arising from any cause, will tend to the congregation of leucocytes, with a wasting of the coats of the vessel and the tissue around, giving rise to the formation of the vacuoles which have attracted so much attention in various forms of disease, and thought to have a special pathological origin.

It is also very important to note the secondary changes which take place in the brain, spinal marrow, and nerves, for a knowledge of their occurrence may enable us to explain many otherwise obscure cases of disease. The fact to note is that the nutrition of nerves does not depend so much upon a vascular supply contiguous to them as upon the integrity of the root of the nerves, or of some distant centre whence they spring; so that a nerve, when cut, degenerates along its whole course. Close to the spine the nutritive centre of the sensory root appears to be the ganglion at its origin, whilst that of the motor is the grey centre in the cord where it arises. These facts have been taken advantage of by Waller in ascertaining the distribution of nerves. He found that after dividing a nerve it gradually became changed into a fibrous cord; at first he found a mere granular fatty change, with the axis-cylinder remaining, but subsequently the whole nerve decayed, which he could trace through the muscle to which it was distributed. Bouchard found a somewhat similar change take place in the fibres of the brain and spinal cord; for example, after an apoplectic seizure due to effusion of blood in the corpus striatum he observed a softening process which extended through the crus cerebri and anterior columns of the spinal cord as far as the dorsal region. Not only in a case of this kind, but in various other forms of lesion, inflammatory or degenerative changes may extend to a great distance, taking the course of the anatomical and physiological arrangement of the nerve-

structures. You must often have seen this occur in a rough manner in cases of injury to the cord from fracture of the spine, and where an evident softening process has extended a long distance downwards in that particular tract which had been injured. All these facts show how degeneration, or some other subtle change, may rapidly take place in the spinal cord, and how disease may be propagated from the centres to the nerves, and sometimes from the latter to the cerebro-spinal centres. They also show that nerve-fibres are something more than mere conductors, that there is a principle of activity pervading them as a whole, which may come and go under varying conditions. These degenerations I shall more fully explain when I come to the spinal cord.

Symptomatology.—Having seen that true paralysis is associated with disease of the spinal cord, we may ask, what are the symptoms which would be connected with disease of the brain proper? This organ being intimately associated with perception, and with the will as influencing the cord and other mental operations, we might infer that these functions would be lost when the cerebral hemispheres are impaired. If seriously diseased, either by organic changes in its substance or by poisoned blood circulating through the hemispheres, all perception and voluntary efforts would be gone, and in course of time there would follow dementia. If affected by acute inflammation, as in meningitis, there would be delirium; also, since irritation of the surface produces movements either directly or through the motor ganglia below it, there might be convulsions. I think, therefore, the symptoms associated with affections of the cineritious substance may be said to follow a pretty general rule. It might, however, be remembered that in experimentation upon animals irritation of the dura mater is sufficient to produce convulsive movements. This membrane is supplied by the fifth nerve, and is really sensitive. It is, therefore, very possible that in disease or injury spasmodic movements may have their origin in the dura mater. As regards the other portions of the brain, it is remarkable how few symptoms are associated with diseases of the medullary matter, whether these be effusions of blood, abscesses, or tumours. Probably if a large number of the radiating fibres were cut through, some kind of paralytic symptoms would result, but as this does not occur none of these diseases which I have named may make themselves manifest, or if they do become known it is only by their encroaching upon parts having more defined functions, as the cerebral ganglia or the cranial nerves at the base.

As regards the cerebellum, the symptoms dependent on its diseases are not striking, although when these have been long

existent we can generally infer their seat pretty accurately. In course of time there is a tottering in the gait when the patient attempts to stand or walk, which shows the organ is associated with the process of co-ordination. In these cases, too, blindness is very often noticed, although, of course, this is not peculiar to disease of the cerebellum; and it is remarkable that nystagmus is often present. This is interesting in connection with the experiments of Ferrier, who found, on irritating the cerebellum, that movements of the ocular muscles (as if through the third nerve) were produced. Rigidity of the limbs is often a symptom of cerebellar disease. Clinical observations confirm the result which Flourens many years ago obtained by experimentation. This physiologist found that when he injured the cerebral hemispheres the animal was stupefied, but when the cerebellum was destroyed, it staggered in its walk. "En le privant de son cerveau on l'avait mis dans un état de sommeil. En le privant de son cervelet on le mettait dans un état d'ivresse," or, as the French Academy concluded its report: "Que le cervelet fit en quelque sort le balancier, le regulateur des mouvements de translation de l'animal."

A very important question to solve is whether there is pain in disease of the cerebro-spinal centres. There can be no doubt that most extensive disease may exist within them without the occurrence of any pain whatever, and it also seems to be clear that in the instances where pain is the chief symptom the disease has involved a nerve after its exit from the centre. In the case of the head, we know that where the greatest pain exists the membranes rather than the substance are involved, the dura mater being supplied with sensitive nerves. The cases which most contradict this statement are those of cerebral tumours, where, no doubt, intense pain often exists, but at the same time it may be remembered that this comes on in paroxysms, as if the tumour merely induced it by setting up irritation elsewhere, and, as a rule, the pain is not situated in the region of the growth. In cases of apoplexy also there is sometimes intense pain preceding the attack, or at its onset. It has been thought by some that a part of the brain only is sensible, and this view is supported by showing that sensation is affected when disease occurs in the neighbourhood of the thalamus and summit of the sensory tract. Dr Copland attached much importance to an old observation in the diagnosis of cerebral diseases—that patients involuntarily or instinctively place one hand over the genital organs.

Now, it is only right to inform you that the ordinary approved opinions of the functions of the brain being located in distinct regions, and that special forms of paralysis are connected, there-

fore, with defined lesions are discarded by so high an authority as Brown-Séquard. In some lectures lately delivered by him he has attempted to show that our facts do not bear out such principles as I have endeavoured to prove to you to be true, and that no definite lesions have yet been found in correspondence with special symptoms. He denies that the brain can be played upon as we play on the keys of a piano, and maintains that its functions are scattered through its substance as a whole. He says, for example, that a small effusion of blood in a well-defined spot may be attended by convulsions, altered pulse, change in pupils, sickness, and a number of other symptoms which cannot be connected with derangement of that small spot only. These symptoms must imply that an irritation has been transmitted to far distant nerve-cells, and so an irritation of one spot may affect a large part of the healthy structure to the production of an over-activity or paralysis. "The latter appears in brain disease, not because conductors or centres employed in voluntary movement are destroyed and lose their function, but because an irritation starting from the diseased part or its neighbourhood goes to a more or less large number of brain-cells, scattered in many places in the nervous centres, and stops their activity." In this way he explains paralysis as arising, not so much from the lesion as from the irritation set up in the healthy portion of the brain. Herein he finds an explanation for the numerous cases which he quotes of paralysis occurring on the same side as the disease of the centre. His arguments are not sufficiently convincing to allow us to discard our old opinions as to the localisation of the functions of the brain, although it must be admitted, and this has generally been done, that an irritation of neighbouring parts must have its share in the production of the manifold symptoms which occur in very specialised lesions. In the case he gives of the small effusion of blood the first symptoms are due to a disturbance of the brain as a whole, but in a short time the phenomena become very defined. Brown-Séquard even seems to deny the frequency of crossed paralysis, a fact taught ever since the days of Aretæus. This author says the body is divided into two equal parts, and what affects one side does not affect the other. "If the cause of the paralysis should be below the head, as in the spinal marrow, the parts below are paralysed, but above this the nerves are not in a direct line, but are inverted, passing to the other side like the letter X, and in this way one side or the other may be paralysed." The uniform experience of all observers has been in accord with this during the many centuries since it was written.

HEMIPLEGIA

Paralysis of Motion and Sensation of one half of the Body.—A perfect hemiplegia, according to our present views of the physiology of the nervous system, can imply nothing less than a disease or temporary impairment of the complete half of the spinal cord, or of all the centres which rule over the movements of half of the body; or if not this it must imply disease of some one centre which governs all those minor ones which do possess the motor power. In the same way a loss of sensation of half of the body would indicate disease of the whole of the sensory tract or of that region into which all the sensory nerves pass.

Now, as a matter of observation, I am unaquainted with any organic disease which can produce either form of paralysis, and as regards that of motion there is really no such affection as a perfect hemiplegia, either of the organic or functional form. The so-called hemiplegia is of various kinds, amongst which a functional hemiplegia as seen in hysteria is quite different from that arising from disease of the cord or the central ganglia. Also, a true and perfect hemianæsthesia certainly does exist, but, as far as I have seen, is either functional or nearly always associated with that form of hemiplegia which is styled hysterical. Loss of sensation on one side from an organic cause has never, in my experience, been complete.

Hemiplegia from Spinal Disease or injury would arise from lesion of one side of the spinal cord, all the parts below being paralysed. For example, a man had a complete severance of the restiform body of the medulla. There was a partial paralysis of motion of the arm and leg, but sensation was unimpaired. The origins of the glosso-pharyngeal and pneumogastric nerves were involved, causing complete inability to swallow. He also had constant hiccough, and died a few hours after the accident.

Hemiplegia from inflammation of one hemisphere of the Brain.—This is a cause of paralysis which I was at one time reluctant to admit, but have not hesitated to do so after Mr Hutchinson's observations on the subject. The facts I knew, but the difficulty of the explanation arose in consequence of the inflammation or unilateral arachnitis having of necessity its origin in an injury. In idiopathic meningitis both sides of the brain are affected, but where one side alone is involved some injury from without must have been inflicted to cause it; hence there would be the possibility of some other lesion of the brain being present, which might have

given rise to the symptoms. Indeed, cases have been reported where such injuries have been quite sufficient to account for the symptoms without having recourse to the effects of the supervening inflammation. I now feel sure, however, after removing all these possible causes, that an arachnitis is quite capable of producing a paralysis. In some cases sensation is impaired, and pain also may be a possible symptom.

I will briefly relate two cases of paralysis accompanying an arachnitis which occurred to me before I was in a position to recognise the true relationship between the symptoms and the disease. They are already published in the 'Guy's Hospital Reports.'

Injury to Head; Unilateral Arachnitis; Partial Hemiplegia

Case.—A boy had a blow on the head from a stone, causing a scalp wound. He had at first no symptoms, but subsequently he became very ill, with great febrile and cerebral disturbance. He gradually fell into a semi-comatose state, and was found to be partially paralysed on the right side. He was trephined, but only a few drops of pus escaped. The post-mortem examination showed that there was no fracture, but that the bone at the seat of the injury contained pus in the diploë. The left side of the brain was covered with purulent lymph, some of which was free on the surface, while some occupied the subarachnoid space; the cineritious substance was also infiltrated with inflammatory products of a pale yellowish colour.

Injury to Head; Unilateral Arachnitis; Hemiplegia

Case.—A man fell from a loft several feet high on to a piece of wood, which produced a compound comminuted fracture on the right side, a piece of the bone being driven in. He at first suffered from concussion, but soon recovered; he remained in a doubtful state for a day or two, when arachnitis came on, and he died a week after the accident. Before death the right side was observed to be paralysed. The post-mortem showed a fracture, beneath which the brain was reduced to a pulp; and on the opposite side there was an arachnitis, the whole surface being covered with lymph.

Paralysis from lesion of the convolutions, or Cortical Paralysis.—The form of paralysis of which I have been speaking excites additional interest at the present time, when we are beginning to regard the cerebral convolutions not as merely having a governing power over the ganglia below them, but as really being a further and higher development of these summits of the spinal system, and consequently closely connected with the motor apparatus. Although I cannot say from my own observation that a loss of a portion of a convolution will produce a localised paralysis, yet in our present physiological knowledge it would not seem impossible, seeing that a destruction of the whole hemisphere can produce what is equivalent to a complete hemiplegic condition. We believe we

see this in the case of unilateral arachnitis, of which we have been speaking, and where the function of the convolutions is for the time destroyed. The experiments of Ferrier, by destruction of portions of the cortex of the brain, gave a variety of results; in some animals the whole of the hemispheres could be removed without any loss of motility, whilst in the higher animals, as monkeys, distinct paralysis followed the injury of particular convolutions. For example, destruction of the posterior parietal lobes was followed by paralysis of leg, of the ascending frontal convolution by paralysis of arm, of the lower frontal convolution near the junction with the ascending by paralysis of the face. The author believed this difference to be due to the degree of development of the animal, for whilst in the very lowest of animals movements might be automatic, in the higher classes, owing to a more complete education, they would be more intimately associated with the cerebral hemispheres. By the light of these experiments we are beginning to make more accurate and close observations with respect to the effects of lesions of the cortex cerebri, and if it be true that the motor region is limited to the antero-lateral portion of the brain, it is evident that lesions of this part and those of the posterior lobes would of necessity produce very different effects. It does seem that injuries to the motor region will produce corresponding paralytic symptoms, and I believe the experience of surgeons shows that persons having received an injury to the head followed by paralysis have recovered after the removal of portions of fractured bone, where the surface only of the brain could have been affected.

That disease of the whole cineritious surface of the brain is adequate to produce paralysis is seen in the following case, which I published several years ago.

Disease of the Cineritious Surface of the Brain; Hemiplegia

Case.—A woman, æt. 36, struck her head against a beam of the ceiling several months before death; she subsequently became ill, and had two or three attacks of vomiting. About three months before her death she became very ill and took to her bed; she had febrile symptoms and sickness, and was evidently suffering from cerebral disturbance. After the urgent symptoms had passed off she lay quiet in bed, and appeared quite sensible of what was said to her. She gradually became weaker in her limbs, and especially in those of the left side, until in three weeks' time her left side was quite paralysed. After this she lay quiet, apparently sensible, and able though with difficulty to answer questions and to put out her tongue. On being asked a question she would wait and deliberate, and then slowly answer. The most remarkable symptom was the fact that she never seemed aware that she had lost the power of the left side. On being asked about her arm she always declared that she could move it, although it lay helpless

by her side. She gradually died. The post-mortem examination showed nearly the whole surface of the right hemisphere to be diseased; it was in a very peculiar condition, as if the whole of the grey substance was undergoing disintegration. This was not so apparent on the surface as on taking off a thin slice, when the cortical part of the brain was seen to be of a yellowish colour, soft, and as if worm-eaten. The disease in some parts affected the deeper layers more than the external. The disintegration reached the medullary matter, but did not appear to penetrate it. This morbid condition extended over all the right hemisphere, with the exception of the base. The left hemisphere was quite healthy.

Since the publication of Ferrier's experiments very careful observations have been made in respect to the character of the symptoms in cases of local injuries to the head. Many instances have now been published which tend to show that spasmodic action as well as partial paralysis of the limbs attends injuries to the convolutions. Cases may be found scattered through the medical journals; but I will content myself with quoting one published by Mr Stanley Boyd, from University College, and one by Mr Smith, from St. Bartholomew's Hospital.

Case.—A little girl, æt. 11, was knocked down by a carriage and brought into hospital insensible. No mark of injury was discernible. On the following day it was observed that the right side was weak; she soon afterwards had clonic spasm of the face on right side. On the third day she had several fits. These ceased, when she was found to have paresis of right side of body, including the face; she could not talk, did not know the names of objects or miscalled them, and was evidently aphasic. On the eleventh day the limbs had recovered themselves, but the face was slightly dropped and she could scarcely speak; she also on attempting to write misspelt her name, and when she read, the words were quite unintelligible. From this aphasic condition, however, she rapidly recovered, and at the end of a month after the accident she was discharged well. It was supposed that she had injured a limited number of convolutions on the left side, and perhaps also had some temporary inflammation of the membranes over them.

The same author also mentions the case of a young man who was knocked down and stunned by a ladder. After recovering from concussion, he was found to have right facial paralysis and aphasia; also occasional convulsions. He quite recovered. It was thought that he had injured the lower part of left ascending frontal convolution as it meets the left third frontal.

I am seeing occasionally a young man, the son of a farmer, who had a block fall from a hayrick on his head. He fell down stunned, and his father says he curled round and round on the ground. Since that time he has been unfit for his work, dull in intellect, and his right arm and leg are weak; they often feel cold, but are not wasted. There is a tender spot near the middle of parietal bone, a little towards the anterior superior angle.

The following case is reported from St Bartholomew's Hospital,

and illustrates the effects of a temporary lesion and perhaps localised inflammation of a part of the cortex:

Case.—A little boy, æt. 6, had a heavy piece of wood fall on his head, striking it on the left side just in front of the parietal eminence. The wound was open and the bone was exposed. He had no marked symptoms until six days after, when an almost sudden paralysis of the right arm was observed and the face was slightly drawn; there was apparently also loss of sensation in the arm. Mr Smith then removed a portion of bone and elevated another, when a little dirty pus flowed out. On the following day his arm was still helpless, but he cried out when it was pinched; he at the same time lost all power of talking, making merely noises, but no articulate sounds. He then began to improve, so that in five days he could talk and move his arm slightly. At the end of a week he could grasp with left hand, sensation had returned, and he could talk, but the face was still drawn. When he left the hospital, two months after the accident, the arm was slightly weak, the temperature was lower than on the other side; this had been observed throughout the case, and the arm was thought to be rather smaller than the left. His speech had returned, and he was liable to almost maniacal outbursts of temper, at which times he swore with great volubility.

The difficulty of course is very great in determining the relation between the symptoms and the part affected, seeing that the extent of the injury cannot be known nor the amount of implication of other convolutions subsequently by inflammation. Reports of cases come to us principally through the weekly journals, and we have no means of gauging their accuracy. I have been reading just now of the case of a boy who had a blow on the forehead between his eyes, followed by convulsions. He was trephined and cured. I ask myself whether an injury to the dura mater alone might not have produced the symptoms.

Dr Russell described the case of a tumour of the frontal lobes, in which there was no symptom except progressive lethargy ending in coma.

Mr Le Page, of Durham, records the case of a boy whose head was crushed between a waggon and a wall. The boy walked home, and the surgeon found a fracture between the temporal and occipital regions, with the brain oozing out. There were no symptoms, the wound healed, and in six weeks the lad was well, and soon after went to work. It was reported that eighteen months afterwards the lad was quite well, with no disturbance of brain or intellect.

Old Atrophic Paralysis.—I might here allude to cases of very chronic or congenital paralysis with wasting, as some of these have been found associated with disease of the convolutions rather than of the spinal cord. Thus, Dr Gowers describes, in the 'Med.-Chir. Trans.,' the case of a man of middle age who had congenital absence of the hand, and where after death he had an opportunity of examining the brain. He found the convolutions of the frontal

lobes equal, as also the ascending frontal convolution, but the ascending parietal convolution on the right side was affected. Its middle portion was only half the size of the corresponding part of the left, but the upper and lower portions of the convolution were equal on the two sides. The microscope showed nothing.

In several cases of congenital wasting of limbs one side of the brain has been found atrophied, including not only the central ganglia, but the convolutions. Dr Taylor has carefully examined a case of this kind.

CASE.—A young man, æt. 25, when five years old had had an attack of apoplexy. He was seized suddenly with unconsciousness, leaving him paralysed in left arm and leg. After some months these began to contract until the condition was attained which was permanent with him. The left arm was small and flexed across the chest and was of little use to him. The left leg was wasted and affected with talipes; no loss of feeling in the limbs. The face was natural and there was no apparent mental incapacity. On post-mortem examination the right hemisphere was found markedly smaller than the left, and on opening the ventricles the corpus striatum and thalamus opticus were seen to be much diminished in size. In the corpus striatum there was a small cavity. The base of the brain also showed a marked want of symmetry, the right side of the medulla oblongata being smaller than the left, and the *left* lobe of the cerebellum was smaller than the corresponding half. The crus cerebri and anterior pyramid on right side were also smaller. In the spinal cord the atrophy was on the side opposite to that of the brain, but on the same side as that of the cerebellum. This wasting was seen at the upper part of cord, affecting the antero-lateral columns and the anterior cornu. No difference was appreciable in the dorsal and lumbar cord.

Dr Taylor believed that the origin of the disease was effusion of blood in the corpus striatum, and that all the other atrophic changes followed, the motor regions being especially affected: cerebrum, optic thalamus, and pyramidal tracts, with the cerebellum of the opposite side. Sensation was not affected.

Other cases have been reported where the atrophy of the brain and cerebellum has been on opposite sides, seeming to show that the fibres of the cerebellar peduncles decussate.

Hemiplegia from Effusion of Blood external to Dura Mater.—I believe some good authorities doubt the possibility of a paralysis occurring under these circumstances, but I cannot myself hesitate to admit the fact of a partial hemiplegia arising in cases where there has been an extravasation of blood on the surface. Whether this may be attributable to simple pressure transmitted to the central ganglia, or due to a direct impairment of the convolutions, may be a question. The cases I especially allude to are those where the middle meningeal artery is lacerated from injury, and blood is effused external to the dura mater, forming a circumscribed clot,

which is found after death to have produced a deep depression on the brain. The only cases of the kind from which any inference could be drawn with respect to the symptoms resulting from this cause would be those where the brain was not injured, and where, indeed, no severe concussion had occurred. They would be those where, as a result of the hæmorrhage, coma had slowly come on; and therefore, if in these cases anything like hemiplegia were observed, it could scarcely be attributable to any other cause than the pressure of the blood. I might say that the paralysis would never be anything more than partial, and it may be further noticed that the blood would always be situated over the motor region.

Ruptured Meningeal Artery; Paralysis of Motion and Sensation

CASE.—A man, æt. 30, had a fracture on the left parietal bone, caused by a poker. This led to the effusion of a large clot of blood on the dura mater compressing the brain. When admitted he was almost in an unconscious state, with contraction of the pupils (particularly the right), and was very restless. Two days afterwards, although he had not spoken, he seemed to have some degree of consciousness, and it was found that he had loss of motion and sensation in the right arm and leg, and particularly in the former. Two days afterwards he had somewhat recovered from his lethargic state, and appeared to feel when he was touched. After this he again became comatose, and gradually sank on the eighth day.

Ruptured Meningeal Artery; Hemiplegia; Trephining; Recovery

CASE.—Some years ago a man was admitted under Mr Cock's care in an insensible condition, having fallen from a height. He gradually recovered from the concussion, and remained sensible for some time; but in the night he was found in a deep coma, with stertorous breathing and with insensible contracted pupils. The man seemed on the point of death, when Mr Cock determined to trephine, being guided in the choice of locality by the fact that the left arm and leg freely moved when they were pinched, whereas not the slightest motion could be excited in either of the limbs of the right side. A large clot of blood was removed; the stertor almost immediately ceased, and on the day following the man could move his right arm and leg freely. He shortly after resumed his work, and remained well for thirteen years, except that he had some fits towards the close of his life. He at last died of apoplexy.

Ruptured Meningeal Artery; Effusion of Blood; Paralysis; no loss of Consciousness

CASE.—A man was taken out of an area apparently in a state of intoxication and was put into the police station; but not having thoroughly recovered himself he was on the following morning brought to the hospital. No fracture could be detected, but there was bleeding from the ear. The left arm appeared very weak and almost helpless. This partial hemiplegia remained, although he recovered his consciousness. He died ten days afterwards. A fracture of the base was

found, and external to the dura mater there lay a large clot of blood, which had indented the brain into a deep hollow. Outside the clot there was some fluid blood, which appeared to have been more recently effused, and to have been the more immediate cause of death.

Ruptured Meningeal Artery; Effusion of Blood; Paralysis; Coma

Case.—A man fell from a plank, striking his head upon a heap of bricks. He was brought in with incomplete paralysis of the right side. He was not unconscious, but was in a lethargic state, and when spoken to was very irritable. He passed his evacuations involuntarily. There was found a fracture of the skull on the left side, and a large clot of blood lay external to the dura mater, compressing the brain.

Hysterical Hemiplegia.—We generally mean by this expression that form of paralysis of one side which depends upon a temporary absence of voluntary power whereby the patient cannot will to move one side of the body. It is evident that this form cannot resemble the ordinary variety of hemiplegia which depends upon an organic lesion at the summit of the motor tract, for in the latter there is an absolute falling of the muscles on one side of the face, with thickness of speech, and, at the same time, the patient's will is good to move the mouth, the eyes, and other parts which are not affected by the paralysis. In hysterical hemiplegia there is no falling of the face, as no want of will could possibly produce such a condition, and the active drawing up of the face on the other side would be but a poor imitation of palsy of the opposite seventh nerve. There is, however, very often an inability to open the eye, or rather the eyelid falls; at the same time there may be an inability to open the mouth, thrust out the tongue, or swallow; all of which symptoms are clearly due to a want of voluntary power. As regards the helpless limbs, it will be found by raising them, and by a little manœuvring, that they are not absolutely dead and powerless, as in a truly paralysed part, but some resistance is made, especially when the arm is placed in an awkward position. Very often, too, in such cases, there is a want of forcing power over the rectum and bladder. It will thus be clearly seen that in hysterical paralysis those parts are affected over which the will more especially exerts its influence, and if the patient is said to be paralysed on one side the distinction between her complaint and the commoner form of hemiplegia is obvious. A close observation will show at once the difference between a hysterical and a real paralysis. In the latter it will be seen how the patient is making every possible effort to walk, her countenance attests it, as well as the action of the auxiliary muscles of the trunk; whereas in hysterical paralysis the want of will is obvious in the dragging of the leg with the toe scraping on the

ground. In paralysis of the arm, if the patient be asked to bend the body, the arm falls forward; if there be no real paralysis it keeps its position, as in health, at the side of the body.

CASE.—Mary B—, æt. 30, was sent in as a sufferer from paralysis of one side of her body. She was a governess, and said that two years ago her left hand became numb, afterwards weak, and at the end of three months her whole arm was helpless. Subsequently the left leg became affected in a similar way, and after this the left eyelid drooped so that she was unable to raise it. She said also she had had a fit, and after this was unable to open her mouth, and lived in consequence on liquid food. On admission she was found unable to move her left arm and leg; the arm when raised dropped lifeless at her side. She had ptosis of the left eye, but the eye was natural and movable. She was unable to open ner mouth beyond half an inch. The tongue protruded straight. It was evident that these symptoms did not correspond to any which would arise from a known special lesion, and therefore the case was regarded as one of "ideal" paralysis. She was cured in five weeks by moral treatment. She was told to use an effort to open the eye and move the limbs, and that an improvement was expected daily. The cure was thus speedily effected.

Hemiplegia with Spasmodic Contraction

CASE.—J. B—, a young woman, subject to various hysterical ailments, began to have weakness of her left leg sixteen months before her admission, and soon afterwards of her arm also. The limbs then gradually contracted until they reached the condition as seen on admission. The arm was flexed tightly across the chest and the fingers clenched. The leg was drawn up to the abdomen and not stretched out straight, as usually seen in this class of case; when the limbs were forcibly straightened great pain was experienced, and they immediately returned to their original flexed position. There was no wasting, good reflex action with hyperæthesia over the left side of the body, as well as tenderness over the left inguinal region. There was always a bad odour emanating from the arm, the clerk said, like old boots. She subsequently complained of dimness of vision of one eye. She was ordered galvanism and faradisation, and told to move her limbs as much as she could. She was soon able to get up and walk about, and left well in four months.

We must not, however, call every case of functional paralysis hysterical, for, as I shall have repeatedly to state, there is not an organic disease of the cerebro-spinal centres which is not simulated by a functional one; of this the following is an example:

CASE.—Mr H—, æt. 35, whilst taking his daily journey to London by railway was seized with paralysis. He was taken to Guy's Hospital, when he was found hemiplegic on the right side and completely aphasic. He was sent on to me, and on his arrival all the symptoms had disappeared. During the next two months he had on two occasions a strange feeling in his right arm and leg. I saw him two years afterwards and he had had no attack. There were no symptoms of epilepsy, and even if such a name were accorded to the attack, we arrive at no nearer an approach to its pathology.

Ordinary Hemiplegia.—The commonest form of hemiplegia is that which arises from disease of the corpus striatum, due generally to sanguineous effusion or softening. It is characterised by paralysis of the arm and leg, of the face in part, and of the tongue; that is, the lower part of the seventh nerve is affected, and the ninth. The trunk and other parts of the body are not involved in the paralysis. These facts have opened up a subject of great interest both to writers on physiology and pathology. For since it is seen that in hemiplegia the will can still operate efficiently on all other parts but the limbs and a small portion of the face, it might be conjectured either that there was some special channel of communication between the nerves which supply these other parts and the cerebrum proper; or that the centres of these nerves lying, not apart, as those which rule over the extremities, but in juxtaposition, can still be stimulated by their neighbours. Be this as it may, we shall find that if special nerves, or any other than those which supply the extremities, are paralysed in hemiplegia, we shall be able to conclude that disease exists at their roots or at the very centre whence they spring, and thus we shall have a means whereby we can detect the exact seat of the mischief.

Owing to the intermixture of fibres, we find that a small spot of disease in either of the central motor ganglia will produce paralysis of the limbs on the other side; a slight lesion, partial paralysis; and a severe lesion, complete paralysis, and not, as might have been expected, had there been no blending of fibres in these ganglia or in the plexuses of nerves, a paralysis of particular muscles, according to the exact site of the lesion. When, then, disease of the corpus striatum exists, we have hemiplegia; any disease will produce it, as it is a necessary result of the lesion. I have found it more convenient to speak of the corpus striatum; but, as I have already described to you, this body is composed of two nuclei, between which runs the motor tract, and it is this which, when injured, is supposed to cause paralysis. A case was reported lately where a growth occupied the caudate nucleus, but there was no paralysis. The patient had fits. You must not, therefore, say, as I heard one of you the other day conclude, that a patient necessarily had apoplexy because he was seized with hemiplegia. The fact of hemiplegia occurring so often in brain disease is owing to these central ganglia being so frequently attacked, and this arises, I apprehend, from their great vascularity; consequently, their vessels are liable to rupture or to become aneurysmal; or, being diseased, to lead to softening or to be plugged by an embolus. It is for the very reason that lesions of particular portions of the brain are productive of certain definite symptoms that I am pursuing this method of

passing in review the consequences of morbid change in whatever way produced. It is quite impossible to describe the symptoms of apoplexy, abscess, or softening, since the symptoms would be as numerous as the sites of the disease might be different. I want you strictly to bear this in mind, and for the present to remember that paralysis of the limbs means lesion in the motor tract.

In hemiplegia arising from disease in the central ganglion you will find those parts more especially affected which are under voluntary control, and thus the respiratory process in not interfered with. The paralysis, in fact, affects only or mainly the arm, leg, and face. The chest is seen to expand as before, and the abdominal muscles move equally on both sides, the diaphragm acts equally, and the patient appears to be able to turn the head. As regards the chest, there can be no doubt that it is not usually affected in hemiplegia, but I have seen a hemiplegic patient who, when requested to take a deep breath, was unable to move one side of the chest as well as the other. And many years ago Dr Walshe, who was quite cognisant of the opinion generally held as to the non-implication of the chest, took the trouble to accurately determine this question of relative expansion by measurement, and concluded that the side of the chest corresponding with the hemiplegia did not expand equally with the other. I cannot but think that in these cases the greater movement on the unaffected side was attributable to the action of the auxiliary muscles which really belong to the upper extremity. It may, however, be taken as pretty certain that those parts of the body which act together as a whole, and are ruled over by nerve centres which are blended into one mass, are not affected in lesions of the central ganglia; for I believe it is for the maintenance of this independence of the extremities that the upper part of the cord is bifurcated in the manner we see. The parts, then, which are affected in hemiplegia are the arm, leg, face, and tongue. If a patient be suddenly seized as from effusion of blood in the central ganglion, he is speechless, and the face is seen to be fallen on the paralysed side. When the shock has passed it is observed that the paralysis of the face is but partial, whilst the tongue is thrust out towards the weak side. The mouth drops, but not the eye, the corrugator and orbicularis being responsive to the will, as before. It was this peculiarity, the fact of the seventh nerve being not completely paralysed, which led the late Dr Todd to seek elsewhere for an explanation for the falling of the face. He thought, as it was generally taught, that the buccinator muscle was supplied with motive power by the fifth as well as by the seventh nerve, and that in a paralysis of this branch of the fifth nerve might be found the source of the symptom. Such an explanation, however, did not at all

simplify the question, for it was as easy to believe in a partial paralysis of the seventh nerve as a paralysis of a particular branch of the fifth. Of late, however, the matter has been set at rest by the statement of anatomists, that the long buccal nerve is really a nerve of sensation; that it reaches the muscle only to penetrate it; and is then distributed on the skin. Pathological facts also have shown that, when the fifth nerve has been paralysed from a growth pressing on its roots, although all the muscles of mastication are paralysed, the buccinator has escaped. Quite recently, also, Mr Turner, the Professor at Edinburgh, has dissected a subject where the long buccal nerve came off from the second division of the fifth, this root, as you know, being altogether sensory. You must therefore understand that it is the facial nerve which is partly paralysed in hemiplegia. At the same time the tongue is involved, shown by its being thrust out towards the weakened side. It was at one time said that the tongue might diverge in either direction, but this certainly is not correct, its direction being always towards the paralysed side. If the organ is thrust out of the mouth it necessarily takes an oblique course, one side being in action and the other inert. By a strong effort of the will it may be turned to either side, showing that, like the seventh, it is only partially paralysed.

There is an additional symptom sometimes met with in the so-called "lateral deviation of the eyes."[1] In a certain number of cases, and more especially when the paralysis is on the left side, the head is forcibly turned away from the paralysed side, and the eyes are also turned in the same direction and a little upwards. That is, if the patient be lying in a half conscious state with paralysis of the left side of his body his head will be found turned in the opposite direction, his eyes also being turned to the right. If the head be placed straight it will resume its former position; this, however, would not occur if the patient were asleep. In my own experience the pupils have also been of moderate size and insensible to light. This deviation of head and eyes is explained by Ferrier to be merely an additional symptom of the paralysis, for the healthy motor centre being no longer counterbalanced by the other, the lateral movement necessarily occurs; it is an exceptional occurrence, but important as showing the greater severity of the lesion. What you have to remember is that in hemiplegia the parts paralysed are the arm, the leg, and the seventh and ninth nerves. The parts involved are for the most part those over which we have

[1] As long as I remember anything of nerve disease this was pointed out by Sir W. Gull. See his Gulstonian lectures, where he gives cases of lateral deviation of eyes, and in all "the eyes were turned from the paralysed side."—*Med. Times*, 1849.

voluntary control, and thus it is that the face, tongue, and limbs are more especially affected, whilst the body is left free. As before said, the trunk is made up of two united halves, and moves as a whole, whilst the limbs act independently, owing no doubt to the separation of the motor tracts at their upper part.

The paralysis of the mouth causes usually some defect in utterance, and this occurs equally whether the paralysis is on the right or left side; but in right hemiplegia there is the very frequent additional symptom of aphasia, a condition in which language or the use of words is lost. This seems to be due to an implication of the third frontal or Broca's convolution, an implication likely to occur in any disease which attacks the corpus striatum, in consequence of the parts being supplied by the same blood-vessel. When, a few years ago, the fact was first promulgated I almost at once recognised its truth by referring to old reports of cases, where I found that it was in cases of right hemiplegia only that the speech was lost. One of these cases was that of the celebrated chemist Dalton, who was struck with paralysis of the right side, together with loss of speech.

The rigidity which so often follows paralysis I shall speak of under apoplexy.

Hemiplegia arising from Lesions lower down the Motor Tract, and implicating special Cranial Nerves.—If disease occurs lower down in the motor tract, we still have hemiplegia, but it is of a different variety, as it is associated with paralysis of special nerves, according to its seat; if, therefore, in conjunction with hemiplegia, we find special nerves are paralysed, we are sure that the grey centres of these nerves are involved in the disease, and we fix upon the seat of the lesion. Thus, in a very interesting case, related by Dr Weber to the Royal Medical and Chirurgical Society, a man was seized with an apoplectic fit, and found to be hemiplegic, with paralysis of the third nerve on the opposite side—that is, he had paralysis of the right arm and leg, with ptosis and dilated pupil of the left side of the face. Dr Weber concluded that there was an effusion of blood in the left crus cerebri, which turned out to be absolutely correct.

If disease occurs lower down in the *pons Varolii*, we might expect that other nerve-roots would be implicated, as those of the fifth, sixth, and seventh; and this is the case. As we are speaking of the motor tract, I will first allude to the case where the seventh or facial nerve is paralysed. I have already told you that in the commonest form of hemiplegia—that arising from disease in the ganglionic centres within the brain—the facial nerve is only slightly affected, so that if you meet with a case where the face is completely paralysed on one side you may know that the lesion is

not in the ganglia above named, but in the pons Varolii. This I have verified over and over again, and on several occasions seen a correct diagnosis made as to the exact seat of the hæmorrhage. In this very model before you, where you observe the pons Varolii cut through and an apoplectic clot in its midst, the true site of the lesion was anticipated long before the death of the patient. In these cases the paralysis is sometimes on one side of the face and sometimes on the other, according to the position of the clot, the explanation which is offered by Brown-Séquard being probably correct—that the fibres of the seventh nerve cross in the pons. It would, therefore, happen that if disease occurred on one side implicating the motor tract and at the same time the origin of the seventh nerve, we should witness the case of hemiplegia accompanied by palsy of the corresponding side of the face. If, however, the disease occurred somewhat lower down in the pons, the centre of the seventh on that side would escape, but the fibres crossing over from the opposite nerve would be involved; we should then witness a case of paralysis of the arm and leg on one side and paralysis of the face on the other. I had an example of this under my care not long ago, in which the man almost entirely recovered.

If the portio dura is affected, you may ask, Why not the portio mollis? It is probable that this is much oftener the case than is supposed, owing to the impossibility of discovering deafness in many sudden affections of the nerve centres; but in cases of chronic disease both roots of the seventh pair have been observed to be affected at the same time.

Cases, however, occur where the diagnosis is difficult, as in the following, where it was at first thought that the lesion was in the pons, but afterwards another view was taken.

Paralysis of the Right Arm and Leg; of the Seventh Nerve, with loss of Taste; no Aphasia.

Case.—William W—, æt. 49, a clerk, has had gout, which he strongly inherited; not very hale man, but temperate and regular in his habits. A week before admission he noticed his speech was thick and his right eye felt strange; soon afterwards also that he could not move the right side of his face so well as the left, and that he was deaf in the right ear; these symptoms became aggravated, and at the same time weakness of the right arm and leg appeared.

On admission the patient was seen to have complete paralysis of the right side of the face; he could not move the right side of the occipito-frontalis nor close the eye. When asked to do so the eyeball turned upwards and slightly outwards. The cheek was motionless and he could not move the angle of the mouth, which

was drawn up on the other side. The tongue and soft palate were unaffected. There was also complete deafness on the right side, so that he could not hear a watch when it touched the skin. No paralysis of ocular nerves; no loss of sensibility. The right arm was weak but he could move it; his right leg was weak and he dragged it as he walked. He had no aphasia; continued pain in the forehead; otherwise sound.

This man remained in the hospital a long time and somewhat improved, his principal complaint being headache. He was tested several times with respect to the sense of taste; his tongue was found to be perfectly sensitive to touch, but he had lost the sense of taste on the right side towards the tip; thus anything salt placed on the right side was unperceived, whilst it was immediately appreciated on the left side. The sense of smell on that side also seemed somewhat impaired. At the end of three months he walked about without any very perceptible weakness of the leg, and the arm regained most of its strength. The paralysis of the face was considerably less, as he could close his eyelids. The deafness remained and the left ear appeared also somewhat affected. Taste still lost on right side of tongue. He remained in the hospital some time longer, with a still further improvement which included the sense of taste. The headache, however, was more or less constant, and constituted his chief complaint. No remedy cured it, but he always expressed himself benefited after any new medicine, as iodide and bromide of potassium, guarana and gelseminum. He said he was much relieved for a time by the guarana.

A case like this is worth a very careful study, both in reference to the diagnostic difference between it and ordinary hemiplegia, as well as for the positive points of interest contained in it. It must have been a very superficial observation which suggested, in the first place, that it was a simple hemiplegia, since there was loss of power in the arm and leg and a complete paralysis of the face. You will remember that there is only a partial palsy of the seventh nerve in the common form of hemiplegia, but here it was complete —a fact at once suggesting that the disease was not in the corpus striatum; nor was there any deviation of the tongue, nor aphasia. The case was one of hemiplegia, but not of the ordinary kind; and the only question therefore asked was, did the lesion involve the motor tract in the pons, near the centre of the seventh nerve, by which both portio dura and portio mollis would be involved, or was there a mere association of hemiplegia with a disease of the trunk of the nerve in the temporal bone? I believe it was the latter, for several reasons. First, the paralysis was complete; probably there is no one centre which, if destroyed, could cause complete powerlessness of the seventh nerve. In bulbar paralysis this is only partial. If complete, therefore, we should infer that the trunk was involved. Again, too, if the paralysis had arisen from central disease the chorda tympani would not have been affected, as was shown to be the case here by the imperfection of taste. The deafness, too, could as easily be accounted for, from disease of the ear itself; and this view was supported by the constant headache.

All these reasons suggested that the trunk of the facial nerve was affected in the petrous bone; but why it was associated with a partial hemiplegia was not very obvious.

MONOPLEGIA

This is the term applied to paralysis of one limb. This may be due to a spinal lesion or a local disease of the nerves. It is spoken of, however, as sometimes having a cerebral origin, and due either to some lesion of the convolutions or of the motor tract within the brain. I have already alluded to cases of temporary paralysis in cases of injury to the head where it is supposed that some convolution has been injured; but of cases of monoplegia, arising from a deeper seated cerebral origin, I have no knowledge. I have no record of a case of permanent paralysis of one limb which had its cause in the brain.

HEMIANÆSTHESIA

It might be thought that if the older physiological doctrine was correct, that the sensory tract terminates in the thalamus opticus, disease of this ganglion or its neighbourhood would produce loss of sensation in half the body. Observations, however, have not yet substantiated this; and very good practical physicians still deny that their cases in any way show such a connection between the symptoms and the portion of brain affected. A few well-reported instances, however, seem to prove that in those forms of paralysis where the lesions had their seat near the thalamus, sensation has been affected. As a fact, in many cases of hemiplegia there is no loss of sensation, whilst in some it is impaired, and in others altogether lost. This is scarcely explicable except on the supposition that different nervous tracts must have been involved in the different classes of cases. A great difficulty arises in ascertaining the degree of loss in persons who have been struck with apoplexy, and also from the fact that it appears to require so great a lesion to cause absolute anæsthesia, which, on the other hand, so often arises from mere functional disturbance. Loss of sensation, for instance, is common enough as a nervous affection due to disturbance in the nerves or in their centres; and, what is very remarkable, a complete anæsthesia of half of the body is always, in my experience, functional; it is too complete to have its origin in the thalamus or other localised spot, especially as it includes in it a loss of the special senses at the same time. Such cases show rather that the higher sensorium is at fault, and that the whole

hemisphere must be for a time in abeyance; unless, indeed, it is supposed that a certain region, viz. the temporo-sphenoidal lobe, contains the centres of the special senses. To go back, however, to the question of whether a limited anæsthesia may be due to disease of the thalamus or its neighbourhood, there has been a growing opinion of late that pathological observation does show a connection between them.

Bright had some belief that if sensation was affected as well as motion, or if the sense of touch was more especially involved, the lesion would be found posterior to the spot usually affected in hemiplegia. He gives the case of a young man, George O—, who had paralysis of motion and sensation, and in whom the former almost passed away, leaving him partially anæsthetic. He died of pneumonia, and a softening was found at the back part of the corpus striatum.

In another case, John W—, where anæsthesia accompanied hemiplegia, a softening was found in the posterior and outer side of the corpus striatum near the junction of the cortical and medullary parts.

In a third case where similar symptoms existed Dr Bright formed the diagnosis that "effusion of blood would be found in the left hemisphere of the cerebrum, extending to the posterior part of the corpus striatum."

In the cases which I have met with of simple anæsthesia or this combined with hemiplegia, where all the symptoms pointed to a lesion of the sensory tract, the special senses were not affected.

Case.—A. B—, three months ago while sitting indoors felt a numbness in left arm, shortly after in left leg, and had great difficulty in getting up to bed. These symptoms increased until he seemed to have lost the use of his left side. He lay on his pillow on his right side. If he attempted to move his head from this position he was sick. He continued thus for a few days and gradually recovered, so that he shortly went to Llandudno and walked five or six miles. He has never, however, regained full sensation or power. He now looks perfectly well, but says his hand feels as if it had a glove on it or numby, and yet it is sensitive, for when the limb is flexed a creeping sensation passes up it. The grip of left hand also is not so good as that of the right. He walks well; no headache; no affection of special senses. Urine healthy, and heart, as regards sounds—but he had rheumatic fever years ago.

Case.—Mr S—, æt. 38, whilst working in his garden early one morning found the right side of his body had become numb; this continued during a week until he came to see me. The gentleman looked quite well, but on examining him he had almost complete hemianæsthesia of right side. On being asked to write he could grasp the pen to use it, but it would fall from his hand if he did not keep his eyes on it; also in walking if he did not continually look at his stick it would drop. He moved the limbs awkwardly as if there were some amount of inco-

ordination. The want of sensibility affected the body, face, and limbs, but the special senses were not affected. Skin and muscles sensible to galvanism. He had no headache and no other symptom whatever. I heard no more of him.

Türck made some very careful observations, and his conclusions were in favour of the view that sensation would be found impaired when a lesion existed on the outer side of the thalamus, involving the posterior part of the internal capsule. In some cases of lesions of the brain in this region he found a loss of common sensibility as well as of electro-sensibility; also that reflex excitability was less than in ordinary hemiplegia; and all physiologists agree in stating that destruction of the thalamus produces no changes in motility in the same way as destruction of the corpus striatum. In looking over my cases I cannot but think that there is some evidence to confirm this, and that there is some association between disease in the neighbourhood of the thalamus and loss of sensation. In two cases of effusion of blood into the thalamus there was hemiplegia of motion and sensation; also in another case of the kind, where sensation was not tested, motion was very little impaired. In a case of a growth in the thalamus, accompanied by fits and pain in the head, there was apparently loss of feeling in the limbs, more especially in the arm. Dr Crichton Browne gives in his adhesion to the view that sensation is associated with the thalamus opticus; his experience being that when this body is implicated in disease sensation is destroyed on the opposite side, and that the limbs do not respond to stimulation as in ordinary hemiplegia; in fact, that common sensibility and reflex excitability are abolished. Bastian and, I believe, Broadbent, two of our best observers, do not consider the theory proved; and the former physician used to teach that in all probability the parts that would be affected in loss of sensation would be those which appear to rule over this sense, as described by Vulpian and Longuet, viz. the upper and posterior strata of the pons, midway between the lateral border and the middle line. Bastian seems to think that disease in this region, or below it, might affect sensation, but that the parts above, towards the hemispheres, could not; and speaks of cases of extreme atrophy of the hemispheres and central ganglia accompanied by loss of motion, but by none of sensation.

It being then somewhat doubtful whether we at present know of any local lesion of the brain which can cause a complete loss of sensation, we must look for the causes of anæsthesia elsewhere. The only complete cases of hemianæsthesia which I have met with have been clearly functional and mostly combined with a hysterical hemiplegia, and not only the loss of feeling but that of pain—that is, analgesia—has been remarked. In this hysterical paralysis of

motion the parts which are affected do not follow any anatomical rule, but are merely those over which voluntary power is exerted, and therefore if any portion of the brain is for the time in abeyance it must be the whole hemisphere, or, if not the whole hemisphere, that large portion which rules over motility, and the adjacent region in which is contained the tactile centre and those of the special senses. This hypothesis would include in it a loss of perception of touch, as well as of all the special senses. It is possible that in some of these cases the loss of motion might have been more apparent than real, and due to want of co-ordination, but in most of them it is clear that for all motor purposes the anterior parts of the brain were functionless, and for sensory purposes the posterior. In hysteria, where there is want of will to move and loss of feeling at the same time, we must suppose that the brain is healthy, but not at work; in the same way as we may see a watch not going, and therefore suppose it to be seriously damaged in its internal machinery, yet on looking into it we find a perfect instrument which only lacks winding up.

Since these lectures were originally given, the subject has received especial attention at the hands of Charcot and the French School, and therefore it may be as well again to summarise the symptoms and record their observations. Hemianæsthesia, as they study it, is the case where loss of sensation exists in half of the body as well as an arrest of function of all the special senses on the same side. It differs, then, essentially in character from hemiplegia, which is a term not etymologically correct, as it includes only paralysis of the limbs and part of the face. In its perfect form anæsthesia is met with usually alone, or associated with a partial paralysis of motion. In cases of profound apoplexy arising from a large effusion of blood, it is impossible to discover the existence of the anæsthetic condition. As before said, it is believed that the lesion necessary to produce hemianæsthesia would be found in the posterior part of the internal capsule; that is, the tract which, running between the lenticular nucleus and the optic thalamus, contains both motor and sensory fibres. As they pass on towards the periphery they separate, the motor bending forward and the sensory backward. In cases of hemiplegia it is the front part of the tract which is injured, and in hemianæsthesia the posterior part. This is the statement, but I cannot say that from a clinical point of view it has been proved to be absolutely true. In the cases where an apoplectic clot has involved this region, I have not myself been certain that the sensory impairment has involved more than the arms and legs, and, on the contrary, when a simple and perfect hemianæsthesia has existed, the case has invariably been of a functional nature. My

search amongst records of cases corroborates my own experience, for in instances of the kind where a clot of blood or other lesion of the posterior capsule has been diagnosed, either the brain in that part has been found perfectly healthy or the patient has too quickly recovered from the attack to allow of the suspicion of the existence of any grave lesion. Without using any theoretical objections, it is evident that if the doctrine be admitted we must suppose the existence of a very limited region of the brain in which all the sensory fibres from one half of the body meet together to proceed to the hemispheres, and included in this region also the nerve tracts from the perceptive centres of all the special senses. It is this spot which must be selected for attack by disease when we have present all the phenomena of hemianæsthesia. From our knowledge of the physiology of the brain and spinal cord, and of the manner in which these centres are attacked by disease, the probabilities are against the existence of a spot so limited having concentrated in itself the line of conduction of all the senses, and of this (having no special blood supply) being selected for the inroads of an apoplectic effusion. For my own part, I have not yet met with a complete case of hemianæsthesia having an organic cause; my cases have always been functional, and in most instances have occurred in hysterical women. The few that I have seen in men have also been associated with symptoms which in women would have been styled hysterical.

Hemianæsthesia, as now being studied, is usually found in young women, and may or may not be associated with hysterical phenomena. Sometimes it is met with by accident, where, for example, a girl of a neurotic temperament is found to have lost feeling when pricked with a needle; she may not be conscious of this loss herself, although it may be complete and include the entire half of the body. Neither face, limbs, nor body as far as the median line may possess any feeling when touched or pricked with a pin. This loss includes the mucous membrane, so that the finger may be placed in the throat and not be felt on one side; the mouth, pharynx, larynx, eye, &c., are also affected. It may not be altogether complete, and some regions of the body may be found where sensation in part remains. Accompanying this loss of common sensation there is as a rule paralysis of the special senses; there is a loss of sight, hearing, taste, and smell. If salt be placed on the side of the tongue it is not appreciated; if strong scents be placed under the nostril they are not smelt; a watch placed on the ear is not heard to tick; and as regards the eye, vision has become very misty. It may be observed that the senses are paralysed on the same side of the body, proving the decussation of all the nervous tracts. This may seem

remarkable from what is known of the commissure of the optic nerves and two sides of the retina acting in unison; there is not, however, a double hemiopia but an amblyopia of one eye. It had long been known that hysterical women often lost their sight for a time, and after the introduction of the ophthalmoscope it was soon found that no structural changes could be observed. It is only of late, however, that it has been shown by Charcot and his school that the dimness of vision is an achromatopsia, or due to a failure in the appreciation of colours; that the form of objects may remain whilst the colour departs. It has been found also that colours disappear in a regular order and return in the inverse order as the patient recovers. The reds and blues have the widest extension, and then follow yellow, orange, green, and violet; that is, at an early stage the violets disappear, then the green, and so on.

I will now speak of the remarkable experiments which have been performed upon hemianæsthetic women, as the treatment and cures of these cases will throw much light upon the nature of the disease. I should say that I do not look upon hysteria as a fictitious disease or as a sham; the condition with all the phenomena is real enough; at the same time, the hysterical state is so often associated with some moral obliquity that it is very difficult to say how far a particular symptom is feigned or exaggerated. The experiments I refer to are those connected with the application of metals. These have been carried out very successfully by Charcot and his pupils at the Salpêtrière, and have been confirmed in Germany and in this country. It is found by this method of metallotherapy that if a piece of metal be bound on the skin of the arm for a short time (half an hour or so), sensation will return; that the same part which was previously senseless and did not bleed to the prick of a pin has now become highly sensitive and readily bleeds. The skin becoming more vascular is regarded as good evidence of the influence produced on the nerves. What is very remarkable is that the anæsthesia is transferred to the opposite side, and an exactly corresponding part on the opposite side of the body can now no longer feel.[1] The metals used are gold, silver, zinc, copper, tin, lead, platinum. The two former have the most efficacy. The principal experimenters, such as Burq and some of

[1] As an outcome of this, we hear of a new treatment in Paris by acupuncture to cure pain at a distance. Neuralgia, pleurodynia, acute articular rheumatism, and other local pains of long standing, are abolished sometimes instantly by acupuncture of the corresponding part of the body in which the pain exists.

A medical man who is in the habit of injecting himself with morphia for the relief of neuralgic pains informs me that when he inserts the syringe in the arm he feels a prick in the corresponding part of the other arm.

Charcot's pupils, have gone further, and show that the particular metal which has the power of restoring sensibility will completely cure the patient if given internally; or, in his (Burq's) own words, "that the external metallic aptitude being known, the same metal being administered internally will determine the same results as its external application." This effect of restoring sensation is also produced by magnets, magneto-electric machines, and solenoids; also by vibrations produced in the part, which is done by placing on the limb a pitch pipe or diapason. Not only is there a transference of the anæsthesia to the opposite side, but when, on the application of metals or magnets, the vision of the eye is restored, an achromatopsia occurs in the healthy eye. As the colours appear first by red being seen in the circumference, all being grey within, and then by blue, green, and violet gradually appearing, so the colours depart in the same order until red is alone seen in the outer ring. In all circumstances the return of sensibility is but temporary; after a time the part again relapses into its former apathetic state. Similar phenomena were observed as regards other symptoms, the contraction of a limb, for instance, so often met with in hysteria; the application of the various agents named would relieve the spasm, but induce it in the other arm; and on the contrary, their application to the sound arm would produce contraction, whilst this would depart from the other. This relief, however, was only temporary.

Although the facts may be relied on, as they have been confirmed in all countries, the explanation is not forthcoming; it has been found that discs of wood and sinapisms have produced the same effect as metals, and that various mental states are sufficient to produce anæsthesia or the reverse. At the end of the last century the whole country proclaimed the wonderful cures produced by "Perkin's metallic tractors." They consisted of two or three metal rods bound together, and by rubbing these over the affected parts people cured rheumatism, stiff joints, sprains, &c. It is, therefore, thought by many that the results are due to "expectant attention;" that the concentration of the mind on a particular part of the body is sufficient to alter its sensibility and its nutrition. This, which is called the English theory, has been much discussed in Paris and put aside as untenable. I should add that as there are various kinds of sensation, so we may find them differently affected. In these cases they are generally all deficient, so that besides anæsthesia there is a loss of feeling of pain (or *analgesia*), nor does the muscle respond, and therefore there is a myosthenia.

It is usually in hysterical women that hemianæsthesia is found, but Dr Barlow has published several cases of children the subjects

of fits and other nervous ailments who had analgesia. It is now many years ago that the addition of loss of sensation to a hemiplegia caused a suspicion in my mind as to the organic nature of the case. In my first lectures, and before the disease had been studied as at present, I had arrived at the conclusion that such cases were functional, and my further experience corroborates it. The first case which I now give is an old one. The next is one which occurred at the time when Charcot was experimenting with metals, and I took the opportunity to pursue his method; I arrived at similar results.

Case.—Mary K—, æt. 24, was admitted under my care a considerable time ago with what I thought at the time to be a serious disease of the brain. She had been out of health for some time; had inflammation of the eyes, and the right one had been removed at a provincial hospital; she also had amenorrhœa, cough, and spitting of blood, sickness, and severe pain in the head. After being in the ward for some time she became delirious at night, and suffered much from frontal headache. Some time afterwards it was found that she had lost power in the left arm and leg. It was then thought that she might have a tumour in the brain, as many of the symptoms were present, such as persistent pain in the head, sickness, and hemiplegia. She daily grew worse, and complained incessantly of pain at the back of the head, so that injections of morphia were daily used. It was said also that she had fits, and foamed at the mouth. I did not see her for some time, but the impression was that she was slowly dying with a tumour in the brain. When I took charge of the case again, nearly six months after her first admission, I altered my view of the case; her head was better, also the sickness, and she had grown fatter. She still said that she had lost all power over the left arm and leg; she had no falling of the face; she now also could not open her mouth, nor thrust out her tongue, this being no part of a hemiplegia; she moreover had loss of sensation of the left half of the body, or complete hemianæsthesia. She had lost feeling, not only in the left arm and leg, but in the trunk as far as the mesian line, also on the left side of the face, including the eyeball; she was also deaf on the left side, and said she could not see, nor smell, nor taste, on the left side; thus the hemianæsthesia was complete as regards common sensation as well as the special senses. On raising her arm and diverting her attention by conversation, it was found to be not utterly powerless, and on moving it about some resistance was offered, showing that volition was not altogether powerless over it. The eye examined by the ophthalmoscope was healthy.

She left the hospital and again re-entered, much in the same state, with paralysis of motion of left arm and leg, no falling of face; spoke well, but could not open her mouth wide enough to put out the tongue; also complete hemianæsthesia of left half of body, including the special senses. I regarded the case as one of hysteria.

Case.—C. B—, admitted January 8th, 1877. She was a young married woman, and had been confined of a still-born child eight months previously. She was much out of health and had some ulceration of the uterus. Owing to her hysterical condition her sensibility was tested without her knowledge, and she was found to be hemianæsthetic on the left side; she was also hemianalgesic as well

as amyosthenic, although she could move her limbs freely; she could not distinguish heat from cold. She was found also to be slightly deaf on the left side; she could not distinguish colours on the left side. She called red pink, yellow white, pink whitish, and blue green.

Two sovereigns were fastened on the left forearm. After twelve minutes she felt the prick of a needle just below the coins. After sixteen minutes she felt the needle nearer the wrist, and there was some analgesia on the corresponding part of the right arm. There was no bleeding from the pricks. In twenty-three minutes there was bleeding at four punctures. After thirty-five minutes there was no sensation in the left arm, but the needle was felt about the lower part of the biceps with corresponding diminution on the opposite side. There was also a rosy blush all over the arm, probably due to the continued pricking. In forty-two minutes there was feeling at the lower end of the left radius, with corresponding impairment on the opposite side. After an hour there was feeling near the left shoulder with impairment on the opposite side. At this time she said she could not feel anything she touched; *i. e.* she was anæsthetic as well as analgesic on the left side.

A few days afterwards, when she was found to be completely analgesic and anæsthetic on the left side, two discs of lead were applied, when after half an hour had elapsed she could feel a little on the wrist. On another occasion iron was applied, when sensation returned in places with a corresponding diminution in the corresponding part of the right arm. Subsequently six sovereigns were applied round the left forearm, when sensation gradually returned with impairment of the opposite side. In consequence of this good effect chloride of gold and sodium was ordered her, to be taken internally in doses of one eighth of a grain three times a day. She gradually improved, and at the end of a month she was walking about and the anæsthesia disappearing. She had quite recovered the function of the special senses, and had regained sensation in the trunk She was ignorant of the medicine she was taking. Hyperæsthesia over both ovaries.

As I before said, I have no pathological facts before me to show that hemianæsthesia is due to a local lesion, as suggested; but, on the contrary, wherever we witness its occurrence the case is evidently only one of functional disease, so that we must look elsewhere for its cause and regard it from an altogether different point of view. Even those who have insisted on its localised origin have illustrated their remarks by cases of hemianæsthesia arising from lead poisoning, alcohol, &c., which have recovered. We have already spoken of hysterical or ideal paralysis, meaning the case where the will has not sufficient power to influence a limb; or, in other words, the case where the motive power of the brain is dormant. We see how in this case all parts under the dominion of the will are paralysed, such as the sphincters, the mouth, eyes, &c., and therefore present a different phase from that of organic hemiplegia. In the same way if the perceptive part of the brain is dormant or inactive then all the senses are lost. This, we know, may arise from a shock and affect the whole brain; but we have only to

suppose half of the brain involved to imagine a loss of the senses on one side only. Probably the doctrine is true of the whole nervous centres, and every part, although not dead, may cease to act or functionise; and this explains the truth of a proposition I often lay down, that there is no affection of the nervous system due to an organic cause but what may be simulated by a functional and curable one. As we know a large part of one hemisphere may be removed without loss of consciousness, so it is not difficult to see how one hemisphere may cease to be in operation or in a state of activity for a long time, and yet consciousness remain. If there be any difficulty in receiving this view, it is only in trying to understand how one side of the brain may act without the other; but we admit this in the case of hysterical hemiplegia. As regards the whole brain being for a time functionless, the possibility of this is admitted by all as in sleep or in concussion, whether the latter arise from a physical or moral shock. As, for example, some years ago a young girl on returning from church was assaulted by a man in a lonely part of the road. When she arrived home she went into hysterics and then fell down in an almost unconscious state. When I saw her on the following day she lay in bed perfectly senseless and motionless. She never moved a muscle, and a needle could be thrust into any part of her skin without her perceiving it. It was some weeks before she completely recovered. She had then complete paralysis of motion, of sensation, and all her senses were closed. The shock had suspended for a time the operations of her brain, and organic life only remained.

Now we have only to suppose that half of the brain is in this way affected to account for all the phenomena of hemianæsthesia. This lopsided action of the brain is probably also the reason for the moral obliquity so often noticed in the same class of patients. It is possible, too, that just as an injury may produce a concussion of the whole brain, so may it also paralyse one side only. I suppose this from the phenomena which sometimes follow blows on the head. The history of injury always makes a case more difficult to unravel, for although it may suggest an actual and positive lesion, yet it is often only the starting point of a long series of imaginary or hysterical troubles. Brodie was the first who clearly enunciated this, and showed that because a pain or weakness remained after the infliction of an injury, there was no reason to suppose that a real lesion had occurred; but, on the contrary, that it had only originated the hysterical condition. He says: "In a great number of instances local hysterical symptoms appear to be connected with some accidental injury, generally a very slight one, and they are then especially liable to be misunderstood and mistaken for some-

thing very different from what they really are. For example, a woman is bled in the arm. She complains of pain extending down the forearm to the hand, up the arm to the axilla and shoulder or to the neck. You examine the cicatrix and discover nothing unusual in it, but the patient flinches when it is touched. In another case the patient has received a blow on the head, she subsequently complains of pain in it and of many other sensations referable to the seat of injury. In another case a young woman pricks her finger, or perhaps the finger is merely pinched. Soon afterwards she complains of pain extending from the finger upwards along the hand and forearm. This probably is followed by a convulsive action of the muscles of the arm, or by a continued contraction of the muscles on the anterior part of the arm, so that the forearm is kept permanently bent—at least, while the patient is awake, for the spasm is generally relaxed during sleep."

CASE.—"A young lady, eleven or twelve years of age, pricked the forefinger of her left hand with the point of a pair of scissors. This was immediately followed by pain in the course of the median nerve, and on the following day the forearm was fixed by muscular contraction at a right angle with the arm. After a few days all the muscles of the hand and forearm were affected with violent spasms producing strange convulsive movements of the hand and forearm. These were attended with sickness and vomiting. By degrees the other limbs became affected and it was impossible for the patient to walk or even to stand; sometimes the diaphragm was affected so as almost to threaten suffocation. At other times the jaw was closed by a contraction of the masseter muscle as she lay in a state of opisthotonos."

It is very important to remember that the history of a blow may have two aspects. It may be regarded as having produced a local lesion, and all the symptoms may be attributed to that, or it may be looked upon as a merely accidental circumstance which has upset the equilibrium of a very mobile nervous system.

A young woman was sent to the hospital by Mr Wm. Toulmin, of Clapton, in consequence of her having fallen over a bottle and struck her back, on which followed weakness of the right side, with loss of sensation, &c. Mr Toulmin put on her a Sayre splint and sent her to the hospital. She displayed all the usual phenomena of hemianæsthesia, with loss of the functions of special senses; she was improving under the latest methods of metallotherapia when she wished to leave the hospital.

Mr Skey describes the case of a young woman who sustained a railway shock, and had total loss of sensation and motion on the whole of the left side of the body and partial loss of both on the right. She had extreme tenderness over the upper lumbar vertebræ. The loss of sensibility was so complete that she was quite uncon-

scious of the puncture of a needle. The paralysis was referred to local lesion, or disorganisation of the cord and its membranes. She completely recovered.

Case.—Eliza T—, æt. 49, reported by Mr. Scott: She was a small woman with a lateral curvature, and had obtained her living by dressmaking. She was sent to the hospital for paralysis arising from injury. Ten months before she had been thrown out of a cart but it could not be ascertained that any local injury was sustained. On the following day she could not move her right arm nor leg, and afterwards experienced strange sensations in the limbs and lost her eyesight. The description she gave of her symptoms was very lengthy, but she had had no bed sores, no incontinence of urine, nor paralysis of sphincters. On admission she was found to be anæsthetic to a considerable extent on the right side, having great difficulty in appreciating the prick of a pin, heat, or cold. She could not distinguish a round from a square object; hearing impaired on the right side, eysight improving—and taste, which at one time had almost disappeared, had returned. The patient gradually recovered and left the hospital well.

The above case resembled in every respect the ordinary ones of hemianæsthesia, the interest of the case lying in the fact that she had received an injury which had led directly to her symptoms. I apprehend there was no local lesion as suspected, but that the blow merely upset the operations of her brain for a time.

The subject is one of great importance, both physiologically and practically, for the history of an injury may lead to wrong conclusions as to the functions of a particular part of the brain, and may suggest an altogether erroneous treatment. In the following case, given by Guthrie in his work on 'Injuries of the Head,' and in which he trephined, I should think there could be no doubt that the operation was perfectly useless for the object intended, and that the blow was merely the starting-point for an hysterical attack, as Brodie has so well described. I imagine a blow on the head may produce a local lesion or a general concussion, and every surgeon knows how in cases of fracture of the skull it is difficult to distinguish between the results of the two kinds of injury. The brain is affected like any other piece of machinery—as a watch, for example. If a watch fall or be struck, it will probably cease to go. The cessation may arise from an evident injury to the spring or some other part, or from a jarring of the whole of the works. The strike or the concussion is quite competent to disarrange the wheels, for I am reminded of one of the earliest watches with which I was acquainted in my boyhood in the possession of a school-fellow, and which had these remarkable properties; on taking it from his pocket to see the time, it would cease ticking, the movement or altered position affecting in some way its balance; he would then give it a knock and send it on again. I am often reminded of this when regarding the mobile machinery of the brain in a neurotic

woman. A blow on her head or back, or even a moral shock, will stop the works ; she cannot move a limb, nor feel in it when pinched, and she has lost all sense of seeing, hearing, &c. She is suddenly roused by a cry of fire, and the whole function is at once resumed. If the cure is not so sudden, it may be effected in many ways by medicine, mesmerism, application of metals, magnets, &c., or by the more severe operation of trephining, as in the following case, given by Guthrie in his work on 'Injuries to the Head :'—

Case.—M. A. F—, æt. 23, a stout, healthy-looking girl, received a blow two years ago from a stone falling from a doorway under which she was passing, which struck her upon the left side of the head at a spot an inch anterior to the parietal prominence. The immediate effect of the blow was insensibility followed by acute pain in the head, which ever since continued to mark the seat of injury. A week after the receipt of the blow she began to lose the power of moving the right arm, there being, however, no loss of sensation or any disturbance of the cerebral functions. During the following twelve months the symptoms remained unchanged, and she visited several hospitals without relief. The paralysis then became more complete, and she was finally admitted into the Westminster Hospital. The arm and leg were then quite paralysed ; the arm, which had been flaccid, was rigid, and vision and hearing were slightly affected.

Mr Guthrie removed a disc of bone from the exact point in the parietal region to which she referred the pain. The portion of bone showed no disease. An hour afterwards she raised the paralysed arm, and was able to extend the fingers. The pain was relieved, the countenance was less dull, and sensation was returning.

During the following three days fever and rigors appeared, as if inflammation of the brain was supervening. When these symptoms had passed the paralysis had completely disappeared and the sight and hearing were regained. Mr Guthrie adds: "She has since had some relapse of pain and uneasiness in the head, but is altogether a different person, although of a very hysterical temperament. The cicatrix on the head is firm, and she considers herself to have been cured by the operation, although I find it difficult to say in what manner it was effected, or why the removal of the bone, which was in a perfectly natural state, should have given relief."

It will be observed that Mr Guthrie speaks of the patient as an hysterical subject ; that the arm was rigid, and vision and hearing affected ; that he says there was no loss of sensation, but, further on in the report, that sensation was returning. He also expresses his ignorance as to how the operation relieved her. I think there cannot be a doubt that she had no lesion at all, but that the blow merely deranged her brain. If this be so it is just possible that where the blow is more evident and localised the symptoms may yet be due to a concussion of the whole hemisphere, although in such a case, especially if the patient be a man, the whole of the symptoms would be attributed to a local lesion. At the present time, when the question of localised functions of the cortex is under consideration, the subject is one of great importance. I might give,

for example, the very next illustration of trephining by Guthrie in the same work.

Case.—Charles M—, æt. 33, of the Foot Guards, was wounded at Waterloo on June 18th, 1815, by a piece of shell which struck him on the superior part of the left parietal bone. He remained insensible about half an hour, and on recovering was found to be unable to move his right arm and right leg which hung dead and had lost their feeling. He was admitted into Antwerp Hospital two days afterwards, and when he had been there four days he was trephined and some pieces of bone removed. Immediately afterwards he was able to move his limbs, and was sensible when they were touched. He gradually recovered so as to be sent home, the only symptom being some weakness of the right hand. The pulsation was still visible at the bottom of the wound. He was subsequently discharged cured.

I am suggesting in such a case as the latter the possibility of one part of the brain being shaken more violently than another, and hence an explanation of symptoms of a passing character. Every surgeon knows that in severe injury to the head where lacerations of the brain may have occurred and effusion of blood, the symptoms for a time are due to concussion; but we regard this as affecting the entire brain. If we believe it possible for one half of the brain or even a smaller portion of it to be affected by a blow on the head we shall be able to account for various temporary nervous symptoms. It might be rightly conjectured that if hemianæsthesia were ever due to an organic cause we should be in a better position to prove the fact by searching for it in men, and so getting rid of the element of hysteria. It is a remarkable fact, however, that in my experience the male cases strongly confirm the opinion which I have already pronounced, seeing that they all have recovered and, what is remarkable, have been frequently attended by the same phenomena of hysteria which we meet with in women. I have now seen several cases of hemianæsthesia in men, and the patients presented as regards the course of the complaint, and as regards their moral character, all those obliquities so often seen in hysterical women. So frequently is a moral delinquency associated with hystero-epilepsy and hemianæsthesia that the two conditions must have a common cause. This would go far to confirm an opinion often propounded that as the central parts of the brain must act together to keep the body in equilibrium, so must the hemispheres co-operate together to preserve the intellectual and moral integrity of the individual.

In propounding the theory that the brain may, as a whole or in part, cease for a time to work or functionise, I have found that some persons to whom the proposition is novel have had a difficulty in accepting it. Every consideration of the subject, however, will show that the theory must be accepted in order to explain

various phenomena which we are constantly witnessing both in the healthy and diseased state of the body. We may, first of all, consider the case of sleep, when the brain is healthy but for a time inactive, owing, probably, to diminished circulation of blood; then the case of concussion, where the patient is unconscious, owing to some molecular alteration in the structure, and where the rapid return to consciousness is an evidence of no organic lesion. I might also allude to the case of hemiplegia, resulting from the ligature of the carotid artery, and perfect recovery in a few days; an example proving that a portion of the brain may become perfectly inactive and yet be structurally healthy. Moreover we cannot but admit that the brain may be structurally perfect and yet inactive as regards its mental functions; for granted that the brain is the organ of the mind, and we consider the case of some savage who has become highly educated, we can only conclude that this organ was previously in part totally inactive. The condition of activity and inactivity of organs has not, perhaps, been scientifically considered, but probably many organs have a large scope of action in this respect. The stomach when not digesting is inactive, bloodless, and asleep; the lachrymal glands are habitually doing little work, compared with what may be required of them during two or three weeks of distress; and the testes may remain dormant for years. I might allude also to the case of paraplegia in connection with disease of the spine, where the most complete want of power had for some time existed, and yet perfect recovery ensued. Here pressure or some such like cause was sufficient to stay the functional activity of the cord but without in any way affecting its structure. If, then, an organ may be structurally healthy and yet not at work, and if this organ be the brain, we can understand many of the phenomena of temporary paralysis.

Case.—H. A. T—, male, æt. 22, a Swiss; had been attached to an equestrian circus, and at different times received injuries to his body and head. He had been out of occupation for a fortnight, wandering about the streets and with scarcely any food. On evening of admission, after having felt giddy for some time, he stopped to take some coffee at the corner of a street, when he suddenly felt a rush of cold in the right arm; he shook, and presently fell. He was picked up and brought to the hospital in a quarter of an hour, where, on his arrival, he was thought to be dead. When this was found not to be the case, he was put to bed, and in about an hour afterwards he regained his consciousness and was able to give an account of himself. It was then found that his right side was affected in the manner in which I saw him on the following day. The right arm was spasmodically flexed, the elbow and wrist bent, and muscles rigid. The hand was turned out, the fingers separated, the thumb drawn in, and little finger tightly flexed, whilst the last phalanges of other fingers were extended. Thus the muscles supplied by the ulnar nerve appeared specially affected. His

foot was extended, and muscles contracted; he could stand on the leg, but used it as if it were a wooden one. There was no apparent paralysis of the face, but he said he could not whistle. Besides this spasmodic contraction of the right limbs, he had almost complete anæsthesia of the same side; he could not feel when touched, nor discern hot from cold. This anæsthesia included the whole of the face on this side, together with the eyes and nose, also the trunk and the extremities; he had also lost the sense of hearing, of smell, and of taste on the same side. He said he had a pain in the right temple and forehead. On testing with both forms of galvanism it was found that the muscles did not react so well as on the healthy side.

At the end of the week sensation was found returning in the face and body, although still very imperfect in the limbs; hearing and taste also returned. Rigidity the same. He gradually improved, and at the end of another fortnight be could extend all the fingers but the ring and little fingers, which remained flexed. The leg was weak, although he could stand upon it. Sensation still much impaired. In the night he had some kind of fit, when all the old symptoms returned, including rigidity and anæsthesia, but on the following day he was again better. On the next day he left the hospital unexpectedly after having stolen some clothes; from this fact and the whole demeanour of the young man it was evident that his "morale" was of a low order.

Wm. P—, æt. 19, a footman, was seized a few days before admission with pain in the head, giddiness, and sickness. He was put to bed, where he remained until he came to the hospital. He was then partially paralysed on the right side, with anæsthesia and analgesia of same side; also partial loss of the special senses, eyesight being imperfect in left eye. He gradually improved, and was able at the end of three weeks to walk about. He said he felt much better after the application of silver coins to his left side. He then heard of the sudden death of his father, and he was seized with pain in the head, sickness, and return of all the symptoms which he had on admission. He again gradually recovered, and when he was able to walk about left the hospital.

A short time afterwards a fellow-servant of his called on me to say that the young man had another attack, accompanied by all the old symptoms.

Dr Donald Fraser relates, in 'Brain,' the case of an idiot boy who fell on his head, and the accident was followed by right hemiplegia and hemianæsthesia. He died after some days, and there were found congenital irregularities, but no lesion of any kind in the region of the left optic thalamus and internal capsule. Dr Fraser says "But for the opportunity of making a post-mortem examination, the symptoms would have been considered as indicating plainly some such organic lesion as a considerable effusion of blood affecting the left hemisphere; while as it was, the most careful examination failed to show any gross lesion."

Case (Reported by Mr F. Eastes).—Albert Rose, æt. 36. Brought in by a policeman, on July 16th, 1881, who found him in the street insensible and convulsed. He was a Frenchman by birth, and had been in the army, but during the last eight years had been employed in Australia on botanising expeditions; he had led a rough life and had had several encounters with the natives. The account

he gave of himself was that on his voyage home, and about a month before admission, he fell down the cabin steps and immediately vomited blood, his abdomen afterwards becoming swollen, black, and tender. When he arrived in London he went to the London Hospital, where he continued to vomit blood. Whilst there he was seized with a pain in the head and lost the use of his left side. On July 15th he walked out of the hospital, slept in a lodging-house that night, and on the following day was proceeding to London Bridge, when he fell and was found by the policeman. This history, together with more minute particulars that he gave after admission, cannot, I think, be relied upon.

He was a very strongly built man with coarse black hair, with a scar over left parietal bone, which was tender on pressure. Tongue protruded straight and no distortion of face; complete inability to move the left arm and leg, and in these limbs, as well as the half of that side of the body, there was total loss of feeling; there was complete hemianæsthesia of the left side and also analgesia. The special senses were also affected. With the left eye he could only see form but no colour. Complete deafness of left ear when a watch was pressed against the skull. With left nostril could not appreciate any odour. Could not taste any substance like quinine, salt, &c., on left side of tongue. He was hypersensitive along the spine. Many of the reflex actions on the left side were absent.

In the evening he had a convulsive fit, breathed stertorously, and threw his right arm and leg about, his tongue became curled up at the back of the mouth, and he seemed in danger of choking had it not been drawn forward.

At night he had another attack, during which the respirations became shallower until they ceased; artificial respiration speedily restored him, when he called out with pain in his head and back. Several times subsequently he was seized with difficult breathing and the tongue was curled up backwards, which apparently would have choked him had not aid been at hand.

On the following day his condition was very strange. At one time he was quiet and natural, but he would then begin rambling and talking nonsense, or would suddenly exclaim in some unmeaning words. A letter was received from the London Hospital, which stated that he was admitted for contused abdomen and hæmatemesis, and that whilst there the paralysis came on with agonising pain in his head. Morphia injections were used, and these he was constantly asking for. When admitted into Guy's morphia was used when the pain was excessive, and for five days he continued much in the same strange excitable state. On the next occasion when the pain came on water was injected by the hypodermic syringe, and he became immediately quiet. At night time the water was again used, and he slept for eight hours.

It was observed that when he was not watched he would read a paper and lie quiet, but when any one came near his bed he would cry out with pain and begin to jerk himself. He was still unable to move the left limb, and was quite unable to feel a test-tube filled with boiling water.

He was being tested by means of various metals applied to the anæsthetic side, when on July 18th he was informed by Dr Steele that the Duchess of Sutherland had been interested in his case, had sent him some money, and wished to see him. In the evening the patient complained of severe pain in the left leg, and when examined he was found to move it. On the following morning he got out of bed and walked up and down the ward by the aid of a chair, but said he could not yet move the arm. On the following day he was allowed to go and see the Duchess.

After this he gradually recovered; sensation had partly returned in his side

on August 11th, that is, it had returned in certain parts and not in others; he could feel better in leg than arm. Hearing returning. Could not read with left eye nor discern colours; no sense of taste or smell. He left on the 17th, being able to walk very well, but the hemianæsthesia partly remaining.

I heard no more of this patient until a religious paper was sent me, which contained an extract from the 'Journal de Lourdes' of October, 1882, giving a further account of our patient. It appears that after leaving London he went to Lille with a return of his paralytic symptoms. Whilst there he joined a pilgrimage to the holy grotto of Lourdes, headed by the Archbishop of Cambrai. In the extract I give below it is said that he was exhibited to the Congress at London. This is not correct; the only member who saw him was Dr Lancereaux, who paid a visit to Guy's with me. I also am ignorant of the operation of trephining. It is seen also that he had a wooden leg besides crutches. Whilst he was in the water and the archbishop and the crowd were standing round he suddenly found the use of his limbs, dispensed with his crutches, and walked up from the grotto. After the narrative of the pilgrimage, the journal gives an account of the sick proceeding to the well, and the archbishop standing up addressing the people. "'Mes frères,' dit il, 'les larmes aux yeux, récitons deux dizaines de chapelet pour nos malades du pélerinage de Cambrai. Comme il finissait, un cri partit des piscines et bientôt après un homme jeune encore sortait chancelant d'emotion et portant dans ses mains deux béquilles desormais inutiles. C'etait Albert Rose de l'hôpital de Lille. Atteint d'hémiplégie et d'hémianæsthésie du côté gauche à la suite d'une opération du trépan mal rèussie, il ne marchait qu' avec deux béquilles et le genou gauche appuyé sur une demi-jambe de bois. Il avait aussi perdu l'usage de l'œil gauche. Les médecins du Congrès-medical de Londres l'avaient declaré incurable. Plongé dans la piscine pendant que la foule priait au dehors avec le saint archevèque, il lui sembla que tout son être *se detraquait;* puis tout à coup sa jambe s'étendit, et son œil gauche s'ouvrit à la lumière. Il etait complétement guèri.'"

On reading this account I wrote to a medical man at Lille, who informed me that the man's case was under investigation, and that he would tell me the result. He knew, so far, that he returned from the Pyrenees to Lille cured of the paralysis, but now had a return of it, and had gone to another hospital. It was admitted that whilst in the first hospital he was not relieved by treatment, for his doctor says: "Il a été traité dans mon service pour des accès épileptiformes et une hémiplégie avec hémianæsthésie. Au sortir de l'hôpital son état n'etait pas notablement amelioré. Il se rendit à Lourdes et fut subitement guèri en présence de plusieurs témoins. A

son retour à Lille le mouvement et la sensibilité etaient revenus. On l'a perdu de vue pendant plusieurs semaines et avant-hier une lettre m'apprenait qu'il etait entré le 6 octobre a l'hôpital de V. présentant les mêmes accidents qu' à Lille, et qu'il cherchait à tromper sur son identité, prétendant que le miraculé de Lourdes est son frère et non point lui."

The following case, which is highly confirmatory of my statement of the functional nature of the complaint, is taken from a French journal. It is a case of hemianæsthesia with no organic lesion.

Case.—M—, æt. 45, journalist, entered La Charité March 27th, 1879, under M. Vulpian. A fortnight before, whilst at work, he fell down with loss of consciuosness. How long he remained so he did not know. When he got up he felt giddy and dragged his left foot when he attempted to walk; his left arm was more feeble than the right, and he could not see well with his left eye. He spoke as usual, and he understood everything. When he arrived home he complained of a pain in his chest and a feeling of stifling, which was relieved by a bandage tied round his chest.

On entering the hospital he walked more feebly with the left leg, and his intellect did not seem very bright; his left arm was weaker than the right. The skin of the left side, including the body and limbs, was totally insensible to touch, pricking, and faradisation. Taste was abolished; salt, sugar, and quinine were not appreciated. Hearing was intact. The sight of the left eye was much confused; the palate insensible. He had irregular choreic movements in the left limbs.

Faradisation was ordered, and in a few days he began to improve. On April 6th sensation was returning in several parts, and the eyesight was improving. Strychnia and iodide were ordered, as well as galvanism. On April 28th sensation was returning in all parts, and on May 11th the patient left the hospital, considering himself well.

M. Vulpian then commented on the case, and gave his diagnosis as one of cerebral hæmorrhage; and, from a consideration of the symptoms, and so many parts being involved, he thought that the seat of the hæmorrhage was in the cerebral peduncle or posterior part of the internal capsule. The recovery he attributed to the absorption of blood and to the new routes found for the passage of impressions.

The patient, after leaving the hospital, became more dissipated in his habits, and was continually inebriated. He died rather suddenly in November, 1880. At the autopsy the brain was examined with the greatest care, and no lesion whatever could be found. "On n'a pas trouvé le moindre foyer d'hémorrhagie ou de ramollissement; soit dans l'écorce grise de cerveau, soit dans les corps opto-striés, soit dans les capsules internes, soit dans les pédoncles cérébraux."

It is very curious how all the cases of hemianæsthesia which are reported and thought to have an organic cause rapidly get well, and pursue a course almost incompatible with the existence of any grave cerebral lesion.

Thus Dr Debove publishes the following case of hemiplegia of motion and sensation cured by application of magnets in less than three hours.

Case.—C. Jules, a tailor, was struck down by an attack of apoplexy. When he recovered his consciousness he found he had lost the power of his left side as well as sensation. He was taken to the Hotel Dieu. It was found that he could only partially move his left leg, so that he could scarcely walk, and his arm he could scarcely move at all. The face and tongue also were slightly drawn. Sensibility was totally abolished, both to touch and pain as well as heat and cold. Taste was also impaired on the left side, as well as smell, and the hearing was also affected. The sight too was impaired as regards colours, all these appearing as black or grey. The diagnosis was cerebral hæmorrhage. Six days after the attack of apoplexy two magnets were applied, one to the middle of the chest and the other on a level with the knee. The patient soon after felt a violent pain in the head, and in two hours' time sensation was returning. In another half hour sensation had returned as well as the functions of all the special senses.

In the author's own words:

22 Mar., 6 heures du soir.—Six jours et demi après l'attaque d'apoplexie, nous constatons de nouveau la persistance des troubles moteurs et sensitifs; la sensibilité générale est toujours abolie du côté gauche, les sensibilités speciales sont toujours aussi profondement atteintes. Puis après ces constatations, nous appliquons au côté gauche deux aimants, l'un au niveau du thorax, l'autre au niveau du genou.

A 6½ heures, le malade ressent dans le côté gauche de la tête principalement une violente douleur.

A 7 heures, la céphalalgie s'est dissipée.

A 8 heures, la sensibilité et la motilité commencent à rénaitre.

A 8½ heures, les aimants sont enlevés, et nous procédons de nouveau à l'examen du malade.

La sensibilité générale est revenue dans tout le domaine précédemment anæsthesié. Les objets sont nettement distingués, les couleurs nettement reconnues; les sensibilités gustative, olfactive, auditive sont également intactes et complètes.

Tout trouble de la motilité a disparu. Le malade marche et même court facilement sans trainer la jambe."

Of course it cannot be denied that there is some spot in the brain, and this probably in the neighbourhood of the thalamus, which, if diseased, would cause impairment of sensation of the other half of the body, but whether this spot can include sensory fibres from the complete half of the body and from the special senses I think is very questionable. At present, we are aware of the fact that patients may have hemiplegia of motion only in connection with disease near the nuclei of the corpus striatum, and that in certain others who have lost sensation the disease is posterior to this, and involves more especially that portion of the brain called the hinder part of the posterior capsule. Beyond this I think at present we cannot venture, or conclude that a simple and perfect hemianæsthesia is dependent on a lesion of this last-named spot. Another question

of great interest has reference to the cure of hemianæsthesia and its *rationale*. The Paris School having witnessed the cure of cases by the application of metals, or by metallotherapia, have formed theories of an electrical nature to account for their results; and, some of its pupils have not only defended their theory, but have felt indignant when other explanations have been proposed. They are certainly wrong in attempting a theory on insufficient or scanty grounds, for the question before us is not one of metallotherapia, but how it can be explained that hemianæsthesia is cured by the application of metals, magnets, metals internally, diapasons, discs of wood, mustard plasters, a sovereign in the pocket (a variety of metallotherapia), trephining, simple neglect, or the miraculous waters of Lourdes. The only answer I can give at present is that various kinds of influences, especially shocks, will arrest the function of the brain or a part of it, and that various kinds of influences, especially shocks, will start it again into action.

APHASIA

I have already stated that in right hemiplegia we have aphasia. This is so important and interesting a symptom that I shall devote a great part of this lecture to the subject.[1] If you go into the wards you will see that loss of speech depends, in the majority of cases, upon three very different causes. First, on disease or disturbance of the whole brain, whereby the perceptive powers and intelligence are destroyed; secondly, upon paralysis of the parts employed in vocalisation; and, thirdly, on a condition in which the patient appears to have forgotten his language or the use of words. It is the latter to which the term aphasia is usually given, and this is associated with a very defined and positive lesion in the brain. It is difficult to define exactly what we mean by aphasia, as all are not agreed as to its exact significance; and, therefore, Dr Hughlings-Jackson (to whom we are greatly indebted for having first drawn attention to its pathology) adopts the term "defect of expression." Others have avoided a strict definition by saying that in aphasia physical expression of thought cannot be rendered intelligible; the voluntary power of using words which express ideas has gone; a portion of brain is always in full activity for the production of outward speech, and this part is damaged. Whatever may be the definition of aphasia the clinical facts are very evident. You will see clearly by examining patients the essential difference between the forms of loss of speech which I have mentioned.

[1] This has been already published in the 'Guy's Hosp. Rep.'

In bulbar paralysis, for example, where the muscles used in speech are paralysed, you will see the patient making a great effort to express himself; he speaks slowly, and the almost unintelligible words appear to come from him with the greatest difficulty. You will also observe in partial paralysis of the facial muscles that the patient speaks like a drunken man, as seen in the general paralysis of the insane; but in aphasia the attempt at utterance is very different. The patient, in his attempt to answer you when you put a question to him, sets up a meaningless gabble; his mouth and lips move quickly, but nothing else than noise results. Without looking at patients belonging to these different classes you would, by their manner of speaking, or attempt at speaking, be able to recognise their peculiar form of malady.

Dr Voisin has delivered a very interesting lecture[1] on the troubles of speech, especially in the general paralysis of the insane, showing the significance of the different modes of utterance. Amongst them he notices stuttering, drawling, hesitation, jabbering, stammering, and quavering. For the perfect faculty of speech, he says, there must be (1) soundness of the cortical substance of the brain, the seat of intellect; (2) of the nervous fibres passing from the cortical substance to the bulb, the conductors of the will; (3) of the bulb and the nuclei of the nerves animating the muscles which are called into play during speech; (4) of the nerves animating these muscles; (5) of the muscles themselves. It is not enough, therefore, that the organ of speech be right, but there must be a sound intellect, as well as a knowledge and memory of words. He says stuttering, hesitation, and drawling, show an embarrassment of speech occasioned by a disturbance of memory, and are often accompanied by a misplacement of words. The seat is in the brain and intellect, and is noticed in general paralysis and other diseases. Stammering, jabbering, and quavering do not result from troubles of the intelligence, but from a want of harmony amongst the muscles, and show a change in the medulla. In cases where speech had thus been interfered with, degenerations had been found in the grey cells of the facial and other nerves. Cases of absolute muteness were due to a degeneration of the muscles of the tongue and pharynx.

It seems pretty certain that aphasia is anatomically due to disease of the third frontal convolution, and, as this lies immediately over the corpus striatum, the reason is clear why these two portions of the brain are so often affected together, and that aphasia so frequently accompanies right hemiplegia; for the middle cerebral artery supplies the corpus striatum and the convolutions over it, and therefore disease of this vessel, or more especially an embolus

[1] 'British Medical Journal,' June 19, 1875.

plugging it, would impair the function of both these parts. This convolution, then, is the organ which we find damaged in aphasia. Whether embolism is more common on the left side of the brain than on the right I could not say without reference to my books. Speech, you may remember, might be accomplished if the patient knew the word to utter, and therefore he can often ejaculate and repeat a word suggested to him.

The clinical facts connected with aphasia have long been observed, but special attention has been given to it since the discovery by Broca of its strict anatomical basis.

Thus, Abercrombie says, "in regard to the paralytic state in general, we may notice that in some cases of palsy there is loss of motion without loss of feeling, in others the feeling is lost also; but in some singular cases on record loss of feeling took place without loss of motion. In one case there was loss of motion on one side, and loss of feeling, without any diminution of motion, on the other. Some interesting phenomena are sometimes presented by the conditions of the mental faculties; one of the most common is a loss of memory of words, and this is sometimes observed to be confined to words of a particular class, as nouns, verbs, or adjectives. The patient is frequently observed to have a distinct idea of things and their relations, as well as of persons, while he is utterly unable to give their names, or to understand them when they are named to him; or there may be a modification of the affection by putting one word or one name of an object in the place of another, and, very singularly, the patient may always apply the name in the same manner."

It is interesting to observe that in the phrenological system of Gall and Spurzheim, the organ of speech was placed in the identical region which has now been discovered by actual demonstration to be its true site. Gall says "the manifestation of verbal language depends on a cerebral organ, and the cerebral organ lies on the posterior part of the superior orbital plate." Many cases are given in the 'Transactions of the Phrenological Society' in support of this doctrine; thus, as long ago as the year 1814, Mr. Nicol, of Inverness, gives an account of a patient who had paralysis, and had lost the power of expression, and in whom after death "about the centre of the inner surface of the anterior lobe the convolutions to the extent of half-a-crown were changed in colour to a light reddish brown, and the corpus striatum had small cysts in it."

Baron Larrey mentions a case where a foil penetrated the eye and injured the anterior lobe of the brain which rests on the orbital plate. After this the patient could no longer fix the proper names to objects, though his perception of their qualities remained

unaffected. He recollected clearly the person, figure, and features of Baron Larrey, but could not recall his name.

There is also related the case of a woman who received a gunshot wound in the orbit, and in two or three days found that she had lost her speech. The nurse said, "I wonder she does not speak, for her tongue is well enough, and when she wants anything she cannot name it, so that we have to bring a number of things to her, and when it is what she wants, she gives a kind of smile."

Dr Osborn, of Dublin, relates a case in 1842, followed by some very interesting remarks, pointing out that the loss of speech is not due to a simple paralysis. He says, "When we reflect upon the number of words in any language and the grammatical inflections, and consider that each of these requires for its pronunciation a certain definite action of the muscular apparatus of the organs of speech, it appears almost impossible that we should recollect all the minute particulars necessary for working the machinery of the vocal apparatus so as to produce such varied effects, and yet all this goes on uninterruptedly. It is the loss of this peculiar art which characterises the affection now before us." I look upon Bouillaud as the first physician who, by a good collection of cases and post-mortem examinations, placed the question as to the seat of aphasia beyond all doubt. In his work on 'Encephalitis,' published in 1825, he propounds the doctrine that the anterior part of the brain is the seat of the organ of articulate language. It is remarkable, however, that he makes no allusion to the side in which the lesion was found. Its positive locality was left for Dax and Broca, and subsequently for Hughlings Jackson, to prove.

In the 'Transaction of the Phrenological Society' for 1882, there is to be found so good an illustration of aphasia, with the symptoms so accurately recorded, that I shall not hesitate to quote it in full.

Mr Alexander Hood, who brought it forward, said he felt sure the man's mind was perfect, although he could not speak, and from this he argued that the brain was not a single organ, and that every part of it was necessary to each mental act; and he quotes from Spurzheim, who had recorded a similar case: "L'homme comprenait tout ce qu'on lui disait, mais il ne pouvait pas trouver la prononciation des mots dont il avait besoin. Si on lui montrait une couleur telle que la verte, et qu'on lui demandait si la couleur était brune, jaune, ou toute autre que verte, il répondait que non; aussitôt qu'on nommait la véritable couleur, il disait qu'oui. Ces phénomènes preuvent que les idées et toutes les fonctions des facultés intérieures doivent être séparées des signes arbi-

traires et qu'elles précédent les signes." Mr Hood's case was as follows:—

CASE.—"R. W—, a blacksmith, æt. 61. On the evening of September 2nd, 1882, in the midst of his family, he suddenly began to speak incoherently, and became quite unintelligible to all those who were about him. The complaint, in the first instance, appeared to be pretty much like delirium or the effects of liquor, with this remarkable difference, however, that the words which were uttered were unconnected with the significations with which they are generally associated. On the morning of the 3rd of September, when I first saw him, he was in bed, and seemed to be somewhat confused, for, though he could speak, no general ideas could be collected from the words which were expressed, as he only rendered himself intelligible by signs. Being apprehensive of apoplexy, as there was some fever present, with a full strong pulse, upwards of ninety beats in the minute, I took fourteen ounces of blood from the arm; but he having become faintish, the wound was bound up and leeches applied to the temples. A brisk purgative was also administered, and towards the evening the skin became cool and the pulse moderate, but the mental affection remained the same, and it was now discovered that *he had forgotten the name of every object in nature.* His recollection of *things* seemed to be unimpaired, but the *names* by which men and things are known were entirely obliterated from his mind, or rather he had lost the faculty by which they are called up at the control of the will. He was by no means inattentive to what was going on, and recognised friends and acquaintances, perhaps, as quickly as on any former occasion; but their names, or even his own or his wife's name, or the names of any of his domestics, appeared to have no place in his recollection.

"Under the serious apprehension that this strange mental affection might probably be the harbinger of death, he was extremely anxious to settle his affairs and make his peace with the world. A gentleman, who had often suggested to him the propriety of making a testamentary settlement, now occurred to his mind, though he could not by any effort call up his name. He laboured with the utmost assiduity more than an hour to make his family understand what he wanted, and ultimately succeeded in directing them to the individual by depicting the number of houses and doors between his own house and that in which his friend resided. Thus directed, some one of the family asked him if it was such a one, naming the person that he wished to see. He seemed to be overjoyed, and signified by various gesticulations that this was the person, and that he was desirous his friend should be brought to him immediately.

"I was afterwards informed by the gentleman that my patient had succeeded completely, by means of signs, hieroglyphics, and a few explanations from one of the family, in making known to him the manner in which he wished his children severally to succeed to the possession of their respective shares of his property. The same evening had been fixed for a committee meeting of a friendly society, of which he was a member; but though he recollected the society, the meeting of the committee, the time and place of meeting, and other circumstances connected with it, yet he had forgotten *all the words* by which these ideas are expressed. He seemed to regret much his inability to attend, and wished to convey this idea to his family, but could make them understand what he referred to only by forming a circle with chairs, and placing one more conspicuous than the rest, indicative of the president's, by which his meaning was at last discovered

"On the morning of the 4th September, much against the wishes of his family, he put on his clothes and went out to the workshop, and when I made my visit he made me to understand, by a variety of signs, that he was perfectly well in every respect with the exception of some slight uneasiness referable to the eyes and eyebrows. I prevailed on him with some difficulty to submit to the reapplication of leeches, and allow a blister to be placed over the left temple. He took also a full dose of calomel and jalap, which operated well, having elicited, besides feculent matter, a copious discharge of bile. From this time he declined all medical treatment, excepting taking occasionally a dose of salts. He was now so well in bodily health that he would not be confined to the house, and his judgment, in so far as I could form an estimate of it, was unimpaired; but his memory for words was so much a blank that the monosyllables of affirmation and negation seemed to be the only two words in the language, the use and signification of which he never entirely forgot. He comprehended distinctly every word which was spoken or addressed to him, and though he had ideas adequate to form a full reply, the words by which these ideas are expressed seemed to have been entirely obliterated from his mind. By way of experiment I would sometimes mention to him the name of a person or thing, his own name, for example, or the name of some one of his domestics, when he would repeat it after me distinctly once or twice, but generally, before he could do so a third time, the word was gone from him as completely as if he had never heard it pronounced. When a person read to him from a book he had no difficulty in perceiving the meaning of the passage, but he could not himself then read, and the reason seemed to be that he had forgotten the elements of written language, viz. the names of the letters of the alphabet. In the course of a short time he became very expert in the use of signs, and his convalescence was marked by his imperceptibly acquiring some general terms, which were with him at first of very extensive and varied application. In the progress of his recovery time and space came both under the general application of *time*. All future events and objects before him were, as he expressed it, 'next time;' but past events and objects behind were designated 'last time.' One day, being asked his age, he made me to understand that he could not tell, but, pointing to his wife, uttered the words 'many times' repeatedly, as much as to say that he had often told her his age. When she said he was sixty he answered in the affirmative, and inquired what 'time' it was, but, as I did not comprehend his meaning distinctly, I mentioned to him the hour of the day, when he soon convinced me that I had not given him the proper answer. I then named the day of the week, which was also unsatisfactory; but upon mentioning the month and day of the month he immediately signified that this was what he wanted to know, in order to answer my question respecting his age. Having succeeded in getting the day of the month, he then pointed out the 'time' or day of the month on which he was born, and thereby gave me to understand that he was sixty years of age and five days or 'times,' as he expressed it."

Mr Hood, who commented upon the case, expressed his belief in the phrenological doctrine, that the organ of language was situated above and behind the eye, and that this man had disease in the anterior lobe of the brain, and probably on the left side, as it was here that he had complained of pain. In a later volume of the 'Transactions' of the Society there is a further account of this case, in which it is said that the patient was subsequently seized

with a fatal apoplexy and paralysis of the right side, when a cavity was found in the anterior part of the left lobe of the brain, in the spot suggested during life, besides a recent clot of blood in its neighbourhood.

In order that you may more fully understand the subject, I will relate to you another case, and then make my comments upon it.

Case.—Elizabeth H—, æt. 24, a domestic servant, admitted July 4th, 1871. A fortnight previously she went to bed perfectly well, but not rising at the usual hour, her room was opened, and she was found, as when admitted, paralysed and speechless. There was no previous history of any illness whatever.

She was a well-grown woman, very pale, and with a vacant expression of countenance. The right arm and leg were completely paralysed, the mouth slightly drawn up towards the left side when she used any muscular effort. She could move her mouth well in eating, and could use her larynx; there appeared some little difficulty in protruding the tongue. There was also considerable loss of sensation in the arm and leg, and some loss of power over sphincters of rectum and bladder. On examination of the heart no bruit could be detected. On speaking to her she appeared to understand all that was said, but could not answer a word. Her mouth moved and she uttered a senseless jabber. She was put on good diet, tonic medicines, and, after a time, faradization to the right side.

In about a fortnight's time her general health was improved, although the paralytic symptoms remained as before, and then I was better enabled to test her knowledge of language. She appeared to understand written and spoken language perfectly; she read books and the newspaper, she received letters from her friends, and on one occasion a telegram; all of which the sister of the ward said she perfectly understood as shown by her actions and gestures, prompting what answers to give. When any object was held before her, and the name demanded, she merely moved her mouth, or uttered an unmeaning sound, but immediately assented by a nod when the correct appellation was given, just as she would shake her head when any wrong name was purposely uttered. At the end of another month the power of the leg slightly returned, so as to enable her to sit up, but the arm remained paralysed, and I waited with expectation to see if, with a slight recovery of the limbs, the speech would also return. There did not, however, appear to be the slighest indication of improvement; at the same time, she seemed as rational as any other person in the ward. The attempt was then made to teach her afresh, and the method, up to the present time, has been eminently successful. A box of letters of the alphabet, with pictures upon them, was brought her, and she was taught in the same manner as a child, or as a person learning a foreign language. On repeating to her several times the name of one of the objects on the cards, she would at length articulate the name herself. On the following day she would say more of them correctly, and forget others, or use the wrong name, just as a child might do. On one of the cards was a picture of an umbrella, and she evidently knew it was a long and tiresome word, and immediately exclaimed "butterfly," but in a moment she shook her head to express her error. A butterfly was on one of the cards, and she had been taught the name. She was also taught to say other words, as "good morning," "Guy's Hospital," and her own name; all of these she would suddenly bring out when I visited her on my rounds, being evidently delighted with her improvement. Although it was true that she could move the muscles of the face, yet every word appeared to be

formed with an effort, as if she never before put her mouth into shape, and much as a stammering person does when trying to give utterance to a word. That an actual difficulty existed was seen in the dissimilarity to the correct sound on the first attempt to speak, although afterwards the words would be properly formed; in fact, if one has observed a child attempting to utter a hard word, and mixing the syllables together or skipping a letter or sound entirely, the exact condition of this woman may be understood. On being told to say "seventeen," the number of her bed, she said "eventeen," but then being requested to make a hissing noise to precede this, she immediately did so, and so produced the correct sound. A very similar performance may be seen going on at any school where the master is endeavouring to teach French; strange grimaces and many feeble attempts are witnessed before the children can say, for example, "Donnez-moi du pain, monsieur." In this way the woman is gradually learning to talk, and, as far as can be ascertained, she has not used a single word which has not been taught her quite recently; she does not appear to have used any expression which might have cropped up from recollection or from any return of memory.

As regards agraphia, the ability to write was rather a difficult faculty to test, seeing that few persons can write at all legibly with the left hand, but I apprehend it is the same faculty which is put on trial when a number of letters of the alphabet are placed before the patient, and she is requested to arrange them into words. I doubt whether this woman would have voluntarily put letters together to form words, for she never attempted to do so; but when told to spell a common word, like "horse," or "cow," she immediately endeavoured to accomplish it, but generally spelt it wrong; there was a tendency for the letters to come right, but they were seldom placed together quite correctly. When wrongly placed she shook her head to express the error, and if the word was made right would accord by a nod.

I should have said that in learning to speak she was not guided by the movements of the mouth or larynx, as are the deaf and dumb, but by the sounds through the ear; this was known by speaking the word we wished her to utter behind her back, when she was found to copy it just as readily as when she saw the face.

The patient was slowly improving, when she was removed to the north of England by her friends.

I relate this case because it presents in a well-marked degree those characteristics which have of late years rendered aphasia so interesting a subject of study. The various forms of the affection have been fully dwelt upon by writers, and distinctions made according to the amount of loss which the faculty of communicating ideas has undergone in different cases. In some there has been a total forgetfulness of words; in other cases words could be written down, but not spoken; whilst in others the exact converse has occurred. The true aphasic condition is seen in the case under consideration, and it is this which is generally supposed to exist when the term aphasia is used. Some writers have spoken of this form as not common; but I should regard it rather as the typical state of what has of late been understood by the term, and it is the exact condition observed in this patient which so perplexed

many of the older medical authors who have described cases of loss of speech. I am referring now to the case where a person understands what is said to him, and apparently appreciates what he reads, but at the same time is unable to express his ideas in words, either spoken or written. Lesser degrees of this aphasic state may be met with, as, for example, where there is not a total inability to speak, but a partial forgetfulness of some words, which, however, if remembered, are sadly disfigured in the attempt to enunciate them or to write them down. Another form is said to occur where the patient can speak, but cannot write, and to this failing the name "agraphia" has been given; whereas, if he can write, but cannot speak, the term "aphemia" would be used. In cases like the one reported, where both the power of speech and writing failed, the term "aphasia" is the one usually adopted. In all these forms the faculty of language is not entirely lost, but only the power of expression, and then the term "ataxic aphasia" has been used in order to distinguish it from "amnesic aphasia," where the memory of words is altogether lost. In the case related by Dr Bristowe, at the Clinical Society, where the patient was taught to speak after he had ceased to be able to do so for some time, the ability to write had never failed, and therefore it was clear that the power of expressing himself in language had not entirely departed, but merely the faculty of knowing how to use the organs of speech. He so quickly regained the use of language that his ataxic condition can scarcely be regarded in so formidable a light as one of true aphasia. In the case, however, which I have related, the power of expression both in writing and speaking was entirely gone, whilst a knowledge of language remained, and it is this kind of case which creates so much interest as regards the question of localising speech in a particular part of the brain, and, indeed, as to the nature of language generally, together with the mental state of that person who has lost the power of communicating his ideas by signs.

Where the power of expression is entirely gone, as in many cases of disease, no explanation of the phenomena is needed, for whether we believe that speech is situated in one spot, or is intimately associated with the working of the whole hemispheres and the entire mental faculties, it is not difficult to comprehend how a severe lesion might deprive a person of speech, so that he should not be able to speak or write, or even know the meaning of words. What his mental condition is under these circumstances may, of course, be very difficult to discover. But the case is altogether different and far more perplexing when he has an appreciation of language, but yet is unable to communicate his ideas by writing or speaking. Here we have an intricate problem, and one which some of the

best minds in the profession have not yet been able satisfactorily to solve.

Drs Broadbent and Kussmaul have quite lately further attempted to elucidate the subject by supposing that some cases of aphasia are not due to a lesion of the speech centre, but to a deeper centre through which auditory impressions pass to the more active one in the anterior convolution, where words are put into shape. If the auditory centre, which takes cognisance of the impressions which are brought from the auditory nerve, is at fault, or the fibres passing from this to the speech centre or Broca's convolution, then there would be no intellectual appreciation of sound, and the patient would be language-deaf, although he could hear sound. In the same way, if the eye were perfect but some visual perceptive part behind it were affected, there could be no appreciation of the things seen. In this way we may have an explanation of those cases where the patient's senses are perfect, but they do not see with their eyes nor understand with their ears. They are styled by Kussmaul *surditas verbalis* and *cæcitas verbalis*, and by the French *la cæcité et la surdité des mots*. In the case of deafness for words, the patient hears but does not comprehend the significance of a single word, although the intellect seems entire; and at the same time he will read to understand, and even write correctly. He will take a book and read with clear articulation, but at the same time will not understand a word that is said to him. In the case of word-blindness, the patient sees the letters but cannot call them by their true names. He may even write to dictation, and then be unable to read what he has written. Such cases as these are occasionally met with, and they are accounted for, as I have just now said, by the existence of some lesion between the visual and auditory perceptive centres and that for ordinary verbal expression. The ordinary "amnesic aphasia" is due, it is supposed, to simple lesion of Broca's convolution.

The difficulties of explanations of simple aphasia are in some measure removed and the way made more clear when we attempt to analyse the faculty of language. For its production three, if not four, different processes are employed. First, the mind is impressed with ideas through the eye by means of written signs; that is, impressions formed on the retina pass through their own perceptive centres (to adopt Dr Bastian's expression) to the cerebral hemispheres, where they are further developed or compounded with other perceptions. Secondly, impressions made on the ear by sounds are carried through the auditory perceptive centres, also to the hemispheres. Now, these signs conveyed by the eye and ear have nothing in common; there can be no connection between the letters which spell,

for example, the word "field" written on paper, and the sound which we attach to this word; the association in our mind is one of our own constructing, and a perfectly arbitrary one. We are compelled to this association from our earliest infancy after the following manner:—When a child is shown a certain word in his book, a certain sound is made to represent it, and thus the visual impression and the auditory impression become intimately blended in his mind. In all probability a picture of the object (say a dog) is shown to the child, to which these visual and auditory signs are always to be attached; but this is not all, for the sound made by the master is to be imitated by the child until the latter can use its organs of speech in a particular way when the said object is presented to him. The whole complex faculty of language is thus taught through signs by the ear, by the eye, and by the organs of speech, together with a representation of the object itself. One would naturally ask what idea of language would exist if it had been taught by means of one or more of these processes, and I think we may get some answer to the question. Let any one who has acquired a knowledge of a language by means of a dictionary ask himself if he need have the slightest comprehension of it when spoken; not having acquired it through the ear, it would be, under these circumstances, quite without meaning to him. Thus the common remark made by many persons, that they can read French or German, but cannot speak those languages, is, of course, true, for they have never tried. The processes of learning through the eye and through the ear are, in fact, totally distinct, although by education we may have intimately blended them together. Then, again, when we speak, we are employing a third faculty; we are not then gaining ideas through the ear or eye, but we are communicating ideas to another person through a totally different channel. If a child were taught the name of an object by a visual or auditory sign, and that child did not learn to make the customary sound which belongs to it, he would understand language by reading or hearing, but he could not speak it. He might gain ideas through the eye or through the ear, but he must learn to transmit them through the brain to the vocal organs in order to communicate them. In illustration is the following. A little boy, the son of French parents, born in England and going to the town school, speaks English like other boys, but at home the conversation is carried on by his parents in French. They speak to the boy in French, and he readily obeys all that is demanded of him, so that there is every reason to believe that he understands the language perfectly; but up to the present time he has never

been known to utter a single syllable of it. He cannot yet read easily, and, therefore, what information he might obtain from books I cannot say. Here is a case of partial education which much resembles that of our aphasic patient. We might illustrate this, although somewhat imperfectly, by the following:—An engine driver has learned the meaning of certain signals, so that he could explain their object to another person, but it does not follow that he could take the signalman's place. He might know that for a certain purpose a certain sign was to be shown, and the instrument for making the signals might be perfect in its working; but he would be quite helpless, because he had not been taught how to use it. He would be much in the position of the French child just mentioned, who understood the language, but could not use it. If he had once learned the use of the signal instrument, and then forgotten it, he would rather resemble our aphasic patient. The man who sits in a tunnel and works his instruments without being able to see the effect on the distant signals is like the deaf and dumb child who has learned to talk by imitating the movements of the mouth of another person, but who hears no sound. Or you can imagine a piece of machinery made for some special object, such as turning, planing, or boring; a motive force alone would not produce the result, but a complex apparatus must intervene to convert the original power into the end desired. In like manner, between the brain proper and the vocal apparatus there is a portion of brain where the ideas are put into form necessary to operate on the larynx.

That this compound of language, made up of spoken, auditory, and visual signs, may be thoroughly broken up, we see to a limited extent in every-day life. For example, a considerable amount of attention, and expenditure of vis nervosa are required in continuous speaking; therefore, in an exhausted state of the nervous system, this faculty may be virtually paralysed. Let a person be prostrated from want of food or over-exertion; he cannot talk, he forgets what he wants to say, he uses one word for another, but he does not forget the meaning of words which are spoken to him or which he may read. Even under ordinary circumstances, in perfect health, we may lose the memory of words, and are for the time exactly like our aphasic patients; we cannot speak them nor write them, but we recognise them when written or spoken, or if a long list of names be given we immediately assent when the right one is arrived at.

It has long been discussed, what amount of intelligence can exist without language; the opinion being that the cultivation of the mind and the perfection of language are coextensive. Take,

for example, the small vocabulary of words found in savage nations compared with the vast number of words used by civilised people, to say nothing of their wonderful inflections as seen in the tenses of the Greeks. This opinion implies that every idea necessitates the conjuring up of its appropriate sign in language, and, therefore, probably cannot exist without it. A very prevalent opinion is, that when we are thinking we are really mentally speaking, and the fact that some persons not having sufficient control over themselves do think aloud tends to corroborate the opinion. If we remember, however, that language is a complex faculty, and acquired by different processes, we shall see that although it may be true that, in thinking, we must conjure up an appropriate sign, it does not follow that this is by mental or imaginary speech; and herein we may, perhaps, find a clue towards a solution of some of the difficulties met with in our aphasic patients. If a person can speak a language fluently, and is recalling to his mind some sentiment heard in conversation, he is no doubt thinking of words as they are uttered; but if he had never learned to speak the language, and had acquired it only by reading, that person would, when recalling the sentiment to memory, have before his mental vision a particular page of a book with a certain line towards the top or bottom. It seems, therefore, almost true of necessity that a person may know a language and cannot speak it, just as another person may understand it when spoken who cannot read or write it. One person does not know language by sight because he has not seen it in print; another does not know it by ear because he has never heard it pronounced, and a third cannot converse in it because he has not learned how. Then, again, if it be true that in thinking we must have a mental object before us, it does not follow that it must take the form of language, for I suppose the child may think of the picture of the dog in its lesson book without necessarily attaching to it any spoken, auditory, or visual sign, and I apprehend that the child could then go on to think about various actions of the dog, as running, eating, &c., without the idea of words or any artificial signs. One boy in school, in thinking over his proposition of Euclid, will have the figure in his mind's eye, and so go through the proof, whilst another who has learnt it by heart will be impressed by the letters, and these he will repeat. I apprehend that in this way two totally different methods have been adopted in learning the problem. If the boy, again, is working an equation in his head, and mentally says $a^2 + b^2$, he may be silently articulating the letters, but not necessarily so, for if he has not been in the habit of doing his sums aloud, it is probable that the mere mental vision of them is sufficient for the operation. If

this be true, it shows that the idea may take the form in which it has been acquired. In the case of the little boy who understood French, but had never spoken it, we should consider that if he were thinking or dreaming of his mother, he would not conjure up language by any imaginary movement of the vocal organs, since he had never used them for the purpose nor by the mind's eye, but simply think of her words as they had impressed him through the ear. It follows then, that even if it be true that we have no thoughts without some corresponding remembered sign, this need not be a spoken sign, for in our aphasic patient in whom speech was lost, the remembrance of a spoken or written word still remained. There may be, therefore, different interpretations put upon the meaning of such an expression as the following, used by a person who has gone to reside abroad :—"I soon learned to speak the language, and after a time to think in it;" or as a foreigner in England will say, "I have never been so familiarised with your language as to be able to think in any other than my native German."

But, as before said, even without language, pictures of objects may be brought before the mind's eye, and thus mental operations may still proceed. How is it with the deaf and dumb? It is said they think with their fingers, since they are seen to move them in their dreams. Or how with the blind who have learned to read with various kinds of raised letters, but without speaking aloud? For the same reason as with the deaf and dumb, their fingers should be seen passing over imaginary embossed books. How is it with animals who are said to dream? They probably do no more than picture to themselves a series of dissolving views, accompanied by the music of familiar sounds. Probably, little more is going on in the human being when he is in a state of reverie, or in the mind of the ploughboy, who whistles as he goes for want of thought. Most persons will state that they cannot accurately think out a subject without speaking or writing, showing that the ideas must have expression in form. What condition the mind of the truly "amnesic" patient is in is very difficult to know; but if in ordinary life most persons' thoughts are not worth much unless put in consecutive form by means of spoken or written language, it would follow that the mind of man without language would be a blank. It could scarcely be this, however, for with mental vision of objects before him, together with remembered sounds and odours, he would be as well off as the dog. Whether really any deeper intellectual processes can go on without language is very difficult to ascertain. It is possible that some obscure, dreamy, and pleasurable condition may exist without any consecutive current of thought passing through the brain, and, indeed, nearly every poet speaks of abstracted states of this sort.

Wordsworth might often have been in this state. In speaking of the 'Wanderer,' he says:

"Sound needed none,
Nor any voice of joy; his spirit drank
The spectacle; sensation, soul, and form
All melted into him; they swallowed up
His animal being; in them did he live,
And by them did he live: they were his life,
Thought was not; in enjoyment it expired."

The American poet Poe says of himself:

"Not long ago the writer of these lines,
In the mad pride of intellectuality
Maintained the power of words, denied that ever
A thought arose within the human brain
Beyond the utterance of the human tongue."

And then he goes on to say how untrue this is, for he is the subject of—

"Unthought-like thoughts that are the souls of thought,
Richer, far wilder, far diviner visions
Than even the seraph harper, Israfel,
Could hope to utter."

"I cannot write—I cannot speak or think—
Alas! I cannot feel, for 'tis not feeling
This standing motionless upon the golden
Threshold of the wide-open gate of dreams,
Gazing entranced adown the gorgeous vista."

The question is a very interesting one, but I should not have dwelt upon it had it not a practical bearing. We are sometimes consulted by lawyers as to the intelligence of patients with regard to the disposal of their property when in the aphasic state. There are some writers who maintain that you cannot separate entirely the office of speech from the thinking process which suggests it, that the workings of the brain can never assume a definite shape without the use of signs or words, and that our mind can never at any time undergo the process of thinking without certain definite terms already made appropriate to the thoughts coming before the mental vision, or without the larynx and muscles of vocalisation passing, in the imagination, through a kind of inarticulate speech. "Names are impressions of sense, and as such take the strongest hold of the mind, and, of all other impressions, can be most easily recollected and retained in view. They therefore serve to give a point of attachment to all the more volatile objects of thought and feeling. Impressions that when past might be dissipated for ever are by their connection with language always within reach.

Thoughts of themselves are perpetually slipping out of the field of immediate mental vision, but the name abides with us, and the utterance of it restores them in a moment. Words are the custodians of every product of the mind less impressive than themselves. All extensions of human knowledge, all new generalisations, are fixed and spread, even unintentially, by the use of words."

Dr H. Jackson, who has given considerable attention to the subject, is inclined to the opinion that loss of speech is a mental as well as a bodily symptom; for, he says, we speak not only to tell other people what we think, but to tell ourselves what we think, and a proposition is not only the ending of a mental operation, but the beginning of another.

Professor Sayce also says thought precedes language, which represents our ideas, and not until we have clothed our thoughts have we truly got them. They must be in a definite shape for further thinking. Thought creates language, but in its turn language creates thought. Speech is necessary for conversation, but also for the intellectual development of man himself. For ideas to be kept in the mind they must be imagined or pictured there. Without thought there is no language, but equally without language there is no thought, in the true sense of the word. Those must admit the force of this who have found how difficult it has been to map out clearly any subject of thought until they have sat down and begun to put their ideas on paper, when the whole matter has gradually unfolded itself before them.

Dr Jackson has also clearly shown that the simple utterance of a word may not be expressive of any idea, and thus it happens that aphasic patients will frequently ejaculate monosyllables, and this at a time when they are thought to be speechless. They may use words, he says, but cannot propositionise. He was impressed by this some years ago by the fact of a patient in the next bed to a sufferer from aphasia informing the doctor that he believed his neighbour was an impostor, for he had heard him swear. Whereupon Dr Jackson showed convincingly that the mere exclamation, as in uttering an oath, is not using language as an intellectual operation in the manner already described, and as a system of signs corresponding to ideas, but a mere emotional or automatic action, and thus affords an additional proof that the organs of vocalisation are not at fault in aphasia. He further showed how his clinical observations corroborated the statements of Horne Tooke and other writers, that swearing is not an intellectual process, but exhibits merely a state of feeling. A man who swears much shows an exuberant amount of sentiment, but detracts so much from the real force of his language. Dr Jackson relates the case of a patient

who attempted to write with his left hand, and, when given a slate and pencil, wrote all over the former the word "damn."

These observations tend to throw light upon those very painful cases which we sometimes have to witness, where old and bed-ridden persons, whose minds have gone to decay, distress their friends by their repeated exclamations in oaths. Persons who have led the strictest and most pious lives, who have never been heard to swear in the whole course of their existence, will now adopt the most horrible expressions. This simply means that the intellectual part of the nervous system has gone, while some of the emotional remains, and thus, without a thought, such expressions as "Oh, dear!" "Good God!" and so on to the foulest words in the category of oaths, may be uttered. I have seen an old man in this state who could use the most sanguinary and condemnatory expressions, but could not utter a syllable for any intellectual purpose.

There are some great authorities who regard the faculty of speech as the great characteristic of man, especially belonging to him as an instinct. The physiologist is not, however, content with this bare assumption, but is endeavouring to discover the meaning and origin of language Hobbes' definition of language, according to Mill, is unexceptionable: "A name is a word taken at pleasure to serve for a mark which may raise in our mind a thought like to some other thought we had before, and which being pronounced to others may be to them a sign of what thought the speaker had before in his mind." Professor Whitney says thought may be regarded as an act of the mind, but every word is an act of the body, and of the body only, performed under the direction of the mind, but not different in kind than beckoning with the fingers, brandishing of an arm, or kicks with the foot. The apparatus of thought has no more immediate connection with the muscles of utterance than with those of facial expression or of gesture. Talking is just as much thought as dancing is, and not one whit more. He thinks that language might begin as a cry or a growl, just as an animal makes when pleased or displeased, and men also make use not only of words, but grimaces, gestures, postures, &c. Captain Burton says there is a tribe in North America who possess such a scanty vocabulary that they can hardly converse with one another in the dark. Professor Key holds much the same view, and looks upon language as only the mode by which thoughts are conveyed from one person to another; and considers that this might be done through other senses. The voice and ear are used in oral language, but there is a visible language in writing and hieroglyphics.

Some of the best known writers on language have failed to see this, and also that language is not commensurate with speech, but something much more complex. The written signs being arbitrary must, no doubt, have been invented last, so it only remains to inquire whether the spoken names applied to objects arose from an intuitive feeling of correspondence between the ejaculation and the object, or whether these were mere imitations of natural sounds. The first theory implies that, in accordance with some intuitive mental perception, there would be some natural cry indicative of fear, anger, or love. This has been styled the interjectional or "pooh-pooh" theory. If, on the other hand, language has been acquired, not from within, but from without, and is a mere copy of sounds, the theory has been called the imitative or "bow-wow" theory. If the idea be carried still further, and it be supposed that every object in motion produces a sound (as the "scratch" of a pen upon paper), we have what has been called the "ding-dong" theory. I should think that physiologists would incline to the theory called ironically the "bow-wow" theory.[1]

This consideration of the nature of our present language, that it is a mental production formed by several processes, enables us to separate these analytically, and to perceive how one of the parts may fail whilst others remain intact. If language be regarded as a simple faculty bound up with thought, it is difficult to understand how a knowledge of it can exist, and at the same time be forgotten; but if it be looked upon as a complex process, we can see how words can be intelligently perceived through the ear or eye, and yet cannot be spoken by the tongue; the organs of speech, notwithstanding, being all the while intact.

As there are direct channels from the senses to the cerebral centres, by which impressions become converted into ideas, the one leading inwards from the gateway of the ear, and another from the gateway of the eye, so it may be presumed that there is a third, which leads outwards from the brain, for the purposes of spoken thought; or, as there is an auditory perceptive centre and a visual centre, by means of which sensations are carried to the hemispheres to be converted into ideas and where the various mental processes are performed, so between the intelligence and the vocal organs we may presumably suppose there is a centre intimately associated with the production of speech. For the same reason as when a portion of brain is injured and vision lost, yet the eye itself is not affected nor the intelligence dimmed, so we might suppose an injury to another part of the brain and the power of speech lost, whilst the vocal organs and the mind still remained

[1] See "History of my Parrot," 'Journal of Mental Science,' July, 1879.

entire. If the up line can be damaged or cut, so can the down line. That there should be a portion of the brain whose especial duty it is to rule over speech, seems less remarkable when we remember that the tendency of physiological opinion of the present day is to map out the cerebro-spinal centres for various and distinct purposes, and to believe that the different complex movements of the body are prearranged and regulated by certain dominant points, either for respiration, speech, or motions of the limbs; and, moreover, that influences pass by special channels from the cerebral hemispheres to these points. It is clear, in the case of aphasia, that some powerfully presiding influence over the organs of speech has been lost, for not only is the remembrance of words gone, but the organs themselves, without being paralysed, appear to have quite lost their habit of accommodating themselves for talking.

That the loss of speech is mainly physical, and not intellectual, is shown by the case of a girl who, after recovering from scarlatina, became aphasic, so that she could not say a single word, nor attempt to read; but she sat down to the piano and played the various old tunes which she had learned before her illness.

Considerations of this kind on the analysis of speech and the compound office of the brain tend to elucidate some of the difficulties presented by such a case as that I have related. But there are still further points of interest in this case not yet alluded to, and one is the reacquisition of language after it had been lost. I have no doubt the usual tacit explanation in such a case has been —that language has returned with recovery of the injured brain; but before this can be satisfactorily determined some more rigid observations are required to show if the facts answer to the explanation. In bringing to my recollection several cases of right hemiplegia with aphasia, where there was no recovery of the limb, the speech also appeared to be irretrievably gone, and I know more than one case where patients, under these circumstances, remain absolutely dumb. I have just now under my care a sailor who was the subject of this affection seventeen years ago; he partially recovered so as to be able to resume his employment, but his speech even now is most imperfect. In the case under discussion the woman recovered in part the use of her leg, but not at all that of her arm, and at the same time there was not the slightest appearance of the return of speech. The few words she was acquainted with at the time of her leaving the hospital she had altogether newly acquired, and there seemed no reason why she should not have learned as much French, or any other foreign language, in the same space of time. It becomes, then, a question whether

this fact be not an argument in favour of the theory that speech is located on one side of the brain, and that, when language is relearned, the other side is being educated for the purpose; in fact, whether the same process is not going on with language as with the left hand when it is learning to write and do what the paralysed one has been accustomed to. If after a violent concussion all idea of language were knocked out of the brain, no argument could be founded upon the recovery of it; but when the mind is entire, language understood, and yet the power of speech gone because one part of the brain is damaged, it seems to follow that if language again return it must come by re-education, and what more likely than that the part corresponding to the damaged one should be the seat of the training—that this should take up the lost function of its fellow-convolution? If speech were originally learned in a special way, it must be regained by the same method.

Believing as I do that the aphasic state is intimately associated with destruction of a convolution on the under surface of the left anterior lobe of the brain, as stated by Bouillaud, Broca, and Jackson, I have come to consider that the reacquisition of language by an aphasic patient is an additional fact in confirmation of it. I may say that I have always expressed my adhesion to the theory first propounded by my colleague, Dr Moxon, in explanation of the localisation of the organ of speech on one side; that it is entirely owing to the education of the two different sides of the brain, as this affords, to my mind, a far more probable explanation than any other. Those who for a moment have rejected the idea of the lateral localisation of speech as *primâ facie* untenable, or even absurd, have not, probably, considered that the two hemispheres must have different functions, and that these have been produced mainly by education. When they see this, the difficulties regarding a local organ of speech will be much lessened. I do not refer to personal education only, but to a long usage of one hemisphere through many generations, for all observers are agreed that the left hemisphere is larger than the right; Dr Bastian asserts that the left posterior lobe projects slightly further back than the right; and Broca, that the convolutions of the left hemisphere are more complex.

We, believe, for example, that the cerebral hemispheres stimulate the large ganglia lying below them to move the limbs at the time when we will to do so, and we know that if the ganglia on one side are diseased, the limbs are also paralysed; the will is good to move them, but the line is cut. The brain as the seat of will remains healthy as before, but it has no influence over the weakened limbs; whence it follows that these central ganglia rule the limbs

and prompt their action on one side only. Then comes the question, when an arm is educated for any particular movement, as, for example, in playing a musical instrument, what is intended by the term education? or rather, what part of the body is educated or trained? Is it the muscle or nerve of the arm, or is it the brain which rules over them? I think there can be but one answer to this, that it is the nerve centre which is educated; whence it follows that just as the two arms are trained to different movements, as the one to handle the bow, and the other the strings of the violin, so must the two sides of the brain have been educated to regulate their action. Since the two hands cannot be interchanged in playing, it shows that each side of the brain must have been specially educated for their particular movements. They have thus become physiologically different. At birth the two sides were alike, or only so far different as hereditary transmission had made them, but they have soon become functionally unlike; they may be employed equally in larger operations, but in matters of detail each is performing its own work. Let us suppose the case of a person who communicated his thoughts by certain movements of his right hand instead of by his larynx, and these movements were called speech; it would follow that if he were struck with hemiplegia, speech would be lost from disease of one side of the brain. It is true that such a case is not identical with that of aphasia, since the organ which we suppose to be employed in communicating ideas is paralysed; but they may, nevertheless, be conveniently compared, for if what we understand by language is associated with the operations of the whole of the brain, how is it that the left hand is not ready to take the place of the right. The case shows this, that it is possible to have educated a part of the body for the purpose of communicating ideas, and that one side of the brain becoming diseased the art which has been acquired is lost. Such a case is not identical with that of aphasia, and no case exactly like it can be imagined, so it must stand alone; but it shows how easy it might be for some equivalent of speech to be destroyed through a softening of one side of the brain, and that always on the same side. A conception of this kind tends to make the lateral localisation of speech less remarkable than might appear on first consideration. The reason why the left hand did not immediately follow the dictates of the mind was simply because, being uneducated, it was unable to do so. It is thought by some most unlikely (and I agree with them) that language should reside in one spot of the brain, seeing that it is associated with every faculty of the mind; it can reside in no special place, seeing that it is everywhere; but in most cases of aphasia, as in the one reported

language is not lost, but only the faculty of speech. Now, if this language were expressed through the right hand, and the left side of the brain were diseased, we should undoubtedly have an instance of loss of speech from a local lesion. The loss would be of a different kind, it is true, but we should, nevertheless, be familiar with the fact that disease of one side of the brain would prevent the ordinary intercommunication between people. We should also find that so far from language being gone, the other arm could soon be educated for the purpose. Take, again, the case of music; this is intimately associated with the higher operations of the intellect, so that a genius will clothe some of his subtlest thoughts in the harmonies of his own creation; these he expresses in part through the left side of his brain when he produces them with his bow in the right hand: let a clot of blood form in the brain, and the power of performance is gone. Though every faculty of his mind, though his whole soul be imbued and penetrated with music, we know that the concord of sweet sounds came through the small channel of the ear, and therefore it is not remarkable that it should flow out in its turn through a channel of equally small dimensions. So ordinary language, gained from impressions which have passed by the narrow inlets of eye and ear, becomes intimately associated with all the operations of the mind, and yet must again be concentrated towards one spot in order to make its exit in the shape of winged words.

The difference between the case of aphasia and that of hemiplegia, just mentioned, is, that in the latter case the organ is paralysed; but if we suppose that some spot in the brain which lies in mid-channel between the brain proper and the nerve-centres of speech is affected, a somewhat similar result would ensue. This leaves only the final difficulty that the organs of speech are double, composed of structures belonging to both sides of the body, and therefore not acted on by one side of the brain only. This difficulty may, perhaps, be overcome by having recourse to the theory of Dr Broadbent, who shows that although the nerve-centres which rule over the limbs are separate, yet those which regulate the body act in unison; they are cemented together, and are both affected by the same stimulus, so that if one channel of motor power be destroyed, the other will transmit an influence to the common centre, and thus no paralysis will occur. He thus explains why in hemiplegia there is no paralysis of one side of the abdomen or chest. Although I believe his theory to be sound, I do not know why, in the case of hemiplegia, it should be assumed that half paralysis of the body would occur as the necessary consequence of disease of the central ganglia, did not the law just mentioned come in to prevent. I am

not sure that it is necessary to assume the dependence of half of the body on these ganglia, seeing that it is not wholly paralysed when they are diseased. For if we acquire a knowledge of the function of a centre by the amount of paralysis which its destruction causes, we have only a right to say that disease of the central ganglia causes paralysis of the arm and the leg together, with the ninth and lower portion of the seventh nerves. But as regards speech, the theory of Dr Broadbent would explain how the larynx could be stimulated to action, should its nerve-centres receive an influence from one side of the brain only. Seeing that the larynx, though having a double set of nerves, is a single organ, it is most probable that a stimulus acting on one nerve-centre would be sufficient to cause its movements. Seeing, again, that nearly all the voluntary movements of the body do take place through the sole action of one side or the other of the brain, it is not unlikely that the side which is most active is that which should rule over the organs of speech. The fact of several cases of left-handed men having been recorded who, when paralysed, did not become aphasic, tends to corroborate this view. But lately there was a patient under the care of Dr Pavy who had left hemiplegia and aphasia due to a gliomatous tumour growing in the frontal lobe, and extending to the frontal convolutions. It was ascertained during the life of the patient, and confirmed by his wife, that the man was left-handed. In any double piece of mechanism of man's contrivance in which the two portions had to be worked in perfect unison, it would be almost impossible te attain this end if each half were regulated by a separate machinery. In the case of the larynx, which must move as a whole, although the stimulus to harmonious movement is acting through separate nerves on the several parts of each side, it would almost of necessity follow that the centres whence these nerves proceed must be intimately united, and, if so, an impulse falling upon them from one side of the brain would be amply sufficient for their excitation. If this were so, and the larynx had to be trained to any special use, it is most likely that one side of the brain would alone be employed for the purpose, and thus, if this were diseased, although the organ could be stimulated to simple movement by the other side, that all the modulations necessary for speech could not be accomplished.

Simple Aphasia.—I have already explained to you the reason why aphasia so often accompanies right hemiplegia; it is that the same blood-vessel supplies the corpus striatum and Broca's convolution over it, and therefore the probabilities are in favour of the same lesion involving both organs. This association, however, does not always occur; and therefore, just as you may sometimes meet

with hemiplegia without aphasia, so you may sometimes have aphasia without paralysis. This may arise in some instances from actual lesion of the convolution; in others from a mere temporary abeyance of its function in common with a similar loss in other portions of the brain. It is, therefore, met with after typhoid fever and other severe illnesses, which may affect the integrity of all the organs of the body. One may see, indeed, how in a weakened brain loss of speech or power of utterance may be the predominant nervous symptom. It is a faculty which is soon lost, and the first to depart after an exhaustive disease. We may all of us understand this by remembering the condition of a man who is exhausted from fatigue; how his intelligence might in no way be affected, since he might understand all interrogatories, and could read what was put before him, and yet be scarcely able to utter a word, or, if he did so, the word might be wrongly placed, and he would, in all probability, be altogether forgetful of proper names. You will see that some effort is required to speak, to collect the thoughts, as we say; whilst little or no exertion is wanted to understand what is said by another. It is not, therefore, difficult to see how loss of words or language occurs after a severe fever. In some cases, I have no doubt, there is an actual tangible cause for it in the brain, and of the same kind which occurs in other organs, but made more manifest because situated in a highly specialised part. For example in some forms of blood-poisoning and embolisms there has been reason to think that some of the smaller vessels have become plugged; but no effects might be manifested if the obstruction were in any other part of the hemispheres than the anterior portion, and then aphasia would be evident. In cases of epilepsy, where one side of the brain is especially implicated in the "discharge," and the other side of the body convulsed and temporarily weakened, a brief aphasia is likely to occur.

I need not detail to you instances of temporary aphasia which follow febrile disorders, but draw your attention to those comparatively rare cases in which it occurs as a primary affection, and is probably due to a slight hæmorrhage, or a lesion of the same nature as takes place in other parts of the nervous centres. It is important to recognise it, because the case is not so easy to diagnose as you might suppose. It is easy enough to make out aphasic symptoms when the patient is lying in bed before us, and we have time to analyse the case, but let a person be suddenly struck speechless, his strange condition will soon become evident to bystanders, but what may have happened to him is very difficult for them to say.

Case.—I will give you an example in the case of a man who was lately brought

to the hospital by the police from the railway station; whilst about to start for his destination he suddenly felt strange sensations, and was unable to express himself; when spoken to he could not give any account of himself, and was brought in here. He walked into the ward and was put to bed, he looked confused, and could only say a few words which meant nothing. His gabbling noise and his manner generally were so strange that it was thought his mind was deranged, and the nurses were ordered to keep a strict watch over him. On the following day, when I saw him, and carefully went into the case, it was clear that all his actions were those of a sane man, and that he simply had aphasia. He rapidly improved, his speech returned, and in a few days he was able to give a rational account of himself. He said he had never lost his reason for a moment, he knew everything which happened at the railway station, he knew where he wanted to go, but could not remember the place, nor indeed find words for his own name or address. He might have shown some exasperation at being regarded as mad. To use his own words, he said "he could think well within himself, but he could not say it." He soon left almost recovered, and after repeated conversations with him as to every particular of the attack, I could make out no other symptom than that of aphasia.

Case.—A medical man informs me that on three or four occasions he has suddenly become aphasic, and he has not quite recovered for some days. On all the occasions he has had numbness and a strange feeling in the right arm. It is clear that whatever has disturbed the equilibrium of the convolution has also troubled the corpus striatum, and the case may have been a form of epilepsy.

I was once called to a hotel near my house to see a gentleman who had become perfectly aphasic, and at the same time agraphic. He walked about the room, seemed perfectly intelligent, and made significant gestures, but only jabbered when he attempted to talk, and scribbled when he tried to write.

As another proof that the functions of the brain are localised, and that aphasia is due to lesion of a particular spot of the brain, I might mention cases of injury to the organ. A case ready at hand I will read from the journals as occurring at St Bartholomew's Hospital. A boy, æt. 6, had a heavy piece of wood fall on his head, towards the front and left side, making a wound and exposing the bone. He had feverish symptoms for six days, when he was seized with paralysis of the right arm. A piece of fractured bone was removed by Mr. Smith and pus escaped. He remained paralysed, and was quite unable to say a single word; he only made noises when spoken to. He continued in this state for a week or two, when the power began to return in the limb, and at the same time the power of speech came back. He then rapidly recovered, and left at the end of two months, the arm only slightly weaker than the other; his speech had quite returned; he was very irritable, and swore with great volubility.

Simple Dumbness or Mutism in Children.—You will be frequently consulted about children who cannot speak, and you will often find

that the difficulty is purely a mental condition; that the children are in fact idiotic. More rarely you will be asked about children who are speechless and yet perfectly intelligent. In these cases speech is acquired slowly, although I cannot say that this has been so in all my cases, as I have, unfortunately, not been able to follow them out.

A little girl, æt. 4, who has never spoken, has fits, and therefore, in her case, there may be some actual lesion of the brain present. She is, however, perfectly intelligent in every particular; she obeys all that is said to her by her parents, plays with her brothers and sisters, and shows no peculiarities whatever.

A little boy, nearly 4 years of age, has never spoken. He is well grown, shows no peculiarity in his formation, is perfectly intelligent, takes a watch, puts it to his ear, examines it, and in every respect appears as sharp as other children.

A boy, æt. 8, I have been consulted about who has never spoken; his hearing is perfect, and in every way he is as intelligent as other children.

A little boy, æt. 6, was brought to me because he had never spoken. He was well grown, with a well-proportioned head, and intelligent looking. He understood everything that was said, and did all that was told him. He could make noises, but no intelligible sound.

I am under the impression that in all these cases speech will eventually come, but it is remarkable that so long a time should be required to rouse the governing organs of speech into activity. I apprehend they are merely dormant, much in the same way as those of the little French boy just mentioned, who, being born in England, talked English well with other boys; at the same time he had never expressed himself in French, although he understood perfectly what his parents said to him in that language. It is not uncommon for hysterical women to remain speechless for a long time, as if the volitionary effort could not be roused to stimulate the organs, and maniacs will sometimes remain absolutely silent for years.

A friend of mind, Mr Frank Campbell, has ingeniously suggested in such cases that one of the parents might have been left-handed. He has remarked that, whatever may be the cause of right-handedness, it has become in part a matter of hereditary descent, but that where one of the parents has been left-handed the children have not so readily adopted the usual custom; their brain has shown no proclivity to action on either side. If in the same way speech belongs to one side rather than the other by the long-continued education of the same side which rules over the hand,

a similar perplexity would arise in the speech convolutions of the child who came of right and left-handed parents.

APOPLEXY

What do we mean by the term apoplexy? I am sorry to say that I am much in the same difficulty as I am with some other terms in use, scarcely able to define it, for the simple reason that the expression has had a different value at various times, the probabilities being that it is used in a very different sense nowadays from what it was fifty years ago. Then the term apoplexy was applied in its more strict signification to a malady characterised by certain symptoms; of late years it has been used to denote a particular pathological condition. Then it was applied to the case of a person falling in a fit; now to a hæmorrhage in the brain.

The word ἀποπλήσσω referred of course to the fact of a person being struck down, and the old definition of apoplexy implied that a sudden seizure with loss of consciousness had taken place, from which there might soon be recovery unless death occurred. Thus, Cullen speaks of apoplexy with effusion of blood, or sanguineous apoplexy, serous apoplexy, hydrocephalic apoplexy, apoplexy from poisons, drunkenness, epilepsy, &c. All this is rational; but by using the term in this extensive sense, it comes to signify little more than insensibility, and thus wholly loses its value as a technical expression, the same word being adopted for the case of extensive effusion in the brain, or for simple drunkenness. I should say, however, that there are still some physicians who use the term in this extended sense, and speak of any one who falls in a fit as apoplectic. This, is, however, I believe, not the usage of the profession, for I have taken the trouble to inquire of medical men whom I meet what significance they put upon the term, and I should say that the word apoplexy is restricted by the majority to cases of effusion of blood in the brain; our experienced resident medical officer, Mr Stocker, always uses the term in this sense. If any doubt existed as to the usage of the profession in this matter we might recall to mind that effusions in other parts of the body are called apoplectic; thus we speak of apoplexy of the lung or of the spleen. Of course, if you consider the etymological meaning of the word, no expressions could be more absurd than these, but they show in what sense the term apoplexy is generally understood. I am under the impression that nine medical men out of every ten would imply by the term apoplexy sanguineous effusion. If this

be so, we cannot use the term in its original sense, as was done by Abercrombie and the writers who have followed him; for, by so doing, we shall have to include epilepsy and many other diseases which have already their distinct appellations affixed to them. If, on the other hand, we use the expression for effusions of blood simply, we are departing from the original meaning of the term. Some of you may say, why not limit the expression to those cases of sudden fits which are due to effusions of blood on the brain? The answer is this—that effusions of blood do not necessarily produce sudden fits of insensibility, or those symptoms which were described formerly under the term apoplexy. We are on the horns of a dilemma. The fact is, that pathology has completely upset our notions about the disease. Apoplexy, or "the being struck down insensible," as formerly understood, included such a variety of complaints that the term could be of little value. After some years it was limited, as now, to certain cases where blood was effused in the brain; but it unfortunately so happens that these are the very cases in which apoplexy, strictly speaking, is not present. I should have liked to renounce the word, like many other medical expressions, but as it must be retained we will imply by the term the case where blood is effused, and forget altogether the etymology. This we do in the case of the lungs, where the term is altogether out of place.

I am compelled to make these remarks because I believe that although there is now a pretty general consent amongst members of the profession as to the use of the term, much confusion is introduced into the subject by the adherence of writers to the expressions used by our ancestors. Thus, by some, apoplexy is defined as being "a disease characterised by the sudden loss, more or less complete, of volition, perception, sensation, and motion, depending upon sudden pressure upon the brain, the tissue of which may be morbid, originating within the cranium." This is so wide a definition that it almost ceases to be a definition at all; but it certainly implies that the term apoplexy is to be used for cases where a certain set of symptoms are present. Another writer defines it as loss of consciousness, with feeling and voluntary motion impaired, or a suspension of the functions of the brain. I have no objection in the abstract to these definitions, if we only agree to use the term in the same sense. I cannot but think, as I just now said, that if the opinion of the profession were canvassed you would find the term apoplexy was not applied nowadays to those cases where there was simple loss of consciousness and no other evidence of effusion of blood on the brain.

Most writers, I say, have followed Abercrombie, who strictly kept

to the true signification of the term. This capital observer says the attack occurs under three forms. In the first form the patient falls down suddenly, deprived of sense and motion, and lies like a person in deep sleep, face flushed, breathing stertorous, pulse full; in some cases convulsion occurs, in others rigid contraction of muscles. This may pass off. Such cases as these he calls *primarily apoplectic*. I think there is very little doubt that some of these cases were instances of Bright's disease, many of them epilepsy, and various other diseases, which would at the present day be recognised as distinct affections, but certainly not be styled examples of apoplexy. Abercrombie, pursuing his theme, and adapting his expression apoplexy to the etymological signification, then speaks of the second form of apoplexy, or that *not primarily apoplectic*, where there is no loss of consciousness, but syncope, with temporary recovery and subsequent sinking into an insensible or apoplectic condition. In these cases, he says, blood was often found effused, so that the very cases which we at present style, *par excellence*, apoplectic—those cases where a vessel is ruptured and blood effused—are those which Abercrombie styled *not primarily apoplectic*. He used, as you see, the terms apoplectic and insensible as convertible terms. His third form is that where the patient is suddenly deprived of power of one side of the body and of speech without stupor. These he styles the paralytic cases, and says the symptoms were due to effusion of blood or softening. The issue is this: a man who suddenly falls down insensible and struggles, presenting the symptoms which Abercrombie describes as being primarily apoplectic, we should now say has a disease bearing some other name, whereas the very patient who, according to this author, is not truly apoplectic is the very one whom we should nowadays declare to have apoplexy. It is a hard thing to have to perplex you in this way, not about matters of fact, but about difficulties of our own making, due more especially to authors using the term in one sense when writing, and in another in speaking or in conversation.

In giving, therefore, the symptoms of apoplexy in the modern sense, you will see that they must be of the most varied character, since effusion of blood taking place into different parts of the brain would produce of necessity very various effects. It would be absurd, therefore, for me to detail to you the symptoms of apoplexy as formerly given in the books, since these have reference alone to a condition which received the name on altogether other grounds. These symptoms often, indeed, denoted epilepsy or Bright's disease, although very often, too, an effusion of blood. If, for example, you had been called to a patient who had been suffering for some hours from increasing effusion of blood in the brain, and you had

present the symptoms described, the case would have been apoplectic in every sense of the term. The general idea of a person taken with apoplexy is that he is struck down senseless, having, perhaps, previously had some headache, or felt sick and faint. He may, in fact, have been first collapsed; then, a reaction having set in, his skin has become hot, his face red, and his pulse throbbing or labouring. He will be lying quite insensible, the face drawn up, showing some paralysis, or hemiplegic. If you are called in to see a patient in this condition you may call him apoplectic if you will, using the term in its original sense; but I believe, unless you had the history of the invasion, it would be impossible to say whether or no that man had extravasation of blood in the brain. As I cannot describe every possible variety of apoplexy, we had better divide them first into the cases where effusion of blood occurs on the surface; secondly, where it occurs in the substance; and thirdly, where it takes place in the central ganglia.

Beginning with the last, which is the most common—the patient, say a man, and generally somewhat advanced in life, has an extravasation of blood take place in the corpus striatum or its neighbourhood. He experiences suddenly a strange feeling in the head, a giddiness; he may fall, he turns pale, his pulse goes down, and he is sick. He shortly recovers, and, perhaps, with help, is able to walk a short distance, when it may be observed that one side is weak. These were the symptoms of a man who was so seized whilst working on the hospital premises, and, being brought to the ward, we had an opportunity of immediately seeing him. An hour afterwards he was lying in bed completely hemiplegic, having lost power in his right arm and leg; the face also was somewhat fallen on that side; and, being thus paralysed, he was not able to speak. When asked to put out his tongue he protruded it towards the paralysed side. These were all his symptoms. The earlier symptoms, due to the shock which the brain had received, had passed off, leaving merely those due to the local lesion. It was a clear case. He had suddenly had some injury to the motor tract, which, no doubt, was due to effusion of blood; and, as no special nerves were affected, I said it was in the corpus striatum or its neighbourhood. At this time his difficulty of speech could not be decided as attributable to aphasia. Now mark, this man had not lost his consciousness, and therefore was not apoplectic in the old-fashioned use of the term; in fact, as Abercrombie would have said, he was not primarily apoplectic. But we nowadays should call such a case, *par excellence*, one of apoplexy, and the clot which we found after death an apoplectic clot, although to say a man is apoplectic when he has no unconsciousness is certainly a contradiction in terms.

That, in such a case of effusion, paralysis is the main symptom, is seen in the fact that the extravasation may occur during sleep, and the patient wake as usual with his intellect unclouded; he then finds that on attempting to get out of bed he falls to the ground, and afterwards discovers that he cannot articulate, or that his speech is thick. He is hemiplegic in the manner of which I told you. If the clot be circumscribed in either of the central ganglia, no worse symptoms need arise, but the patient gradually recovers, first getting the use of his speech and then of his extremities. But it is only in a certain number of cases that the effusion is so slight; and thus, as in the case of the man just now mentioned, whom I saw after the occurrence of the fit, I said that the blood was then limited to the ganglia, but whether it would there remain or extend still further I could not say. I said that if it burst through into the ventricles, then he would fall into a state of coma and have the usual so-called apoplectic symptoms. I came in to see him in the evening, and the event had occurred—the blood had broken through into the ventricles. A great pressure was taking place on the surrounding parts, squeezing the convolutions out flat against the skull. Whilst passing downwards, the blood had filled the fourth ventricle, and so involved the respiratory and other nerves. He was then in the truly apoplectic condition as originally understood—in a perfect state of insensibility or coma. The whole body was paralysed, the limbs dropping when raised; the rectum had lost its power, and there was a fæcal escape into the bed. The breathing was irregular, mucus was collecting in the tubes, and in a few hours he died.

There are many symptoms of the true apoplectic condition which it is important to notice: I will first mention stertor or snoring. Snoring is due to a temporary, stertor to a real paralysis of the palate, whereby it flaps to and fro as the patient breathes. Stertor occurs during inspiration, but there is also a peculiar puffing-out of the cheeks during expiration from paralysis of the buccinator, and occurring more on one side than on the other, according to the nature of the attack. As the chest and the lungs are paralysed, so the mucus collects from an inability to cough, and thus it flows from the mouth, or is blown out on one side by the force of expiration. The respiration is often altered in rhythm. It will sometimes get slower and slower, and cease for half a minute, and then go on again for a few seconds and again cease. Or sometimes the expiration is extraordinarily prolonged, and then a deep short breath is taken. Dr Stokes has described a somewhat similar kind of expiration in cases of diseased heart, where the patient for a moment ceases to breathe, then short and superficial respirations

commence, which gradually deepen, until an extreme one is taken, when they gradually diminish until the arrest recurs again. This has lately been studied in heart disease and called "Cheyne-Stokes respiration." The surface of the body is congested and the face livid. The heart is also partially paralysed, and thus its beats decrease in frequency, the pulse coming down perhaps to 50, and being perhaps irregular. In this condition you will often find the pupils contracted. Much has been said about the condition of the pupils in brain disease, so as to assist us to diagnose between concussion, compression, apoplexy, and drunkenness, and on more than one occasion we have had letters in the newspapers informing us that mistakes would not occur if we had recourse to the state of the pupils. But, as I shall again have to remark, I think there is no rule in any of these conditions, and the state of the pupils will depend much upon the part of brain affected; you may be sure, however, that either an extreme dilatation or contraction denotes disease. In that severe form of apoplexy where blood is poured into the ventricles, and presses on the base of the brain, the pupils are very generally minutely contracted. Where a large effusion has occurred into the substance of the hemisphere the pupil on that side will often in the first instance be larger than the other, although subsequently it may be found smaller. Sometimes both eyes are forcibly turned away from the side that is paralysed, as I have mentioned under hemiplegia. In a case I saw lately of a man who died in profound coma from an apparently apoplectic attack, and in which no special paralysis could be made out, the eyes, with the pupils contracted, continually rolled from side to side. Slowly and methodically they first deviated to one side and then to the other; this continued for some considerable time whilst I watched him. Sometimes the paralysed side is rigid, which was regarded by Dr Todd as an evidence that the effusion had occurred in a healthy brain, and that the paralysis was not due to softening. I cannot say that this explanation is correct, but that an irritation is set up in the corresponding ganglion on the other side you may know by the twitching or convulsive movements which are frequently observed in the healthy limbs. Sometimes it is merely seen as a constant restlessness and pulling up of the bedclothes by the hand; therefore, unless carefully watched, the patient may wriggle off the bed. The convulsive movements are sometimes so severe that the case is regarded as one of epilepsy; and thus, just as epilepsy accompanied by unilateral paralysis is sometimes mistaken for apoplexy, so I have on several occasions seen apoplexy called epilepsy. When there is much pressure on the brain, its surface in a few hours becomes

inflamed, as I have frequently seen, and this is, perhaps, another cause for special symptoms. Sometimes the limb is painful when moved, and this, I believe, augurs badly for the recovery of the patient. Whether the pain is centric or is due to a neuritis in the limb has not been made out. In a case lately in the hospital, of a man who had from infancy a weak arm and leg, the former became rather suddenly flexed across the chest, and any attempt to move it caused most exquisite pain and almost threw him into convulsions. After death a most careful examination failed to show any recent inflammatory process in the brain, cord, or nerves.

One of the most marked cases of painful rigidity which I have lately seen was associated with an abscess in the brain. The patient had a pyæmic abscess secondary to one in the liver, rendering him hemiplegic on the right side; the arm became drawn up across the chest, and on attempting to move it or bend it the most exquisite pain was produced. After this painful contraction had lasted a week the limb became flexible and could be moved with impunity. In apoplectic paralysis similar phenomena may be observed; after the attack the limb may be drawn up, and great pain experienced on attempting to move it. After the existence of this rigidity for a few days it will pass off leaving the limb flaccid. In one case the painful limb was apparently anæsthetic. The explanation of the pain is by no means obvious; it can scarcely be due to a temporary or fleeting neuritis of the arm; and to say that it is dependent upon a morbidly sensitive cerebral centre is admitting altogether a new fact into nerve physiology, that is—that a centre can be influenced by external impressions according to its own state of sensibility; that not only will a sensitive centre when diseased fail to appreciate any injury done to the nerves proceeding to it, but that when inflamed it will receive a painful impression when those nerves are irritated. The case of rigidity of which I have been speaking is styled early rigidity in contrast to the late rigidity of old paralytics.

I should say that this which I have described is the commonest form of apoplexy, and when witnessed from the commencement, is the easiest to diagnose. There is first the shock, then the hemiplegia and loss of speech, followed by such symptoms as would denote the spread of the blood through the substance of the brain, or its bursting out on to the surface, or, as more frequently happens, into the ventricles—viz. coma, stertor, and all those symptoms which are usually described as constituting apoplexy. It often happens that some hours may have elapsed before the doctor is called in, and then all the earlier symptoms have passed. He finds the patient in a perfectly insensible condition, with con-

tracted pupil, a slow labouring pulse, flushed face, profuse perspiration, stertor, froth issuing from the mouth, and other signs which "foretell the ending of mortality."

Having cursorily regarded the physiology of the nervous centres as far as can be elaborated from pathology, you will perceive that the symptoms of apoplexy will vary according to the seat of the disease and the amount of the effusion. The commonest form is that which I have mentioned where the effusion takes place into the central ganglia. If the blood be restricted to these parts, the symptoms proceed no further than the hemiplegic stage. Let the blood exceed these boundaries, a truly apoplectic state results, and death usually occurs within twenty-four hours. But it is clear that if a large vessel gives way in the first instance, the symptoms of the first stage, the primary shock and the hemiplegia, may soon pass off, and the blood pouring out into the ventricles may so compress the vital parts that death will rapidly ensue in a few hours. If blood be effused to a small amount in any other part, the symptoms depend upon the site. If in the pons, and interfering merely with the motor tract, it is not necessarily fatal; but if in larger quantity, so as to compress neighbouring parts, then, of course, fatal symptoms rapidly ensue.

I need not detail any particular case to you, but if you take up a volume of our Inspection Books for any year you will find plenty of cases in illustration, of which the following are outlines.

Case.—A cook, æt. 52, whilst employed at her occupation in a gentleman's house, was seized with apoplexy. A medical man, who was speedily in attendance, bled her and sent her to the hospital. She was hemiplegic on the left side, and retained her consciousness, which had never left her. She died on the following day, when a large clot of blood was found in the right corpus striatum, tearing up the substance of the brain; also some fluid blood in the ventricles.

Case.—A man brought in perfectly insensible; stertor; quite powerless: contracted pupils. The ventricles found full of blood, which passed down through the third and fourth to the base. The corpus striatum was only superficially ruptured, so that the blood had flowed at once into the ventricles. There was no clot in the substance of the brain.

Case.—A woman of loose character took up her night's lodging at a coffee house. On the following morning she was found perfectly insensible. The police, who were called in, believed she was drunk, and the doctor that she had been drugged. She was sent to the hospital in a perfectly unconscious state, with stertor, minute contraction of the pupils, and limbs quite powerless and flaccid. After death a large clot of blood was found occupying the right hemisphere. This had burst into the ventricles, which were full of coagula; blood also had passed through to the base, and then travelled up to the sides of the brain.

Pons Varolii.—I have already spoken of the case where a small effusion of blood has taken place into the pons unattended by loss of

consciousness, and where, if it has occurred on one side of the pons, a hemiplegia has resulted, accompanied by a marked paralysis of one side of the face. These symptoms have in more than one case suggested a correct diagnosis of the seat of the lesion, as in the following:

Case.—A man, æt. 50, who was said to be well in the morning, was seized with a fit. When brought in he was conscious and spoke, though hesitatingly. The left side of the body was paralysed, and the right side of the face. Effusion in the pons was diagnosed. On removing the brain after death nothing was noticeable, except a swollen condition of the pons Varolii. This, on section showed a clot on one side, just breaking into the fourth ventricle.

When the effusion is in large quantity a total insensibility may ensue, and a complete paralysis of the whole body. Such a case is one of the most difficult for diagnosis, since from the fact of both motor tracts being involved, and a general paralysis necessarily resulting, it is far from easy to distinguish this state from one of coma, or from one where the voluntary power is simply for a time in abeyance, as in stupor. You have, for example, a patient lying insensible in bed, and you lift the arms or legs, which fall lifeless at the side. Does this result from paralysis or coma? I have seen a most experienced physician mistake a complete case of paralysis for poisoning by opium, and another physician a similar case for uræmic coma; and, on the contrary, I have seen a most careful practitioner regard a case of dead drunkenness as one of sanguineous apoplexy and paralysis. The diagnosis is most difficult. In the case of effusion of blood in the pons Varolii, where the patient is insensible and wholly paralysed, the condition is very like that caused by opium poisoning. The resemblance is the more striking when, as is often the case in effusion of blood at the base of the brain, the pupils are minutely contracted; should, again, the respirations be lowered in number or laboured, the similitude would be exact. Thus it has often happened that patients who have been taken to hospital with apoplexy of the pons Varolii have had the pump employed for the purpose of emptying the stomach of supposed laudanum. I should state that the coma is due to the sudden nature of the attack, or to the large amount of effusion of blood, by which pressure is exerted on surrounding parts, but that unconsciousness is no necessary symptom of apoplexy of the pons; and in cases of chronic softening of this part the intellect is in no way impaired. Not long ago a medical man was most unjustly censured by the magistrate because he had raised a suspicion of poisoning by opium in a case of this variety of apoplexy, and I believe there is scarcely a hospital in London in which a similar experience of the difficulty of diagnosis could not be given. Some

of you may remember the case of a woman who was brought into the hospital, and when I visited her in bed was found in a state of quiet stupor, her hands dropping helplessly when raised from her side. When the urine was examined it was found to be highly albuminous, and I then stated my belief that it was a case of uræmic coma. We were shortly, however, informed that she had been suddenly seized whilst in an omnibus, and then, of course, I changed my opinion to one of sanguineous effusion; but without this history I should have formed an erroneous judgment. Here there was a clot of blood in the pons.

Dr Moxon had lately the case of a man under his care with Bright's disease. One day he suddenly became dull and half conscious; he muttered and spoke with difficulty. The pupils were contracted. He seemed also to have paralysis of the left facial. On the next day his consciousness had returned, and he moved his limbs. He subsequently fell into a state of coma, and died. A clot of blood was found in the pons.

One of the last cases admitted was that of a man in profound coma. In considering the possibilities of the cause, the house-physician thought of diabetes and examined the urine. On finding sugar he pronounced in favour of this disease, but a clot of blood was discovered in the pons. I believe that sugar has already been found in such cases, suggesting the probability of an irritation of Bernard's diabetic spot.

So much regarding apoplexy of the *Pons* specially.

I had lately an opportunity of seeing a case which you may regard as a type of the ordinary form of apoplexy. A man, whilst engaged in his business, was seized with violent pains in his head. He then began to talk incoherently, and was assisted to his room, when he fell down, and had a convulsion. The doctor found him collapsed and cold, and with a pulse scarcely to be felt. He gradually came out of the syncope, and then passed into the apoplectic state, with stertor, great rise of temperature, throbbing pulse, left side paralysed, right constantly moving, and hand pulling the bed-clothes. Death in a few hours.

The collapse is sometimes very remarkable. A few months since I was called, with Mr Stocker, to see one of the treasurer's servants. She had fallen in a fit in the yard, and when brought indoors was cold and pulseless. Brandy was administered, and it was doubtful whether she would survive the shock. She gradually revived, when the side was found paralysed; she has now nearly recovered.

Considering the different causes which may give rise to effusion of blood in the substance or on the surface of the brain, the sym-

ptoms must of necessity differ in detail. If the case be fatal, and a careful examination be made after death, the symptoms and post-mortem appearances can generally be made to accord, but it is not to be argued from this that such symptoms of necessity denote that particular form of disease. Very difficult of diagnosis are aneurysms of the larger arteries of the brain, in which there have been symptoms indicative of pressure on some particular region, and subsequently those of apoplexy, due to bursting of the sac and flooding of the brain with blood.

Cases are constantly occurring in which effusions of blood may be conjectured to be present, but cannot be absolutely diagnosed, as the symptoms are not sufficiently distinctive. For example a lady goes to bed well; wakes with an intense pain in the head, which continuing, the medical man is sent for; just as he arrives she sinks into an apoplectic condition and is collapsed; she gradually recovers, and when I see her some time afterwards she has perfectly regained her consciousness, but has complete paralysis of the left third nerve. Here is a case where you might form several conjectures as to the cause and site of the lesion. A gentleman after pain in his head discovers weakness of his limbs, deafness on one side followed by paralysis of the sixth nerve and ptosis. Indeed, there are a great many varieties of apoplectic seizure. The subjects of apoplexy, as a rule, have the premonitory symptoms just mentioned, and then fall into a state of insensibility; afterwards a gradual recovery takes place with some form of paralysis. Sometimes the premonitory symptoms are of longer duration, exemplified by pains or strange sensations in the limbs, headache, giddiness, &c. In other cases the vessel which ruptures is a large one, the bood bursts out in large quantities, coma comes on, and death ensues in two or three hours. These are the cases which the late Dr Addison was accustomed to style a "smash into the ventricles."

Sometimes loss of sensation accompanies loss of motion in the hemiplegic, or, to use technical phraseology, "anæsthesia often accompanies akinesia." I have already alluded to this when speaking of anæsthesia, and suggested that the neighbourhood of the thalamus was the seat of the lesion. Much of our difficulty arises from the doubt as to whether there be any loss of feeling or not. There is often some numbness, and yet the patient feels when pricked. He will also often not know in what position his arm is lying, and feel for it with the other.

In the rapidly fatal cases the blood has most usually had its source in one of the central ganglia, then ploughed up the substance of the hemisphere, or burst into the ventricles. In those cases where no further symptoms occur after the first shock and

the hemiplegia, recovery takes place. If at a subsequent time the brain is seen the remains of the effusion or its consequences are found to be limited to the spot where the rupture took place.

In the common form of ingravescent apoplexy Dr Broadbent thinks that the symptoms are due not only to the slowness of the extravasation, but to the seat of it; that it does not take place in the corpus striatum proper, but between the lenticular nucleus and the internal capsule, and so opens up the island of Reil; nor does the blood flow into the Sylvian fissure.

Occasionally blood is effused into the *white substance* of the brain, and then, as you might suppose, the symptoms are most obscure. In some cases, where such effusions have been found, the symptoms, when sought for, have been of the vaguest character—so wanting in preciseness that I could not expect you to diagnose apoplexy of the medullary matter of the brain, although you might suspect it. There have been symptoms which denote cerebral disturbance, as pain in the head, giddiness, sickness, faintness, followed by some reaction and labouring pulse, but nothing more distinctive.

Somewhat more definite are the symptoms which result from *meningeal apoplexy*, that is, the case where blood is effused on the surface of the brain; when the fact is known the symptoms are quite appropriate; but I cannot say, on the other hand, that the symptoms are sufficiently distinctive to warrant the diagnosis of meningeal apoplexy, although they may be suspected. You might imagine, from what I have already told you, what the symptoms might be—no paralysis, but mental confusion or delirium, ending in coma, and perhaps convulsions. The great importance of having a knowledge of such cases is from a medico-legal point of view, seeing that a hæmorrhage on the surface may be either spontaneous or arise from injury. I will not enter upon this subject, as I have done so elsewhere. If blood be poured out in large quantity and quickly, coma and death rapidly ensue. In less amounts the symptoms are those of irritation. These are best seen after injury, but occasionally also in the medical wards. Thus there may be convulsive movements, or even attacks of a distinct epileptiform character. The majority of such cases in my experience have occurred in Bright's disease, and have been attributed to uræmia.

Case.—A little girl was under the care of Dr Pavy with renal dropsy, when one day, and a few hours before death, she was seized with a screaming fit, followed by convulsions. A layer of blood was found covering the brain.

Case.—A young woman came into the hospital suffering from pains in the joints and a mitral bruit. Being soon after her confinement, the condition was undetermined between rheumatic and puerperal. She soon afterwards com-

plained of great pain in the head, and became perfectly maniacal, in which state she died. There was found a diseased mitral valve and embolic concretions in kidneys and spleen. The anterior part of the brain was covered with blood, effused under the arachnoid, and which passed down between the convolutions. There had evidently been a recent rupture of a vessel in the pia mater, although, as usual, undiscovered.

CASE.—A woman, aged 58, having previously felt giddy, fell down in her room. She was taken up insensible, but recovered in about ten minutes, and spoke. In twenty minutes she again became unconscious, and, remaining in this state all day, was brought to the hospital. She was in a perfect state of coma, with stertorous breathing; limbs rigid, with occasional twitching, and drawn up when touched. Pupils continually varied in size, and the face appeared paralysed, sometimes on one side, and then on the other. The diagnosis was uræmic poisoning. After death an examination showed the whole surface of the brain covered with blood, which had evidently proceeded from a large vessel in the pia mater.

CASE.—A young man fell and struck his head on the pavement. After recovering he went home, but appeared in a half-stupid state, and on the following day he had a fit, which was called epileptic, and on the succeeding day another. When taken into the hospital his condition was like that of a man who had delirium tremens. On the following day he had another epileptic fit, which left him in a state almost maniacal. He continued thus for nearly two weeks, having fits, and being in the interval in a condition much resembling that of delirium tremens. The post-mortem examination showed a fibrinous clot of blood closely adherent to the cineritious surface of the brain.

I have on more than one occasion seen a patient trephined for meningeal apoplexy, showing how difficult the diagnosis is. A man fell down whilst at work, and was immediately brought into the hospital. He was pale, comatose, with stertorous breathing, and had rigidity of his limbs, with jerking movements. Blood was found effused over both hemispheres.

Another man fell downstairs and was brought here insensible, with a scalp wound, and soon afterwards had a fit. He was trephined, and nothing was found under the bone. After death effusion of blood was found on the brain, and some old local disease. It was then learned that he had been subject to fits.

In some cases of meningeal apoplexy an old disease of the brain has been found, as if this had been the source of the hæmorrhage, just in the same way as we believe it sometimes occurs in the spinal cord.

In a case which occurred lately of a man who had fallen and cut his head the ventricles were found full of blood, but a most careful examination failed to discover the source of the hæmorrhage.

In the case of a man who was brought into my ward in an apoplectic condition the symptoms were of the most heterogeneous kind, and were found after death to be due to effusion of blood on

the under surface of the brain and into the fourth ventricle, the brain itself being healthy. He was taken, a few hours before his death, with giddiness, pain in the neck, inability to swallow, closure of left eyelid, right pupil strongly contracted, left dilated, but he could move his arms and legs. The symptoms were due to an implication of the nerves rather than to any affection of the brain itself.

Effusion of Blood on Surface from Injury.

Case.—A young man, æt. 18, was admitted into the hospital with cerebral symptoms of a not very severe nature, and died on the following morning. Very little history was procurable, but it appeared that eleven days before, he had been fighting in a barge with some other men, and received a blow on the head. He did not suffer much in consequence, and continued his employment during the next ten days; on the following day, feeling unwell and his head ache, he came to the hospital; he walked up to the ward, appeared quite rational, his only complaint being pain at the back of the head. There could be little doubt that he had been more ill than he chose to admit; he was depressed and wished to conceal his condition. Body that of a strong muscular young man; the head presenting no signs of injury. On lifting up the dura mater, the surface of the brain on the right side was seen to be covered with blood; the blood was mostly fluid, and about four ounces in amount; a few coagula remaining adherent to membranes. The whole of the brain on the right side was surrounded by blood which compressed it, and somewhat flattened the pons. The left hemisphere was untouched. The brain was carefully washed in order to discover any breach of surface or rupture of blood-vessels, but it appeared perfectly sound in every part. A close examination of the blood showed that a part of it might have been due to a recent effusion, but there were thin layers of coagulum which had evidently been there for some days; these were assuming a brownish or ochrey colour, and were becoming very closely attached to the dura mater. No crystals or hæmatoidin discernible.

As in some cases of effusion of blood after injury there has been considerable violence to the head it is probable that many of the symptoms are due to *concussion*. It is as well, therefore, to appreciate, if possible, this condition. The effects of concussion on the surface of the brain were well seen in a case under Mr Durham, where a young man fell down stairs on his head. He was insensible, with pupils dilated and a marked rigidity of his arms and legs. He continued in this state for nearly forty-eight hours, when his temperature rose very high, and he died. There was no fracture, no laceration of the brain, nor effusion of blood. Its whole surface was very red, a section showed it everywhere studded with red points, and the substance of the brain everywhere was of a pinkish-yellow colour. The surface of the ventricles was covered with minute ecchymoses, as well as fornix, septum lucidum, &c. The central ganglia were also similarly dotted.

It would only be in very extreme cases of injury that these actual extravasations would be found; but as regards the condition of the brain in simple concussion there is much difference of opinion. Dr Gardner has lately written a paper showing how unsatisfactory is the ordinary explanation of the phenomena of concussion. He doubts whether any shaking causing a reverberation of the brain can bring about any displacement of its molecules; whether a mass of substance like the brain, in a case of unyielding walls, could undergo such a change. He made experiments in order to test this. The author argues in favour of some recent German views, that blows on the head produce reflex paralysis of the vessels of the brain, and that in consequence of this the cerebral ganglia would suffer. Experiments show that blows on the head will produce contraction of the vessels of the brain.

Effusion of Blood into the Cerebellum.—Dr Broadbent has lately published two very interesting cases of this form of apoplexy, and in neither were there any characteristic symptoms.

One was that of a girl, æt. 20, who had an effusion of blood in the left lobe of the cerebellum, and died after a few days. She lay on her side, unwilling to be moved or spoken to. She had pain in the head, and seemed as if she suffered from great weariness, and wished to be left alone. She at last died suddenly from rupture into the ventricles.

The other case was that of a girl, æt. 16, in which there was effusion of blood bulging into the fourth ventricle. She was seen leaning against a wall, complaining of pain in her head. She was taken to St. Mary's Hospital, and was then insensible. She moaned, and could move all her limbs, but resisted all movements made by others, and gave evidence of pain. She died in two hours.

I was lately called to Norwood by Mr Dalton to see a schoolboy, æt. 14. He had been seized in the morning with pain in the head, followed by dulness and lethargy. Death occurred in a few hours, and a clot of blood was found in the cerebellum.

The diagnosis of such cases is most difficult or impossible, especially where the effusion is small in quantity, for in such circumstances there may be no other symptoms than a tottering in the gait. A most remarkable example of this was recorded by Dr Brodribb, of Hastings. A lady, æt. 53, had travelled from London to visit a sick relative, and being depressed in spirits had recourse more than once to her brandy bottle. After her arrival at the house she went out for a drive, and on her return she could scarcely walk or stand. She expressed herself as being drunk, having partaken too largely of the brandy, and her friends were willing to

coincide in this opinion. After a few hours she fell into a state of coma and died. The *post mortem* showed a clot of blood the size of a pigeon's egg in the right lobe of the cerebellum. Dr Brodribb, on further inquiry, could not learn that there had been any special loss of motion nor any disturbance of the senses, but merely a want of regulating movement, as in a drunken person, which she was supposed to be at the time, not only by her friends but by herself.

Changes in the Brain and subsequent course of the Paralysis.— If a small amount of blood be effused, producing hemiplegia, and no further result follow, the patient gradually recovers. The paralysis of the face quickly passes off, and if it be on the left side the patient is soon enabled again to speak, although the paralysis of the arm and leg remain. I should think that, in many cases, the effuson of blood can do little more than compress and temporarily suspend the function of the part, for otherwise we could scarcely account for the complete recovery which may sometimes ensue in a few days.

In most cases, however, a very lengthened time is required for recovery to occur, and this is only partial; as the blood is absorbed the parts again come into order, and their function is resumed. But since some of the conducting fibres are absolutely severed, it is impossible that motion will ever be perfectly restored. You will find, as a rule, that the leg recovers before the arm, but at the end of some months nearly all hope is gone of either limb permanently recovering, if not restored by that time. You will see, therefore, how absurd it is for us to assent to the suggestion of a patient to do something for a paralysed limb after years of its existence. A week or two ago a lady asked me if something could be done for her arm and leg, which had been paralysed for twenty-five years. She was really asking for the removal of a cicatrix from the brain, and a restoration of the original tissue. This would be strikingly absurd if asked in reference to a scar on the skin.

During the paralytic state the muscles are flaccid, respond readily to either form of galvanism, and reflex excitability is retained. The temperature is often slightly increased. Sometimes, after a few hours, the limb becomes rigid and painful when moved. This symptom, in my experience, is unfavorable. When recovery takes place, the speech becomes distinct, the tongue is put out straight, and power returns in the limbs, beginning in the leg. If the arm recovers first, Trousseau considers the case a bad one, and that the mind will suffer. With this view Dr H. Jackson coincides. Dr Gull, in his Gulstonian lectures, gave two cases where the arm recovered first, and the disease was situated in the inferior part of the poste-

rior lobe of the cerebrum. If there has been a lateral divergence of the eyes, a diplopia or hemiopia may exist for a long time during convalescence. This is so now in one of my patients, who has also an inequality of the pupils. If further observations tend to confirm the views of physiologists as to the localisation of functions in the hemisphere, it may perhaps be shown hereafter that these additional symptoms are owing to a wider implication of the surrounding convolutions; and that hemiopia, for example, is due to the injury of a part situated more posteriorly, which Ferrier has shown to rule over vision.

Now, what becomes of the clot? The blood disintegrates, it becomes yellow, ochrey, or coffee-coloured; the corpuscles break up, and out of the colouring matter crystals arise; these take at least a fortnight to form. Whether a true cicatrix may follow is doubtful; more generally some inflammation occurs around the clot, lymph is poured out, which hardens, and thus a cyst is often produced. In a person who has been long hemiplegic a small cyst containing fluid may be found in the corpus striatum, or a brown spot may be seen looking like a cicatrix, the remnant of the dried-up clot. In some cases of effusion of blood in the brain it may be useful to ascertain the time of the seizure; the presence of crystals may assist us in the inquiry, as they seldom are found before two or three weeks. These crystals, which spontaneously form, are called hæmatoidin, and differ from the hæmine crystals which are formed artificially by acetic acid. The latter are small rhombic plates with acuter angles, whilst the former, which form spontaneously, are much larger and broader crystals, and of a deep ruby-red colour.

If this process of recovery do not ensue, a softening may gradually go on until neighbouring parts of the brain are involved, and then further symptoms arise, of which I shall speak when I come to softening. You may often find that the emotional powers are readily excited, as if less under the control of the patient; but whether the disease has or has not in these cases proceeded beyond the region of the ganglia I am not quite certain. Occasionally, too, epileptiform attacks occur, as if the old clot were a source of irritation.

The *contraction of the limb* in some long-standing cases of paralysis is very remarkable. I have already alluded to a rigidity of the limb which is sometimes observed at the commencement of the attack, but I am now speaking of the permanent contraction, with a certain amount of withering of the limb, which gradually comes on after the paralysis has existed for some time. Dr Todd believed it was due to an excitation continually sent down to the nerves from the brain, and that the origin of the phenomenon in these circum-

stances was the irritation caused by the cerebral cicatrix. I have always known that this could not be the explanation, seeing that it occurs under a variety of morbid conditions of the brain; indeed, the most marked cases of contraction I have witnessed have been those where, so far from there being a cicatrix, the brain tissue had become altogether destroyed. In fact, it was long ago maintained by Lallemand that contraction more frequently occurred in softening. I remember the case of a man who had had his arm rigidly flexed across his chest and his fingers contracted for nearly two years, and whose brain presented little more than a hollow space on one side. It is for such reason that I have always maintained the impossibility of the rigidity being due to any influence propagated downwards, the nerves being in a state of mere negation as regards cerebral influence. An explanation first offered by Dr Charcot, and confirmed by Dr Béhier, the clinical professor at Paris, was that the paralysed limb had undergone a great change in its tissues; the muscle was atrophied, and the nerves had become enlarged and indurated through the addition of a connective tissue. The nerve filaments had become reduced in size, whilst the neurilemma was thickened. In this condition the term "cirrhosis of the nerves" had been applied. Where this does not hold good the rigidity has been explained by a descending degeneration or a sclerosis extending down the motor tract, through the crus and pons to the lateral columns, as I shall have to mention when I come to the "Spine." The muscle itself is altered, and does not become flaccid when the patient is under the influence of chloroform. At other times a slight œdema may occur in the paralysed limb. In the early rigidity there is often pain on moving the limb; and it may be a question whether this is due to a commencing neuritis or to an extreme sensibility of that part of the cord near the seat of disease. Certainly this may be suspected when the limb is seen to move or jump on the patient gaping or sneezing. Sometimes the limb is constantly moving, as is seen in chorea, but this is generally at a later stage when the arm is permanently flexed and rigid; or instead of the movement being of the choreic kind it is more systematic, as is seen in athetosis. These two kinds of movements are constantly observed in the old paralytics of lunatic asylums. Sometimes, if the patient close the hand or contract the fingers of the sound side, those of the paralysed side will move likewise in sympathy; sometimes, if the weakened limb be stretched out, the muscles will tremble and the reflex actions will be found exaggerated. If we suppose a local inflammation of the brain in early rigidity, and a chronic inflammation in late rigidity, we should have the same pathology in the two cases. Rarely a subacute inflammation of

the joints occurs which would account for the pain. The skin also of the palm of the hand becomes soddened, and emits often a very disagreeable odour, showing that the cutaneous secretions are morbid. The occurrence of these and other symptoms of the kind, indicating that nutritive changes are going on, probably implies that the morbid process has descended to the cord; for, as a rule, no wasting or any other marked alterations occur in a hemiplegic limb.

Causes of Apoplexy.—According to the old definition, these might be numerous, the simplest being that where a ligature is placed around the neck, producing temporary congestion of the brain; but restricting ourselves to the definition of effusion of blood arising from the rupture of an artery, the main cause would be disease of the blood-vessels; hence the reason of increasing liability to apoplexy with advancing age. In younger persons a cause might sometimes be found in aneurysms of the cerebral vessels, and in all probability much more frequently than at present, if they were carefully looked for. I remember thirty-five years ago seeing the late Mr Wilkinson King carefully washing a brain so as to expose the blood-vessels, as he expected an aneurysm, at the same time informing me that he had discovered a ruptured sac on three several occasions in the midst of an apoplectic clot. These aneurysms in young people have probably had their origin in embolism in connection with endocarditis, as I shall presently have to mention; but all effusions of blood in children are not necessarily due to rupture of aneurysms, for their vessels may become diseased and give way as in adults.

Researches of late in France have shown that besides these single aneurysms a very large number may be found scattered through the brain. These are called miliary aneurysms. Their frequency has not been confirmed in this country. Since in apoplectic patients there is disease of the blood-vessels, you might suspect, as is the case, that they were often the subjects of Bright's disease. You are constantly being told of the various degenerations which occur in the tissues in morbus Brightii, and more especially in the blood-vessels, one evidence of which is witnessed in the amaurosis and effusion in the retina, which is a frequent concomitant of Bright's disease. In most cases you will find the cerebral vessels evidently diseased, as seen by the naked eye; in other cases you find the smaller arteries thickened, and the more minute ones, when placed under the microscope, are seen to have undergone a fatty degeneration. You know also how frequently hypertrophy of the heart is found in chronic morbus Brightii, and in connection with this circumstance is the interesting fact that this state of heart had long been observed in fatal cases of apoplexy, and a theory was held

that the effusion of blood was due to the increased pressure on the vessels in consequence. The observation shows that these were really cases of Bright's disease in which apoplexy occurred, although, most remarkably, the kidneys were never examined. It is important to remember the connection, because the discovery of albumen in the urine of a person lying in a lethargic condition might suggest uræmia, and lead us away from the idea of apoplexy, whereas it would only be another evidence in favour of diseased blood-vessels. This hypertrophy of the heart led to the notion that increased pressure on the blood-vessels had much to do with their rupture. Now, as a matter of fact, I believe they must be actually diseased before they can give way. But supposing the moment has all but arrived when the catastrophe is to happen, you may imagine that a very little increased force acting on the vessel will cause it to rupture. More recently Dr G. Johnson has enforced this doctrine—that the first change in Bright's disease is in the blood-vessels, which become hypertrophied, and subsequently the left ventricle; that the compensatory thickening of vessels is not uniform, and that therefore the cerebral and retinal vessels, not partaking of the change, more readily yield to the increased action of the hypertrophied heart. From this point of view the hypertrophied heart must be regarded as another element in the causation of apoplexy, besides the tension of the blood-vessels.

It is thought by some that increased tension alone in the arterial system may cause rupture of a vessel, or that delay in the venous system may do the same, but in a healthy person strangulation does not produce apoplexy, and in those frightful cases of congestion of the head seen in bronchitis apoplexy is not an ordinary result. The fact is, the character of the circulation of the blood in the head is not yet quite understood; it appears that it can never contain more than a certain amount of fluid. Then, again, the anastomoses are so remarkable that we may have such a state as I one day met with in a case of ligature of the carotid, which certainly would never have been anticipated. The common carotid had been tied, and when the patient died a few days afterwards the whole of the cerebral vessels, as well as those of the pia mater, were filled with solid coagulum. It is said that the immediate causes of apoplexy are over-exertion, straining at stool, or any undue excitement. I cannot say from my own experience that such causes are effectual. It appears to me that it has been too readily assumed that during exertion or movements of the body there is greater stress thrown upon the blood-vessels, and that they are then more liable to rupture. The presumption has been taken

from the fact of hæmorrhage on the surface of the body being arrested by pressure and quietude; but no inference can be drawn from this as to the amount of force exerted on the blood-vessels during rest or movement. You know Mr Durham has made experiments whereby he has shown that the circulation of the blood through the brain appears less active in sleep than waking. However this may be, I cannot disregard our experience as to the occasions on which hæmorrhage is likely to occur from the bursting of a diseased vessel. In the case of a diseased cerebral artery I am not at all sure that the pressure is greatest upon it when the circulation is active, for how can we account for the very frequent occurrence of apoplectic seizures in the night when the patient is asleep? Take, again, the case of hæmoptysis in connection with tuberculous disease of the lung. I believe it is rather the rule than the exception, when this occurs, for the patient to wake in the night with blood in the mouth; in the daytime there had been no sign of its occurrence when the patient was actively engaged. In spite of this fact, when we are treating a case of hæmoptysis, we insist on the patient being absolutely quiet, on his lying in bed, and making not the slightest movement of the arm, such as putting on a coat, which we suggest might seal his fate. Believing that such practice has been determined entirely on *à priori* considerations, I have for some time ceased to adopt it, and certainly with no ill consequences to the patient. I am inclined to believe, although I must not teach this as a proven fact, that the pressure exerted on the blood-vessels is greater during sleep, and is lessened by exercise. The case of sudden rupture of the heart will also bear out my statement. In several cases which I have seen where the patients were found dead in bed a fatty heart had suddenly ruptured, and this in persons who had been at work, or at least walking about, all day. I believe there are cases of heart disease where a little gentle exercise will promote a more active circulation through the system, and thus quiet the palpitating and irritable organ. These remarks arise out of the question as to the exciting causes of apoplexy, and therefore I express my suspicion that those usually given have been concocted by writers in their study, and not adopted as the result of experience. The commonest causes are rupture of diseased vessels from age, and then ruptured aneurysm. Occasionally it may arise from a previously softened brain, and sometimes as a part of a general purpuric or hæmorrhagic condition.

I have said little of the premonitory symptoms of apoplexy which are often spoken of, as numbness and tingling of the fingers. I shall again allude to these, but regard them as of little value

in the diagnosis of approaching apoplexy. Certainly they are of little importance when we remember their excessive frequency in gouty and nervous persons who again get better of them. Headache in like manner is of no diagnostic value. It is true that pain in the head sometimes, though exceptionally, precedes an apoplectic attack, and remains after the vessel has ruptured, but in such cases some special or accidental cause must be in operation. In looking through my cases I find occasionally that giddiness, headache, noises in the ears, and thickness of speech have preceded apoplectic attacks, but they have been quite exceptional.

Diagnosis of Apoplexy.—According to the old definition this is easy. If we go back to Cullen, it is simply synonymous with insensibility, and would be applicable to cases of poisoning or drunkenness as well as to cases of disease. If, however, we mean by apoplexy effusion of blood into the brain, how do we then frame our diagnosis? If the attack be of the more ordinary kind mentioned, this is easy. If there be the sudden seizure of pain in the head, giddiness, &c., followed by thickness of speech and weakness of limbs the case is clear. If, however, you are called to see a patient at a still later period, when he is quite insensible, you will have to inquire into the history. You may find him in the ordinary condition which is known as apoplectic, with stertor and coma; but you may clearly make out from the face and movement of one side that a paralysis exists, and therefore you may diagnose apoplexy. If the coma is profound, the chance of his ever coming out of it again is most remote. If you see a patient immediately after he has fallen, and you find him in a state of deep coma, you may be pretty sure the case is not one of apoplexy. If you hear that he has struggled, it is in all probability epilepsy, and the fact of his having apparently some hemiplegia is no argument against it. In this case it would probably be not one of simple epilepsy, but one of disease near the corpus striatum. When a medical man is called to see a person who is lying insensible with apparent paralysis of one side, the case presents considerable difficulty. I have seen an epileptic patient under these circumstances regarded as apoplectic; and, on the other hand, I have, on several occasions, seen the case of fatal apoplexy looked upon as epilepsy. This was no doubt owing to convulsive movements. The most difficult case which the house-surgeon of a hospital can meet with is that of a man brought from the streets in a perfectly insensible condition. He may have fallen and have a wound on the head. The question the surgeon asks himself are—Is there an injury? Is the case one of apoplexy? Is the patient poisoned or drunk? In complete insensibility there may be effusion of blood in large quantities in

the ventricles, at the base of the brain, or in the pons Varolii. In these cases the pupils may be contracted; hence the resemblance to poisoning by opium. The probabilities would be in favour of the latter if the breathing were very slow. You have heard Mr Stocker express an opinion in favour of apoplexy if, on undressing the man, there is found a fæcal discharge in his trousers.

If the patient be in a semi-conscious state there are three conditions which are much alike—concussion, drunkenness, and uræmic poisoning. In none of these are there any very characteristic symptoms; the patients move their limbs and perform automaton-like movements, and the pupils are of the ordinary size. The so-called serous apoplexy of older writers was probably Bright's disease. Two cases, which much resemble one another, are those of ingravescent apoplexy and effusion of blood from rupture of the middle meningeal artery. In both there is the shock and the collapse, with the reaction, coma, and paralysis; the latter, however, is only partial in the case of compression. About two years ago we had two cases, admitted to the hospital in the same week, in which the diagnosis was most difficult, owing to the erroneous history. A man was found lying insensible in his workshop, and brought to the hospital, his friends saying that he had previously had fits. His head was shaved and most carefully examined, and not the slightest trace of injury could be discovered; consequently the case was regarded as one of disease; yet, when examined after death, a crack was found through the temporal bone, and blood effused on the dura mater. The other case was that of a man who, after reaching home, said he had received a blow on the head, complained of pain, and gradually sank into a state of insensibility. He was brought to the hospital with apparent paralysis of one side. The house surgeon was about to trephine, but the operation, being deferred for consultation, was not performed. There was found after death a clot of blood in the thalamus opticus, and not the slightest trace of injury.

Time will not permit me to endeavour to unravel every possible case of the kind, and indeed I could not, for, I believe, when you are called in to see a patient lying insensible, it is often perfectly impossible to form a diagnosis, although you may make a good guess. I ought to have said that the suddenness of the paralytic attack does not preclude the possibility of the case being one of softening. This process may go on gradually, and then suddenly some connecting fibres will be severed, and the consequent paralysis ensue.

You will observe from what I have said, although I should think most of you have seen enough cases to render the statement

unnecessary, how erroneous is the opinion that apoplexy (that is, effusion of blood in the brain) is suddenly fatal. This is a popular opinion, and exists, I believe, even somewhat extensively in the medical profession. This is evidenced by the fact that in stories and theatrical pieces the characters are made to die suddenly of apoplexy; and as regards a very prevalent opinion amongst ourselves one may read in the daily papers the accounts given of inquests held on persons who have died suddenly, where the medical man has attributed death to apoplexy. I will just say, once for all, that apoplexy does not cause sudden death—a popular mistake, and one not yet eradicated from the mind of the profession. The case of shortest duration of which I know is where an effusion of blood occurred on the brain, and the patient being dragged through the streets, survived only an hour. It must be remembered, however, that a blow on the head will produce sudden death; but seeing what extensive injuries occur to the brain without immediately fatal results, a vital part in these cases must in all probability be involved; as, for example, in the case of a madman who struck another patient in the Cambridge Asylum behind his ear and felled him to the ground. Death followed almost immediately. There was no external sign of injury, but a clot of blood was found filling the fourth ventricle and spreading over the base of the brain.

This opinion has been promoted by another delusion—for I cannot help calling it so, although still held by some members of the profession—which is this: that persons of a certain configuration are prone to apoplexy. It is said that the pattern of body which is most prone to apoplexy is denoted by a large head and red face, shortness and thickness of the neck and a short stout squat build. This remark is as old as the time of Hippocrates. Hippocrates and those I quote are very good authorities, and it might appear presumptuous to differ from them; but the difference of opinion lies probably in the explanation of the cause of death. What did they observe? That such persons as just described died suddenly. True, and, according to my showing, the very proof that they were not apoplectic. The mistake has arisen for two reasons—first, the error as to the cause of death, more extended observations telling us that the suddenness of the death must have reference to the heart; secondly, the error arising from mere vague impression. Thus, a man with a red face is thought to have more blood in his head than a pale one, and therefore it is always ready to burst out into his brain. You know very well that a man with a red face has no more blood in his brain than another; it is a mere idle fancy; it is the associating two things together, in our imagi-

nation, which have no real connection. It is like the association of hydrophobia with the dog days, these being named after the star Sirius which is to be seen in our winter nights; or the erroneous belief that fever is most prevalent in summer. The fact is, that blood is poured out in the brain because a vessel has burst. The person in whom the vessels are diseased is consequently he in whom apoplexy is most likely to occur. Such a person is often pale and thin, with a long neck. I knew a gentleman some years ago who had such an extraordinarily red face that some young friends disliked to walk in the streets with him lest he should die of apoplexy; his face was of a deep purple hue, like a ripe gooseberry, ready it was thought to burst and let out the contents. This gentleman died of heart disease.

Diagnosis from Embolism.—This is generally made out from the circumstances under which the attack occurs; for example, if a patient with known heart disease be attacked with hemiplegia we naturally look to the heart for the cause, and much more if the patient be still a sufferer from a recent endocarditis; or if we are called to a patient previously unknown to us, who has had a fit of paralysis, and we find on examination that he has a cardiac bruit, we premise that the cause of the attack may be embolism. But other circumstances, as well as the nature of the attack, assist us in the diagnosis; an old person, the known subject of Bright's disease, would, in all probability, be a sufferer from a change in the blood-vessels, whilst this would be less likely to exist in a younger person. Then, again, the suddenness of the attack would be in favour of embolism rather than sanguineous apoplexy, for the fibrinous clot carried into the vessel and plugging it immediately renders the part of the brain which it supplied functionless, whereas effusion of blood, as a rule, takes place more slowly, and the effects on the brain take a longer time to be produced. Then, again, it is found by experiments that the left middle cerebral artery is more liable to be plugged than the right, consequently a right hemiplegia would more likely be due to embolism than a left hemiplegia; but whether this is true in the human body I am not quite sure. Again, this artery not only supplies the greater part of the corpus striatum, but the convolutions over it, and therefore, if plugged, the additional symptom of aphasia is likely to arise. Thus it is that this symptom is so often met with in embolic hemiplegia. It might be thought that unconsciousness would be less likely to occur in embolism than in sanguineous effusion; but this is not always the case, for although it is true that there is often complete coma in large effusions from rupture of small vessels, as in ingravescent apoplexy, the unconsciousness and mental confusion

are often less than in embolism. There may be some difficulty in explaining this, although the fact appears to be as I have stated. It may be that the circulation through a larger part of the brain than is directly supplied by the plugged artery is for the moment disturbed, or that in consequence of the sudden obstruction it undergoes some kind of œdematous swelling. You will see, however, that the very hasty opinion sometimes expressed that a paralytic attack is due to hæmorrhage on account of its suddenness will not hold, since the very suddenness is rather a sign of its embolic nature. Embolism or plugging of the vessels by no means necessitates the detachment of a vegetation from the valves of the heart, since it may occur also in various blood diseases. I have seen several examples of it in typhoid fever; at least this has been the supposed cause of temporary hemiplegia and aphasia.

You must remember that the effects on the brain by the plugging of a blood-vessel are very remarkable. I have just told you of a case where the carotid was tied, and the brain on that side, so far from being anæmic, was intensely congested; and the same occurs when a smaller vessel is blocked by a fibrinous embolism. If the brain be seen a short time afterwards, the portion of it supplied by the blocked artery is red from stagnant blood. It seems almost as if the vessels beyond the point of obstruction, becoming for a moment emptied, subsequently, by a kind of suction or exhausting action, drew the blood back from the veins into the affected part, and there retained it in a stagnant state. In these cases of embolism sometimes a rapid recovery takes place; this is no doubt due to the circulation of blood being restored by means of anastomosing vessels, sometimes by the channelling out of a new path through the obstructed vessel. If the recovery do not soon occur, *i. e.* in two or three days, a softening may take place in the affected part of the brain. But, very remarkably, the result is not always a softening, but rather a hardening, for, from the blocking of the vessel, a firm mass may be formed, as in the embolic impactions of the spleen. Since these results have not always been followed by an obstruction of a vessel, as in ligature of the carotid, it has been thought that the softening did not arise so much from the diminished blood-supply as from an injury to the vaso-motor nerves which accompany the blood-vessel; but this idea is quite conjectural.

I have been speaking of embolism of the middle cerebral artery, but, of course, the symptoms would vary according to the particular vessel which is blocked. Thus, if the posterior cerebral were the one involved, sight might be affected, since this vessel supplies the corpora quadrigemina. A few such cases have been recorded, and a temporary blindness has resulted.

The effects of obstruction of vessels by an embolism elsewhere are worth observing, as showing what may occur within the skull. In a limb, embolism, as you know, may cause gangrene. In two cases where the femoral was blocked the patient was seized with sudden and intense pain; the leg got cold and almost powerless. After some days the circulation returned. In a case of obstruction of the aorta the patient was almost paraplegic.

Treatment.—Now, first of all, as regards bleeding. I will make some general remarks with respect to this, as it will save me much repetition. This was once the universal remedy; now it is all but discarded. How do you account for this? You must ask the older members of the profession, who at one time practised one method and now another. If you do you will receive for answer that disease has changed its type; that fever was different half a century ago from what it is at the present day; that pneumonia was different then from what it is now. But how about this disease which we are considering—apoplexy? Is the bursting of a blood-vessel different now from then? in answer to this it will be said that the type of disease not only has changed in its own inherent nature (whatever a disease is *per se*), but that the patient has also changed; there is no longer that vigour of constitution which formerly existed amongst us, and therefore, although apoplexy cannot have altered its character, the sufferer is a different man. You have often heard me express my opinion about this doctrine of change of type: I do not believe it. I have read descriptions of disease in the works of our older authors, and I fail to discover the difference between these and those of modern writers. Then, as regards any impoverishment or deterioration of the human race, there is no proof of this. When a handful of men the other day reconquered India, how could we believe in the diminished prowess of our countrymen? You may remember that in Shakspeare's Henry V, the king, speaking on the day of the battle of Agincourt, exclaims—

> This day is called the feast of Crispian.
> He that outlives this day, and comes safe home,
> Will stand a-tiptoe when this day is named,
> And rouse him at the name of Crispian.

Now, it is very remarkable that on that very day of November more than four centuries after, there was fought the battle of Balaclava; and I would ask whether our soldiers showed they were the degenerate descendants of the conquerors of Agincourt when came the cry—

Forward, the Light Brigade!
Was there a man dismayed?
Into the valley of death
Rode the six hundred.

As the question turns so much upon the subject of bleeding, I have taken the pains to inquire whether the results were different some years ago than at the present time, but I cannot learn that they were. I know that people receive severe injuries, and lose pints or quarts of blood, and that the surgeon treats the matter with indifference. And, as regards the effects of bleeding formerly, I have often asked the late Mr Monson Hills as to his experience when persons came here, especially at the "spring and fall," to be bled by the dozen or twenty every morning. I had supposed that they would walk in and as quietly walk out after the operation, but he would answer, "No such thing;" they very commonly fainted, and they might be seen lying in rows on the surgery floor like so many slaughtered sheep.

I have read much of what has been said about this change of type, and I am still waiting for a single good fact to substantiate its truth. What are the probabilities in favour of a change of type rather than of a slight error in observation, and what are the arguments used in support of it? They are these: When one of our profession is said to treat his cases differently now in his old age from what he did in his youth, he exclaims, "My principles are not changed; nature has changed! I used then to take a few ounces of blood from my patient with fever or pneumonia, and now I give him a few ounces of wine instead; the majority recovered then, and only a few die now. Surely disease has altered its type." The fallacy of this lies in the undue preponderance given to the influence of medicines; and shows, therefore, to us how important it is to study the progress of disease uncomplicated by our interference, and to pass unheeded the contempt occasionally thrown on the truly scientific procedure of the study of the natural history of disease.[1]

The question of bleeding, then, I discuss with no reference to any fanciful opinions about the change in type of disease. I believe an apoplectic man, if it be thought useful, will bear venesection at the present time as well as he could half a century ago; and what is fifty years in the world's history? If I can show you that patients benefit now by bleeding, I suppose we must conclude

[1] So difficult is it as years increase upon us to give a fair judgment on the past and present, that we see one of our most esteemed physicians, now retired from practice, declaring that the treatment of disease has been retrograding during the last twenty years.

that the type has altered once more. I am not, however, going to do this, for I have little experience to guide me as to its use in many cases in which it was formerly practised. If you read the older writers you will perceive that they did not discriminate between the general effects and the local or mechanical effects of bloodletting. They had a notion, which is opposed almost universally to the doctrine held at the present day, that inflammatory diseases, including fevers and the pyrexiæ, were due to increased vital actions going on in the body—that the blood was too much in quantity, too rich, or too stimulating. Consequently disease was to be "knocked down" by bleeding, purging, blistering, &c. When, therefore, a man was bled on suspicion of an inflammatory attack, and this did not reveal itself, the conclusion was that the disease was arrested. It is difficult to form an estimate of such cases; but when you read, on the other hand, of the doctor being called in to a patient sitting up in bed or in his chair, purple in the face, and gasping for breath as if every respiration would be his last, and you read how the doctor took out his lancet and bled the patient *pleno rivo*, the face meanwhile resuming its natural colour, and the breathing becoming tranquil, you can have no doubt of its efficacy. In this case you will perceive that the lungs were gorged, the right side of the heart loaded, and that the lancet came just in time to disencumber the overburdened organs, so as to allow them free play again for their functions.

The effects for evil or for good of venesection, having for its object the arrest of inflammatory processes, have not been ascertained with sufficient accuracy to warrant me in offering an opinion as to its value. I have seen, however, a sufficient number of cases bled to know that it is not a very fearful measure. In fact, if I were obliged to adopt one method only—that of venesection, or brandy-giving—I know which I should prefer.

It has fallen to my lot to have seen three patients with typhoid fever bled, and it is remarkable that they all got well. It is very extraordinary what importance we attach to the artificial withdrawal of a few ounces of blood; and yet we see our patient with typhoid fever have a large hæmorrhage from the bowel, and we have but little fear. The surgeon also treats his cases of fractured skull and fractured leg without much regard to the pints of blood which have flowed away.

When I refer, however, to bleeding as a means of relieving engorged lungs and heart, I can speak with some certainty and authority. I have no hesitation in saying that I have saved patients' lives by this treatment, the diseases in which I have adopted it being bronchitis, heart disease, apoplexy, and epilepsy. Now,

you must remember that the indications for bleeding in these cases are very different or very opposite to those which would suggest its employment in the class I have mentioned, and it is owing to this being not rightly understood that the practice is not more frequently adopted. A patient was formerly bled because his pulse denoted an inflammatory condition—it was full and hard. The tradition has descended to us; and thus at the present day, when, meeting a medical man in consultation over a case of chronic bronchitis, I have suggested the propriety of bleeding, he has often said, "I dare not; the pulse is scarcely to be felt, and the patient is dying. The removal of a few ounces of blood would be the finishing stroke." Herein lies the error. If bleeding is of use in the cases I name, it is to relieve congestion of the lungs and heart. And it is especially in severe cases of bronchitis, such as we have seen this last winter, that I would recommend it. You see your patient sitting up in bed, face, tongue, and lips blue or purple, and the jugular veins starting out of the neck, and often visibly pulsating; the heart beating quickly, and perhaps with a tricuspid bruit, indicating the gorged right heart and obstructed lung; the veins in the body are full to bursting; the heart can scarcely work longer, as it cannot get rid of its blood, and yet all the while little passes into the left ventricle which again meets with an obstacle in its action by the engorgement of the entire capillary system. The pulse is consequently, as you might expect, very small, very weak, or scarcely to be felt. Because this is its character the doctor dares not bleed. He thinks he is to feel the state of the artery in order to know if the venous system wants emptying, and rejects the proposal for bleeding, because the pulse is of the character I state. It is exactly the pulse, joined with the other indications, which points to the remedy.

In short without discussing it further, if you take away blood from such a person, you relieve the heart and the lungs, the circulation becomes freer, and the pulse improves in fulness. Many years ago I was asked to see a little boy suffering from bronchitis after hooping-cough. He was lying half raised on a pillow, gasping for breath, his face livid, eyes starting out of his head, and the superficial jugular making itself most apparent. The medical attendant and myself looked at this vein, and, in spite of the protestations of the father, opened it, and let out a few ounces of blood. The lividity passed off, the child sank back on the pillow into a tranquil sleep, and from that time recovered. You must make no comments upon the valves at the commencement of the jugular veins, for, in spite of these, the blood will run out in abundance.

Many of you in this room saw the case of epilepsy which one of my clerks bled a few months ago. The man was a strong agri-

cultural labourer, and came here suffering from severe epileptic fits. One day, on going round, we were informed that he had never been out of a fit for four hours. We found him lying in bed with constant convulsive movements, but the most striking condition was the engorgement of his lungs, his labouring heart, and increasing lividity of the surface of the body. I requested that he should be bled, and one of you, wishing to do well at his first attempt, or from the lancet being over sharp from disuse, fulfilled my object to the utmost; the blood poured out in a torrent; the face rapidly became pale; the man opened his eyes and spoke for the first time since the morning, the interval having been a blank to him. The effect was one of the most striking that I have ever witnessed, and it is worthy of note also that he had no fit for a long time afterwards. Since this case was given in my earlier lectures I have had several of a like kind, especially epileptiform uræmic fits. In one case of a lady, who had been in convulsions for several hours, and was quite livid, with cold hands and feet, and almost pulseless, the withdrawal of two pints of blood immediately relieved the symptoms, and she is now comparatively well.

In heart disease, the expectoration of blood when the lungs are apoplectic affords often the greatest relief to the patient. The practice has been too often to give remedies to arrest it, but the beneficial effects of the hæmorrhage to the sufferer, in spite of our vain attempts at prevention, have been so striking in two or three instances which I have witnessed that I cannot do otherwise than direct you to let nature take her course. In these cases I have sometimes bled with the greatest advantage.

Finally, I come to the subject which suggested these remarks, the treatment of apoplexy by bleeding. It was recommended, and is so still by some, for the reason that it diminishes the amount and force of blood in the system, and so tends to lighten the pressure within the cranium, and also because it prevents the tendency to subsequent inflammatory action. I have always felt some difficulty in accepting this explanation, because, if of any use towards the object named, it ought to be performed at the onset of the attack; this, however, is the time when the the patient is collapsed, and you are recommended to give a stimulus, which, indeed, often appears to be absolutely necessary. After reaction sets in, I believe bloodletting is often useful; whether it acts by diminishing the flow of blood to the brain is doubtful, but by relieving the congested lungs it is often highly beneficial. The patient often dies directly through the lungs; if, therefore, you can relieve them and give him a few hours' respite, you might just get him over the critical moment. The cases in which we read of immediate cure by bleeding I should think

were really those of epilepsy. Once more, then, bleeding in order to relieve congested lungs is highly useful, but whether of advantage as one of the old antiphlogistic remedies to combat inflammatory disease I am uncertain. I could not inform you of its exact value unless I had statistics before me.

It is one thing to recommend you to adopt a method because it forms a part of a given routine plan, and another to exhort you to the use of particular remedies, because experience and a discriminative trial have found them useful. Thus, if you are called to see a person seized with an apoplectic fit, and you find him collapsed, you administer stimulants, which, under the circumstances, are necessary. If you see him at a later stage, when the coma and stertor are present, I have no objection to your bleeding him if other circumstances permit. At the same time an endeavour according to old theories is made to withdraw the blood to distant parts, and thus mustard poultices are placed around the calves, and a blister is applied to the back of the head. I sanction the custom because it is expected that the doctor will do something, but in all probability it is quite useless. The next thing is to give a purge, such as calomel or croton oil. I think all are agreed as to the beneficial effect of aperients; indeed, in a large number of cerebral troubles, purging is of the utmost value. Then, if the patient recover, it is the fashion with some to give mercury to prevent inflammation. I have seen this adopted on several occasions, and I cannot say that I have seen the slightest good accrue; on the contrary, it has tended to weaken the affinities of the cerebral tissues and promote their disorganisation. I do not know that mercury has any effect in arresting inflammation. It is a drug which appears to act on all the secretory organs of the body, and thus promotes various physiological processes. Consequently, it will often cause the absorption of inflammatory products already poured out. During convalescence the question of lowering or supporting treatment is all-important, but must depend on circumstances. I lately saw a man lying in bed totally hemiplegic two weeks after the seizure, and pursuing the old-fashioned antiphlogistic plan. His condition suggested an opposite method, and being put on a mutton chop and pint of porter for dinner he began rapidly to improve. The recuperative process required further aid from nourishing diet. It is a common practice to apply cold lotions to the head, but then the same thing is done in arachnitis, in fever, or delirium tremens—indeed, in all cerebral disorders. It is impossible that a universal plan can be either rational or useful. Galvanism is beneficial after some weeks have elapsed since the attack. The continuous use of this and faradisation for a lengthened

period preserves the nutrition of the muscle, and is therefore often of great service. A large number of cases of hemiplegia pass yearly through the electrifying room, and Mr Sandy thinks that about half of them receive considerable benefit. I have never more than once ordered a shock through the head, as I consider the experiment a hazardous one. Many years ago Marshall Hall made some observations with respect to the effects of galvanism in various forms of paralysis, and stated that this agent was powerful in cerebral paralysis, but not in spinal paralysis. Although in one sense both forms are spinal, there is a great difference between that resulting from disease in the corpus striatum and that originating in the grey centre of the cord. In the former case, as in ordinary hemiplegia, the nutritive centres of the nerve are not involved, and the muscles react to both kinds of galvanism; it is very different, however, in spinal paralysis.

Heat Apoplexy or Sunstroke.—This has been recognised from all time, as we read that the husband of Judith died of it: "And Manasses was her husband, of her tribe and kindred, who died in the barley-harvest. For as he stood overseeing them that bound sheaves in the field the heat came upon his head, and he fell on his bed and died in the City of Bethulia." Opinions have varied considerably as to the nature and causes of coup de soleil, but of late much weight has been attached to the observations of those who have taken the trouble to more closely watch the phenomena, and more epecially to note the increased temperature of the body. This rise of temperature has been so repeatedly observed, and the symptoms accruing from excessive heat are now so well known, that there seems little doubt that all the phenomena of sunstroke are due to the effect of its sudden increase. It must be remembered that one of the most remarkable facts in the animal economy is the constancy of its temperature, even to the fraction of a degree. Whether we eat much or little, take exercise or remain at rest, live in a tropical or temperate climate, the result is the same—our temperature is uniform. It is clear, therefore, that as we are producing more heat at one time than another, and losing unequal amounts at different times, there must be a regulating power in the body which preserves the normal standard of warmth. The balance is supposed to be regulated by the spinal cord. Injuries of this part destroy the equilibrium, and cause irregularities of temperature. In various morbid conditions, such as rheumatism, a hyper-pyrexia may suddenly occur, and which can only be accounted for by some sudden change in the nerve centres. This high temperature is incompatible with life, as the blood and muscles undergo a change, and the capillaries become filled with the débris of the disintegrated tissues. Exactly as the

process may be watched in the human body in disease, so in the same way it may be closely imitated in animals by exposing them to great heat. The temperature of the body is in health kept down to the standard mainly by the evaporation from the surface through the perspiration, and we can thus easily see the danger to which we are exposed should the atmosphere be unable to carry off the superfluous heat from the body.

In the coup de soleil, as it occurs in India, the patient often suddenly falls down in a kind of syncope; this is probably due to the effects of the heat acting directly on the spinal centre, and so giving a shock to the heart. A reaction then occurs, and all the symptoms of pyrexia develop themselves: as hot skin, red face, quick pulse, and a rise of temperature to 108° or 110°. As all these symptoms are the result of increased temperature, a heat stroke may occur in the night as well as the day. Half of the patients die who are struck down by the heat, and those who recover often remain for ever after the victims of an impaired nervous system. They suffer in various ways from cerebral symptoms—irritability, impaired memory, headache, mania—or become confirmed epileptics. An example of the worst form of heat stroke is seen often in stokers who have been engaged in the engine-room whilst their vessel has been in the tropics. They suddenly fall down, become pale, and if not removed speedily die. In slower cases of heat stroke there is gasping, commencing stertor, convulsion, and in a less degree of exposure, headache, restlessness, giddiness, anxiety, and other symptoms, giving evidence of a disturbance in the cerebro-spinal centres. Sometimes a temporary hemiplegia or paraplegia has been observed. Sir J. Fayrer says that the appearances after death are a gorged venous system, and viscera full of blood, but rarely cerebral hæmorrhage; so that death is not due to apoplexy but to asphyxia. The true nature of the malady is confirmed by the efficacy of the remedy. Just as cold affusions save the life of the patient who has a sudden pyrexia from disease, so in sun-stroke the same means have been found equally efficacious. Quinine has been said also to be a most effectual remedy in India, when speedily used, either in the ordinary way or by the hypodermic method. This I can conceive from its known apyretic properties. Since the thermometer has come into use as a diagnostic agent, and when it has been at hand to apply it, several cases of heat stroke have been observed in London. In one of the late hot summers a lad wheeling a barrow down Fleet Street was taken suddenly ill and carried to St. Bartholomew's Hospital, where he died in an hour. His temperature was ascertained to be 110°. A case is also related by Dr Thompson of a man who having been out

on a very hot day went home giddy and sick with a pain in his head. He was delirious in the night, but arose on the following morning and went out, when he fell unconscious and was taken to the Middlesex Hospital. He was in a state of perfect coma and died in an hour. His temperature was 107°.

In the United States, not only in the southern towns, but in New York, there have been several very severe seasons of sunstroke, or rather heat stroke, for many of the most sudden and alarming cases of death and illness have occurred whilst the patients were within doors. Thus, in August, 1878, we read as follows in the 'Pall Mall Gazette:' "At St Louis, on the 14th of July, no fewer than forty grown-up persons were killed by sunstroke, the heat on that day being the greatest that had ever been experienced. At daylight the atmosphere was almost suffocating in its closeness, and the dispensary was hurriedly fitted up as a hospital in anticipation of what was to follow. As the morning wore on the cases of sunstroke increased with alarming rapidity, and a large crowd collected at the door of the dispensary to watch the operations of the physicians and attendants, who were rushing about in a state of excitement. At about 10 o'clock the venerable Dr C—, editor of the 'Christian Advocate,' sank to the floor whilst at work in his office, and remained for some hours in a critical condition. At 11 o'clock Mr T—, whilst talking to his partner Mr L—, fell flat on the floor insensible. Mr L— ran out for ice, and on his return fell prostrate himself, and although both partners ultimately revived they narrowly escaped with their lives. Business was stopped 'on Change,' and at noon there were fifteen corpses in the Morgue, and at 8 o'clock it contained twenty-six. Several horses also fell dead in the streets."

We are constantly consulted for the effects of sunstroke. I have had several patients who have suffered from epilepsy as a consequence of heat, and one gentleman, who had sunstroke in South America, has had ever since all the symptoms of general paralysis. I will give one case as an example:

CASE.—Captain K— was living at Bombay, having charge of the P. and O. steamers. During the hot weather he became muddled, and for three days was quite lost. The doctor attributed his condition to the effects of heat, and sent him to England. On his arrival he looked like a healthy man, but he had a confused appearance, and on being asked said he felt strange and was quite unequal to business. He went into the country, and continued to improve until the expiration of four months, when he had a fit, a kind of petit mal. He still continued to improve, and again took office in England in the company's service. After another eight months he had a second fit, and at the same time a small hæmorrhage took place in the retina. He now has about two or three fits in a year.

If heat may produce sudden death there is every reason to believe that it might cause injurious effects of a less severe nature, or such as might lead to a fatal result in a few days rather than in a few hours or minutes. There has been a very ancient and general belief in this noxious influence of heat in the case of children, although the subject never seems to have been scientifically studied.[1] I have always been impressed with this since my earliest childhood, on account of a little brother of mine dying of head disease, the first symptom of which was severe headache after playing in the garden on a summer's day, and from the distinct remembrance I have of my father likening the case to that of the Shunamite's son, of whom we read that—"When the child was grown, it fell on a day that he went out to his father to the reapers. And he said unto his father, My head, my head. And he said to a lad, Carry him to his mother. And when he had taken him and brought him to his mother, he sat on her knees till noon, and then died."

The following we regarded at the time as a case of cerebral disturbance arising from heat:

I was asked in the month of July to see a child with Dr Eastes who was suffering, as we believed, from meningitis. The symptoms came on very suddenly after she had been playing in the sun. She remained ill, having convulsions, &c., for some time, when she slowly recovered, leaving her with some weakness of the left arm and leg. She would also occasionally have sudden attacks of her head falling forward. The onset and cause of the complaint was so remarkable that we looked upon sunstroke as the most probable cause of it.

Lightning Shock.—In sudden death from this cause no marked changes are found; the disturbances produced in the cerebro-spinal centres are too subtle to be manifest to the eye. In some cases, however, positive injuries to the body are inflicted in the same way as when a tree is rent by the stroke; and it has been stated that the blood is found coagulated, and that there is no rigor mortis. In a case lately reported (the name of the author I forget), the body was found scorched and blistered on the surface, corresponding to holes burnt in the clothes. The examination was made eighteen hours after death, and the rigor mortis was well marked. The left ventricle contained a small quantity of dark fluid blood, and the veins contained a similar kind of fluid. There was no coagulum anywhere. A woman was once brought to the hospital, collapsed and insensible from the effects of lightning; after three days she began to speak, and on the fifth day was again quite well. In a

[1] Dr Gee has lately studied this affection and given it the name of *phrenitis æstiva.*

similar case of which I have heard, a woman was struck down and found lying cold and speechless; she soon afterwards came to, and then some febrile action occurred. In less severe shocks patients have experienced pains and strange feelings in the body and limbs.

Of this I was a witness lately whilst staying at Oberammergau to see the Passion Play. During a violent storm on Thursday evening, whilst I was standing opposite the church, the lightning struck the steeple, and at the same time knocked to the ground a man who was near. He was picked up in a state of insensibility and carried home, when it was found that his left arm and leg were paralysed. After a few hours he had recovered so far as to move his limbs, and in a few hours he walked. On the Friday he walked into the village with a stiff leg, and said his arm and leg were benumbed. On Saturday he was better, but he was unable to join the band with his violin in the Sunday's performance.

Sometimes very remarkable effects are produced by lightning-stroke, as in a case reported to the Clinical Society in 1878, by Mr Wilks, of Ashford. A man was at work in Romney Marsh, and standing near a tree during a thunderstorm. A flash came and struck the man and the tree; the latter had its bark stripped off, and the man was found lying naked on his back two yards off calling for help. His clothes were strewn about over the field. These were torn into shreds. His trousers, which had been pulled from him, were hanging in threads; his vest and stockings were torn across, and his boots, which had been dragged off his feet, were also split; his watch and chain were fused. When he arrived at the hospital he said he had never lost his consciousness, and felt nothing but a sensation of heat all over him. His eyebrows were burned off, his beard scorched, he had abrasions all over the body, a severe laceration on one leg, and a fractured tibia of the other. He slowly recovered from the shock and the effects of the wounds. The electricity appeared to have passed over the surface of the body, injuring the skin, stripping him of his clothing, but not touching any internal parts.

INFLAMMATION OF THE BRAIN

The next subject we come to is inflammation of the brain. A difficulty arises at the onset as to the interpretation of the term as used by authors and by medical men generally. It must be self-evident that inflammation of the brain cannot be treated after the simple manner of inflammation of the lungs, for, in so complex an

organ as the brain, the symptoms must vary immensely with the part affected, as also with the cause. In other organs we make a division into the inflammation of the substance itself, or of the viscus and its covering—for example, pneumonia and pleuritis; but an inflammation of the membranes of the brain alone, without involving the cerebral structures, is almost impossible. Such a term is a misnomer; the symptoms, indeed, which are ascribed to it imply an involvement of the brain itself. Since, however, there is an affection where the membranes seem to be especially or primarily involved, to this the general term meningitis can be applied; of this several varieties may be noticed. On the other hand, there is an inflammation of the brain proper, followed by softening and, in certain instances, by abscess; to this the term cerebritis or encephalitis can be applied. What I should have preferred would have been to take distinct pathological processes, examine them separately and the symptoms accompanying them, and subsequently discuss those cases where no distinct morbid changes have yet been discovered. As, however, we cannot ignore the terms in common use, I am forced to treat the subject in a manner different from what I should have desired.

Cerebritis and Softening.—As one of the chief results of inflammation is softening, and as this may arise under a variety of circumstances, I think it will be as well to allude to this first. Softening —or *ramollissement*, if you prefer the French term—is used in a very vague manner. Generally, when we say softening is present, we mean a chronic change has taken place in the brain substance, whereby it has become disintegrated, and its function lost. But softening, as a result of inflammation, may be acute, and be developed in a few days. Such a case we ought not to designate by the name of softening, but by that of cerebritis or encephalitis. In all acute inflammations the tissues become soft, but we should not, therefore, name the disease after one of its effects. We should not, for example, call pneumonia a case of softening of the lung. In the case of the brain, however, we are often compelled to speak of the result as if it were the disease itself, being altogether ignorant of the cause, not only during life, but even after death; a doubt even then existing whether the softening be due to inflammation or be the result of a chronic disintegration from a change of nutrition. Then, again, besides these actual and tangible forms of softening, we are using the term in the vaguest possible sense as applicable to a great variety of symptoms. Thus, when a person becomes a little feeble in his mind, and has some slight paralytic symptoms, we often say the patient has softening of the brain, intending only to express the idea that some impairment has taken place in the cerebral structure,

and not necessarily a change like that of softening, which is visible to the naked eye.

There are, no doubt, a large number of changes going on in the living brain whose effects are at once perceptible by some alteration in the working of the machine, expressed by some physical or mental failing, which in any other organ would not be manifest. A slight structural change, for example, in the liver would not be apparent, except perhaps by some general feeling of *malaise*, but in the brain this would at once evince itself. What these changes are and how associated with distinct symptoms we have yet to learn. I hear sometimes the remark made that morbid anatomy has taught us enough, and that all we want is some medical philosopher to arise to generalise from our facts and supply us with theories; but I think I am in a position to say that our facts are meagre or scanty, and that we are only in the infancy of the science of cerebral disease.

As regards the softening—this tangible softening, with its evident symptoms—we have been in the habit of expressing the difference between a chronic form resulting from decay or degeneration and that arising from inflammation, by styling them white and red softening. You are familiar with the terms red softening as denoting inflammatory, and white as meaning a more passive or atrophic change. If, however, red softening does result from inflammation, then it would be more desirable to at once designate it inflammation of the substance of the brain, or cerebritis, or encephalitis; but the reason, as I before said, why we cannot do this is that it is only in exceptional cases that this inflammatory process is evident as an acute and idiopathic process, and thus we are obliged to speak only of the effects. In the majority of cases the softening is chronic and associated with other disorders. If the softening be of a red colour, we call it inflammatory, the redness being due to the greater vascularity. We are influenced also in our decision by the age of the patient, and by the circumstances connected with the illness. In older persons, and especially where the arteries are diseased, as in morbus Brightii, we expect to find rather the white or non-inflammatory softening.

Suppose we make a post-mortem examination and find softening, how does it display itself? In some cases, when you make a section through the organ, you see the hemisphere presenting a peculiar appearance in the medullary matter; a certain portion, more or less circumscribed, looks and feels pulpy, resembling somewhat a piece of blanc-mange. As a rule, however, it does not look smooth, but it is disintegrated, and thus, if a section be made, it shows a broken surface. When you pass the knife through the substance

it sticks to the blade, and if you stir it about you can make it into a pulp or paste. If merely a number of softened spots were present these would be apparent, when you made the section, by an equivalent number of broken surfaces.

If the softening has proceeded a stage further, then the brain matter may be quite broken up, or be semi-fluid, and, a portion of this running off, a depression would be left. If a stream of water be allowed to trickle upon it, the brain matter may be washed away, and a distinct hole be left corresponding to the softened part. Sometimes even during life disintegration and absorption occur, so that, when you make a section of the hemisphere, you find a large hollow space filled with a fluid like lime-water and the *débris* of brain substance. All these cases where there is actual loss of substance come under the category of white softening. They arise in connection with diseased vessels and general decay. In the red or inflammatory softening the disintegration is not so great. Besides these two kinds some authors have spoken of a yellow softening which they surmise to be of a peculiar kind and due to a chemical change going on in the fatty acids of the brain. In some of the best marked cases, however, which I have witnessed, I have considered that the yellowness is due merely to an altered condition of the colouring matter of the blood which has been present in it.

Then, again, showing how difficult it is to decide by the mere colour whether the softening is inflammatory or not, if we take the case of acute hydrocephalus or tubercular meningitis, we know that there is an inflammatory exudation into the ventricles, and that the central parts have undergone a remarkable softening; the septum lucidum and fornix and adjacent parts are broken down and diffluent, but they are perfectly white—milky white. So marked is this that those who maintain that a structure must be red to indicate inflammation would say that this central softening of acute hydrocephalus was due to a simple death or atrophy of the part, or had occurred fom the presence of so much fluid, which had, as it were, melted it down. Of this there is no proof, but there is evidence that the change is inflammatory. You no doubt might think that the microscope would positively inform us as to whether a softening was inflammatory or not, but I am sorry to say it does not do much for us in this respect; for when the cerebral structure is broken up, and a number of new products are present, it is extremely difficult to say whether inflammation has anything to do with the process or not. The microscope is extremely useful in proving the fact of softening, because, besides the broken nerve tubules, it displays a quantity of new formations, such as granule masses, which, to say the

least of them, are morbid. It often happens that we wish to know whether a part of the brain has undergone a morbid softening or not, and by using the microscope and finding these bodies we are sure of the fact.

Softening is most commonly localised, whether it be due to an acute or chronic cause, although occasionally we find large portions of the cerebral structures affected. In cases where there is much disease of the blood-vessels, spots of softened tissue may be found throughout the whole brain, and in the much rarer cases of acute encephalitis nearly the whole cerebral structure may be found to be undergoing disintegration. In cases of this kind destruction of so large a part of an important organ will, of necessity, very speedily bring about a fatal issue, but in instances of local inflammation and softening life may be prolonged for many months, and ulterior changes result; one of the commonest is for the brain tissue to perish until a mere vacuity is left, containing a whitish fluid with remnants of blood-vessels. In some cases this cavity is lined by a smooth and tolerably thick membrane. Should the inflammatory process proceed to the stage of suppuration, then an abscess is formed. This may or may not be contained in a cyst. The latter, under these circumstances, is not merely a thin delicate membrane, but a thick, firm bag, composed of tough lymph. A very important question, whether idiopathic inflammation of the brain ever ends in suppuration, you have heard discussed on other occasions—whether, indeed, a cerebral abscess does not signify either that the morbid process has been started in the cranium, or that it is pyæmic. The question has a very wide pathological significance, referring, as it does, to the mode in which the various tissues of the body undergo their own peculiar modification in disease, but to this I shall have to refer again.

For the sake of convenience inflammation of the brain may be divided into a *general* cerebritis and a *local* cerebritis, and these again into the *acute* and *chronic* forms. In all these varieties the usual result would be a softening of the tissue, but in some cases the inflammatory products are organised and an induration takes place; this receives sometimes the name of *sclerosis*. Of course, there is no reason why induration and softening should not be associated, as they often are. Patches of sclerosis are often also designated by the term *grey induration* or grey degeneration. If circumscribed, the inflammatory product is scarcely distinguishable from a new growth or tumour. The softening, as before said, is usually styled red and white, and these terms are often considered to be synonymous with inflammatory and non-inflammatory softening. This is not, however, always evident, since the redness is due only to a stagnation of blood. The yellow softening is, in all probability, only a further stage of the

same process, where the red corpuscles are broken up and some fatty degeneration has taken place in the substance of the brain. In chronic degeneration of brain tissue we find broken-up nerve tubules, granule-masses, and amyloid bodies. Now this might have been inflammatory in the first instance, and therefore there are undoubtedly many cases where the red, yellow, and white softening are merely stages of the same process. In all probability the local softenings in old age are due to disease of the blood-vessels arresting the flow of blood or causing the plugging of an artery by means of fibrin formed at some atheromatous spot. The condition of brain is, therefore, analogous to a limb in senile gangrene. As I have already told you, although a vessel may be quite blocked, the brain tissue beyond it is of a red colour, owing to the reflux of blood into it, and sometimes a hardened mass is formed instead of a softening. Not only is there a stagnation, but small effusions of blood sometimes take place into the tissue. Although the red softening occurring under these circumstances may not be clearly distinguishable from the acute inflammatory form, as the redness in both is due to hyperæmia, I would not say that they were identical, seeing that the causes which are instrumental in producing them are different. Besides the well-known effects of emboli in the larger vessels there can be no doubt that the smaller ones become plugged, giving rise to less defined symptoms, as delirium, wandering, &c. In cases of ulcerative endocarditis I have seen aphasia without paralysis, suggesting an implication of special convolutions: and the same also in typhoid and other diseases. The plugging of the vessel is due in the cases first named to a coagulation of blood on a roughened surface of the artery, and this leads to a complete blocking of all its branches with fibrin; this must be distinguished from the case of embolism, where the fibrinous mass is carried from the heart. The former is merely atheromatous, and we endeavour to judge between it and embolism by the presence of endocarditis, the age of the patient, and the suddenness of the symptoms. When the smaller vessels are plugged, leading to a more diffused softening or spots of softening, the case is very obscure, but it is very likely that many anomalous cerebral symptoms are due to a plugging of the smaller arteries by embolic particles, which are carried into various parts of the medullary and grey substances of the brain. Thus, a girl was under my care for rheumatism, having had several previous attacks and also mitral disease, when one day she was found insensible, and during the following four weeks had paralysis of the third nerve, of the seventh, congestion of the optic discs, and a variety of other nerve symptoms of a most anomalous character. After death there were found ecchymoses of various parts of the brain and scattered spots of

softening. The basilar artery was completely plugged by an embolus, and the superior cerebellar and posterior cerebral were almost obliterated. I might also mention here other and more minute changes which are sometimes met with in the cerebro-spinal centres and whose nature has been explained by Dr Lockhart Clarke. They result from a long-continued congestion of the nerve substance and are met with in tetanus, hydrophobia, diabetes, and some other diseases. He finds a dilatation of the blood-vessels, with a degeneration of the nerve tissue around them, which produces a kind of excavation. Cavities are thus formed, which are visible to the naked eye, and contain extravasated blood, pigment, and products of nerve decay. If these are absorbed simple vacuities remain. This condition is found both in the brain and spinal cord, but more especially in the pons and medulla oblongata.

A general cerebritis, although not so evident in a post-mortem examination, is probably not infrequent; it would be associated, in all probability, with an inflammation of the membranes, and therefore a meningo-cerebritis would be the more appropriate term. The membranes are seen to be thickened; in the meshes of the pia mater hard inflamed lymph may be found; at the same time the ventricles are distended with fluid, and the whole of their surface is in a granular condition. The brain substance throughout has not a healthy appearance or consistence, and the microscope shows inflammatory products and degenerative changes. I have found this condition in connection with cirrhosis of the liver, granular kidney, and chronic pleuro-pneumonia in cases of alcoholism, and therefore I judge the meningo-cerebritis has exactly the same pathology as they have.

I have met with three or four cases where the inflammation has not been confined to the brain and membranes, but has implicated the skull.

Case.—A man, æt. 40, was admitted into the hospital with a history of headache, loss of memory, difficulty of speaking, &c., of nine months' duration. A general torpidity came over him until he became quite unconscious and generally paralysed. A conjectural diagnosis was made. The inspection showed that an inflammation had attacked not only the brain, but the membranes and skull itself. The whole internal surface of the latter was covered with bony granulations, with a roughening of the corresponding surface of dura mater. Arachnoid surfaces adherent in places; substance of brain soft, with an inflammatory cyst in anterior lobe.

A young man, æt. 21, had a very similar disease, where the whole of the surface of the skull was scabrous and adherent to the dura mater. Brain affected throughout, and cyst in cerebellum. He was in bed for months with blindness, deafness, and a general weakness of the limbs. This probably arose from injury.

Symptoms.—In speaking of the symptoms of softening, if you

take the case of acute general cerebritis, they may be of the most obscure character. There would, of course, be severe pyrexia, with delirium, dulness of intellect, and final coma, but perhaps no other symptoms especially referable to the brain. I believe cases of simple general acute cerebritis are not very common. In those which I have seen the nature of the disease was by no means evident during life. A young man was admitted in a condition like that of fever, it being said that this torpid state had gradually come upon him. He lay perfectly motionless in bed, and never spoke, although his eyes were open, and he appeared to understand; he did not live long. After death the brain was found softened throughout; the whole was pulpy, and some parts were actually semi-fluid. I have seen one or two similar instances. In cases of less rapid progress, the cerebral symptoms would be more marked, whilst the pyrexia would be less, and there might be headache, sickness, a slow labouring pulse, constipation, delirium, and gradually approaching coma. In two cases I have seen lately the patient lay in a listless state, answering when spoken to, and then falling into sleep. This sleepiness is especially noticeable. So wanting in character are the symptoms, that the most fatal of disorders has been regarded as a simple functional disturbance; and I have seen the case of a lady in which the phenomena were ascribed to hysteria. According as particular parts of the brain are involved, so would special paralytic symptoms be present; if any portion of the motor tract, a hemiplegia; if the base of the brain, paralysis of the cranial nerves. If the softening should be confined to one spot, then the symptoms would be proportionally limited, just as I told you in the case of sanguineous effusion; if to the corpus striatum or thalamus, a simple hemiplegia; if to the medullary substance, symptoms of the most indefinite character. If it involved the cineritious substance, there would be more remarkable symptoms denoting mental disorder.

Meningo-cerebritis.

Case.—A young woman, admitted February 18th. Father and mother healthy. One brother has had rheumatic fever twice. No history of tumour or consumption.

Personal history.—The first symptom noticed was seven months ago, when she laughed without a cause at her mistress and was discharged for it. She was a nursemaid, but could never bear the noise of the children. On leaving service she kept company with a young man who left her, and this caused a mental shock. Since then she has been strange in her manner. Four months ago she began to suffer from incontinence of urine; this has continued since, and the urine has now an offensive smell. Two months ago she lost the power of walking; she used to be helped upstairs at first, and then carried up. About this time she lost the power of

talking, though she could occasionally speak perfectly well. When placed upright in a chair she would bend over till her head reached the ground. When spoken to she generally laughed. Appetite was voracious six weeks ago; since this she has eaten in the way described under present condition. She has complained of pain and aching in her limbs, more especially when warm in bed. She has menstruated regularly till the last three months; since then only once. No history of discharge from the ears, blow on the head, or severe pain in it.

On admission.—She has taken a journey of thirty miles. Patient is a healthy-looking woman with a good colour in her face. She has a peculiar stupid expression, and when spoken to generally laughs. When asked a question, she seems willing to answer, but unable to do so; she can, however, speak in a slow deliberate tone of voice, and very low. When she eats she keeps the food in her mouth for an hour at a time, and does not seem able to masticate it. She can understand perfectly any questions put to her. There is no paralysis of either side of the face, and sight and hearing are unimpaired. She can protrude her tongue slightly, and it is indented at the edges, and covered with a white fur. Pupils generally dilated and equal, contract with light. There is a want of will in all her actions. Right side of body: When her right arm is placed vertically to the bed she retains it in this position for a great length of time, and can grasp firmly your fingers, but has a difficulty in unloosening her hand. She can write words with her right hand, not with her left. The right side of her body has altogether more power than the left; the leg responds better to reflex action by a prick on the sole of the foot; the left leg also responds, but to a less extent. She cannot hold her left arm up in the same way as the right. The right leg is generally moved over the left when the left is pinched. She has fits of jogging in her right leg; she can feel a pinch anywhere over the body. No heat of skin. She occasionally heaves a deep sigh. Bowels generally confined. She has had no motion while in the hospital. Heart: There is a thrill over the apex of the heart, but the chest walls are very thin. No bruit. Chest: Sounds and resonance normal.

February 20th.—She takes hardly any food while in the hospital. There is a bedsore coming over the sacrum. She is menstruating.

22nd.—Died this morning at 6.20 a.m. Yesterday she could not swallow. In the evening her temperature was 102 deg.

Post mortem.—Head: The falx cerebri was rather adherent to the hemispheres, and on its separation it was seen to be, especially on its right face, thick and finely tuberculated by a yellow gelatinous granulation like a layer of new tissue, and on section of this layer and the subjacent falx, it appeared that the opinion formed as to the nature of the thickening was correct. The falx was unchanged, but lying upon it, more on the right side than on the left, was a layer of granulation tissue. The membranes of the brain in this region were yellow looking, thickened, and adherent to the substance of the organ. This state was most decided anteriorly, but extended back on the right side to the posterior part of the corpus callosum. The arteries of the brain looked quite normal. Elsewhere the membranes were perfectly healthy. They were neither greasy, nor tuberculated, nor opaque. Taking the right frontal lobe between the finger and thumb, it was felt to be decidedly indurated on comparison with the other side, and still more so when compared with other parts of the brain. On section both sides, but especially the right, showed in the frontal lobes that peculiar gristly resistance found in cases of sclerosis. Throughout the whole brain this was more or less the case, but it was especially so at the anterior parts. On removing the upper part of each hemisphere, nearly to the level of the corpus callosum, the cut section showed a

peculiar condition. The whole surface of both grey and white matter from the longitudinal fissure outwards as far as, but not involving, the grey matter of the external convolutions, and from the front to a little behind the fissure of Rolando posteriorly, was of a brick-red colour; this was most intense as far as the anterior part of the longitudinal fissure on the right side, *i. e.* where the granulation tissue on the falx was most decided. The left side, in addition to the red tint, was also soft, but on the right side it was hard. It was also noticeable that the grey matter of the various convolutions jutting into the brain from the longitudinal fissure was nearly twice its proper thickness, swollen out, and it became quite impossible to define the outline of the convolutions, so perfectly did their outer border blend into the red tint of that in the white matter. On both sides the red tint was noticed from the surface down to the roof of each lateral ventricle, and on the left side the roof of the ventricle was very soft. The corpus callosum was soft and the fornix also. The ventricles and other parts of the brain appeared perfectly healthy, the substance was firm, the cut section purplish in hue from engorgement of the vessels.

Examined microscopically the parts over the left lateral ventricle had the usual appearance of soft brain tissue (red softening), *i. e.* numerous granule masses were seen and a general corpuscular state of the brain substance. The tissue from the right side (red induration) showed a remarkable absence of anything like nerve structure, but appeared to consist mostly of vessels and a dimly fibrillated substance.

The medulla, pons, and spinal cord were perfectly healthy.

The parts that were most diseased corresponded with the first and second frontal convolutions. The third was healthy on both sides. The disease extended further back than this in the white substance of each hemisphere, but the greater part on each side would be included in the anterior part of a brain divided vertically across from the commencement of one Sylvian fissure to the other, that is, behind the third frontal convolution on each side.

Weight of brain 45 oz. Venous blood in excess. Other organs healthy.

When this girl was admitted the first impression made on the mind of the clinical clerk was that it was a case of hysteria. This idea was, of course, soon dismissed when the history was taken and the symptoms were more clearly revealed. The first impression, however, was very natural, and gives a clue to the whole character of the case, for it indicates that there were no striking paralytic symptoms present, and that the girl's manner was both lethargic and emotional. In fact, she presented the symptoms which we sometimes see in extreme forms of hysteria. The history, however, showed that her illness began in a tolerably definite manner some weeks before, until she had reached the feeble state in which she was admitted. Then, as the report says, although there was some difference in the degree of power in certain parts of the body, there was no distinct paralysis as the term is usually understood. The inability to move appeared owing merely to a failure of the volitional act.

In true paralysis the spinal system is affected, whilst the will is good, hence the patient is seen to make the greatest effort to move

a leg or arm, although the result may be ineffectual. In disease of the brain proper, or during its functional abeyance in hysteria, it is the will itself which fails; now it was evident that in this girl the power of acting or willing was gone. She made little effort to move, to speak, or even to masticate her food, and she allowed the bladder to empty itself in the bed. This latter fact removed the case from simple hysteria where the patient never allows herself to be inconvenienced in this way. She had not paralysis of the bladder, but simply, as in mad people and in the lower animals, she exerted no intellectual control over it.

The patient had clearly, therefore, some progressive disease of the nervous system, and the question was where was its seat and what was its nature? The absence of true paralysis showed that the spinal system was not affected, and by the spinal system is meant, not only the cord which is contained in the spinal canal, but the medulla oblongata, crura cerebri, and central ganglia within the cranium. The disease, therefore, was in the brain proper; a conclusion quite compatible with the symptoms, which were rather mental than physical. The question then arose whether it was a tumour or a diffused inflammation. The former, as is known, although localised, may produce in an inexplicable manner a disturbance of the whole brain with a corresponding insanity, but at the same time it is usually accompanied by well-defined symptoms, as severe pain, sickness, convulsions, and amaurosis, due to atrophy of the optic discs. It was, therefore, concluded that the disease was of a more diffused nature and largely involved the cineritious matter; it could be none other than inflammation or encephalitis, usually known by the name "red softening." It turned out to be an inflammation, but only a portion of the brain was soft, the greater part of the affected hemispheres being indurated from the effused lymph within them. A considerable part of both hemispheres were structurally destroyed.

In our present state of knowledge it may be affirmed, when a patient has been ill only a short and well-defined time with symptoms denoting a deep implication of his nervous system, and no paralytic symptoms are present, that the spinal system cannot be affected, but the brain proper, viz. the hemispheres. He would of course lie in bed in a lethargic condition, having no will to move. Some time ago a young man lay in Stephen Ward for several weeks in a seemingly torpid state; he never spoke, but his eyes wandered after objects, as if he comprehended every occurrence which took place. After death his whole brain was soft or pulpy.

Cerebritis

CASE.—Henry A—, 48, admitted in December. He was a painter and had suffered from the effects of lead, he had also had once a severe fall on his head and he had been a hard drinker. His history was, that in June, whilst painting, the brush fell out of his hand several times; he went down stairs, and then fell on the ground insensible. He soon recovered consciousness and walked two miles home. About two weeks afterwards, whilst going to his work, he felt pains in his right leg; these gradually extended upwards, so as to affect arm and head. He soon became insensible, and remained so for half an hour. He afterwards walked home, when he found he could not speak and was rather deaf. After being in this state a week his speech and hearing returned. The doctor believed he was going out of his mind. He went to work for five weeks, when a tingling of the left arm came on, and after being at home a month, again went to work and remained at it for seven weeks. He then began to have much more severe symptoms—pain in his limbs and head, swelling of the ankles, dimness of sight, and failure of memory; also great sleepiness. These symptoms continuing he was brought to the hospital in December.

He was in a semi-conscious state, objected to being moved or roused, sight almost completely gone, and could only just discern light; there was extensive hæmorrhage into both retinæ, obscuring the optic discs. There was a slight blue lead line on the gums. He was delirious at times and often lay quite unconscious. The kidneys and other organs healthy. There was no paralysis, as he could move his limbs freely. On January 12th he was much the same, lying in bed in a half conscious drowsy state, sometimes talking, but quite incoherently; the ophthalmoscope showed that central absorption was going on, and the discs had a woolly appearance. At the end of the month he was in an unconscious state out of which he could be roused with the greatest difficulty, and bed sores had appeared. He thus continued and six weeks afterwards he was still lying in an apparently unconscious state, and quite blind. When roused he would sometimes say a word and put out his tongue; he had a fresh hæmorrhage into the retina. No special paralysis of any part. During this time he had been taking the bromide occasionally.

At beginning of March he began to improve; he answered more rationally. Quite blind, pupils dilated and insensible, except when asleep; they were then naturally contracted.

On the 18th of March he was much better and began to eat. From this time he slowly improved, so as to be able to sit up in bed, and answered question put to him quite rationally. On the 26th he got out of bed and walked along the ward. The report of the examination of the eye was that the optic discs were anæmic, veins few and varicose, all blood spots absorbed. It was thought that this was due to a blocking of cavernous sinus. He continued to improve, and walked about the ward and apparently had quite recovered his intelligence. On April 27th he had a convulsive attack, was almost insensible, and his arms and legs twitched. On May 10th had been still improving and sat at table to dinner. On May 11th he had a fit, was convulsed for an hour, and then died.

On opening the skull the convolutions were found flattened and much compressed; this was not due to an internal pressure from fluid, but to an increased size of the hemispheres from adventitious matter. A section of the hemispheres showed the medullary substance infiltrated with a new material, and more so on the right than the left side. Its colour and consistence distinguished it from the cerebral

tissue, being firmer and of a slight grey colour, but in certain spots it gradually passed off into the natural brain substance. In parts where the new material was massed together it could be felt by the finger as tolerably defined from its hardness. It spread through the hemispheres and encroached on the cineritious substance, pushed the convolutions aside, separated them, and absorbed some of them. Many convolutions were destroyed and they thus appeared to be fewer in number, with long distances between them. Until it was evident that a new material had been formed, the first appearance might have suggested an hypertrophy of the white substance of the brain, with an absorption of the cortical part. The great mass of new matter, amounting almost to a tumour, was in the right anterior lobe, encroaching on the Sylvian fissure to outside of corpus striatum. The central ganglia, however, were untouched. Cavernous sinus healthy. A section of the Pons Varolii showed some minute and recent extravasations into its substance.

It was a question whether in this case the disease should be regarded as a cerebritis in which the inflammatory product had become isolated and hard, or whether it was of the nature of a new growth or tumour around which an inflammatory process had taken place. The most remarkable circumstance connected with the case was that the symptoms bore an inverse relation to the amount of disease—that as the one developed the other decreased. The state of brain found after death might well account for his earlier condition when he lay senseless in bed, and it can only be supposed that, though the central disease was progressing, the neighbouring healthy parts of the brain were at the same time recovering from some disturbance which in the first instance temporarily paralysed them.

Case.—A little girl, æt. 14, began to ail about a year before death with symptoms denoting a cerebral cause, and yet of a very undefined character. It was said that she one day fell down and lost her sight, subsequently had headache, and was sometimes sick. She came to the hospital as an out-patient on account of her failing powers both in mind and body. Those who casually saw her believed her to be an idiot. She then came into the hospital, where she lay two or three months until her death. Her symptoms were almost entirely of a negative character; she had ceased to be able to stand, and had very little power in moving her legs. Her arms she moved but feebly and slowly. She had a vacant stare and dilated pupils. She generally lay quiet, making no complaints, and when spoken to smiled. When asked her name, or a simple question, she answered sensibly, but remarkably slowly, so that it was not apparent for some time whether she understood the question, or was able to express herself. It evidently took her a long time, and caused her a great effort to collect her thoughts. The only difference perceived from week to week was that the bodily and mental powers grew feebler. As regards the former, she had no paralysis in the usual sense of the term, but she failed in the ability to attempt any movement. When food was put in her mouth she would cease chewing and swallowing, so that it would remain in her mouth until removed. She could evidently see, and, on examination by the ophthalmoscope, nothing abnormal was discovered on the retina. The skin appeared sensitive as far as could be ascertained. During the last few days of her life she lay with her eyes open; she looked at the nurse, but could no longer speak, although, by a movement of the lips, appeared as if endeavouring to do so. She then became cold, and her feet very livid, and so quietly died.

The diagnosis in such a case was difficult. There was nothing to warrant any other opinion than that the brain as a whole or the hemispheres were at fault. As, however, many cases have occurred where the whole brain has been affected in connection with a tumour, either functionally in a reflex manner, or organically by a secondary inflammation, especially of the ventricles, it was thought possible that a tumour might exist in the hemispheres or cerebellum. There was, however, the absence of the usual symptoms of this condition, viz. violent headache, frequent sickness, and optic neuritis.

Post-mortem Examination.—There was a general meningo-cerebritis. No tubercles discernable in the brain or any part of the body. The character of the inflammation was not of the kind seen in tubercular meningitis. The whole surface of the brain had lost its transparency; the arachnoid was thick and opaque, and in the meshes was a considerable quantity of fluid; this was mostly serous and escaped when the pia mater was torn. In the meshes, however, there was some exudation of a firmer character. This appearance was universal, but rather more on the surface than at the base. The ventricles were very greatly distended with clear fluid; no signs of any inflammatory action except on the fourth ventricle, which was slightly granular. The brain as a whole was firmer than is usual 24 hours after death; it felt hard to the finger, and the septum lucidum could be stretched out firmly without laceration. No tumours or deposits in any part. The most striking morbid condition was the firm adhesion of the pia mater to the surface; in spite of the presence of fluid it was difficult to remove it on any part, and on the surface of the convolutions any attempt to do so tore off the brain substance. Generally the outer cortical layer of the grey substance came off with the membrane, so that the latter when removed was covered with a thin granular layer of cerebral matter. This condition reminded us very much of the similar fact on attempting to tear the capsule from a granular kindey. The bones of the skull were perfectly healthy, nor did there appear any cause for the occurrence of this general chronic inflammation of the membranes and substance of the brain.

In cases of *local softening* the symptoms would depend much upon the seat of the disease; for example, when, as is often the case, the parts supplied by the middle cerebral artery undergo decay, either from disease or plugging of the vessels, the symptoms would be those of a slowly progressive hemiplegia.

Case.—A lady on rising from her bed found herself a little weak in her left arm and leg; being alarmed, she took a journey to rejoin her friends; when she arrived she could scarcely walk up stairs, and her speech was observed to be somewhat thick. On the following day she could not get up, as her limbs were still weaker, and on the next day after that the left side was completely powerless, and her speech so indistinct as to be scarcely intelligible. She then became bodily ill from the onset of feverish symptoms, the skin being hot, tongue furred, and pulse quick. During this time we supposed that an inflammatory process was going on in the brain. After a few days the feverish and constitutional disturbances passed off, so that we concluded that the inflammation was confined to the region supplied by certain vessels. She subsequently got into a fair state of health, having paralysis of the left side and being highly emotional.

Case.—*Softening and atrophy of the brain.* A man was admitted into the hospital in a fit, which was styled apoplectic, and it was thought that he would

shortly die. He, however, gradually recovered from the attack, but for the remainder of his life he was paralysed. After he left his bed he was put in a chair, when it was observed that he gradually grew weaker in his powers of mind and body. He sat motionless the whole day, having a vacant look, and with his arm drawn up across his chest. He never spoke but could protrude his tongue. He continued in this sort of vegetative state until his death, fifteen months after the attack. The autopsy showed that nearly the whole of the left hemisphere was destroyed, its place being taken by a bag of fluid, which was confined only by the pia mater and arachnoid, and which burst when touched. It contained at least half a pint of fluid like lime water. The softening process had destroyed a large portion of the left corpus striatum and thalamus as well as the convolutions on the surface, but the fluid had not broken into the ventricles.

Chronic cerebritis or sclerosis, general and in patches.—There may be yet other conditions which may some day find a place in the category of inflammations; for example, children die with brain symptoms, and, the heads being very large, water in the ventricles is suspected. This is, however, not always found, and then an opinion may be entertained that an actual hypertrophy of the brain has occurred: opinions at present vary as to the possibility of such an event. Then there is an occasional induration or sclerosis of the whole of the brain, as described by Bright in a very remarkable case in his 'Medical Reports.' It was that of a little girl, who for a year before her death, lay in a perfectly motionless and senseless state, with her limbs stiffly extended and without the possibility of making the slightest movement. The white matter of the brain was found after death as hard as soft cartilage, so that the grey substance could be peeled off it, leaving the mould of the convolutions in the white substance. A stream of water washed off the grey matter, leaving the convolutions below on the hard white substance, giving it the appearance of a wax model of a brain. The ventricles looked as if they had been modelled in wax. The white matter passed in streaks into the grey convolution around. The cord was also hardened. Dr Bright regarded the case as one of chronic inflammation of the cerebro-spinal centres. He says also in another case of a child where after various symptoms the arm and leg became quite stiff and often extended quite straight from the side so that the patient was unable to bend it: "I anticipated from the stiffness of the limb that the brain and spinal cord would be in a state of hardness." The post-mortem showed a gelatinous tumour in the Pons, and the cord throughout was very firm, being almost as hard as cartilage.

Dr Norman Moore has described a case of primary sclerosis of the brain in a child. The grey matter was softened by yellow patches. These, in spite of their consistence, were inflammatory, and of a sclerotic character. The child after premonitory vague

nerve symptoms became rigidly flexed in all its limbs. Other cases have also been reported in which chronic inflammation or sclerosis of the brain was associated with rigidity of the limbs. The *sclerosis in patches* is met with generally in connection with a similar affection of the spinal cord, to which I shall have hereafter to refer. They are seen as isolated patches, scattered through the brain substance, and are composed of a grey adventitious inflammatory material.

Extension of disease from ganglia to surface of brain.—As I shall have occasion to mention again, when speaking of diseases of the spinal cord, it is especially worthy of notice that not only are cases of inflammatory disease and softening marked out by the distribution of blood-vessels, but they are dependent upon the anatomical and physiological arrangement of the nerve fibres. Not only is the nutrition of the latter dependent on the integrity of the grey centre, but morbid processes run along them in the direction of their physiological action. This is very evident in the case of portions of the spinal cord, where a spot of disease proceeds in a definite course. I shall have to tell you how the health of a muscle is dependent on the nerve which supplies it, and this again, on the grey centre whence the nerve proceeds. From this centre, again, changes may be found continuous with similar ones in the corpus striatum; and here once more I must tell you how morbid changes in this large ganglion may include similar changes in the convolutions with which the ganglion is connected by means of the corona radiata. Thus it would seem that the ultimate relation between the convolutions and every muscle of the body, as shown by physiological experiments, is corroborated by pathological processes. The point is this—that asociated with local softening in the central ganglia of the brain there are often found corresponding atrophies or degenerations of the convolutions with which they are associated. I have often seen this myself, but the fact has been observed long ago, as you will see by reading the cases of brain disease described by Foville, Bright, and others. In the case just described, the wasting was too great to allow of its being used as an example, but cases constantly occur when, from disease in infancy, a child has grown up paralysed or crippled on one side, and the hemispheres and ganglia on the opposite side have been found atrophied. A well known case is described by Schroeder Van der Kolk of an idiot girl, æt. 27, who was paralysed on the right side from infancy. The left hemisphere was found much smaller than the right, and the space was occupied by fluid. The corpus striatum and thalamus opticus were much smaller than natural, especially the latter. The convolutions were also small, as well as the left crus cerebri, the

left side of the pons, and the pyramidal body; and what was very remarkable, the right lobe of the cerebellum was smaller than the left. The spinal cord was also smaller, especially in the dorsal region, as well as the nerves which were given off from it.

Dr Ogle describes the case of a man, æt. 62, who was of weak intellect since childhood; he had contraction and atrophy of the right arm and weakness of the right leg. After death there was found a large cyst in the brain, which occupied and destroyed about the posterior half of the corpus striatum on the left side and the outer part of the optic thalamus, as well as a portion of the outer wall of the ventricle. I have already alluded to a case of Dr Taylor's where the history clearly points to a blood effusion in the ganglia, and therefore to a secondary softening of the hemisphere.

Other forms of degeneration.—I would warn you against confounding the term softening in a strictly pathological sense with the *popular meaning of softening*. We intend by it a distinct localised process accompanied by special symptoms, whereas the extra-professional signification, according to British public pathology (to use my friend Dr Sutton's expression), is synonymous with a weakened brain, which might have its origin in a hardening as well as a softening.

In cases where a slow degenerative process has been going on throughout the brain, the symptoms would be of a less special kind, and indicative of a general decay of the organ. Indeed, it so happens that in the well-marked cases of softening of the brain the diagnosis is often wrongly made, whereas the term is applied to examples of disease which indicate decay, but not necessarily softening. Amongst our patients we constantly have persons come before us presenting a variety of symptoms indicative of an impaired brain, and, for want of a better term, we declare they have softening. They evince a paralytic condition both of body and mind.

Probably one of the first phenomena you notice in such a patient is his manner of speaking. It is not so much that he speaks thickly or indistinctly, but he answers in a manner which shows that his mental vigour is departing; so far from hesitating in his speech, he answers rapidly or curtly. When a person speaks slowly it may be from a careful consideration of what is to be expressed, whilst a mere hasty flight of words shows a want of this power. Thus your patient answers you in a good-natured way, "Yes, yes, yes," and on questioning his friends you will find such an answer is not correct; it has been little more than the result of an excito-motor action. Of course, if there is much decay in the central parts of the brain, the speech may be indistinct or thick. Then, also, there

may be slight paralysis of the limbs. The patient totters into your room as if he had lost the use of his legs. In a hemiplegia you see patients make an effort, but here he tumbles into your presence. So with the arm; you see him endeavour to take up an object, and his hand falters. Ask him to write his name, and his hand shakes. There may be also altered sensations, as a numbness of the hands and feet, or a complaint of tingling, &c. The patient cannot button his clothes or tie the strings of his dress. There may be also some difficulty with his bladder or rectum. As a rule the emotions are soon disturbed; the patient laughs and cries, as in a hysterical condition. Such a state may go on until one particular part of the brain is destroyed, and then marked paralytic symptoms, such as those of hemiplegia, set in.

It may happen that the friends keep back these symptoms, which they do not care to recognise; or the patient, coming alone to your study, is unconscious of them, and suggests complaints to your mind altogether of a different kind from the real ones, or alludes to certain symptoms connected with his stomach or bowels. He complains perhaps of what he calls bilious attacks or constipation. This is important to remember, because, as age advances and the brain is liable to change, the earliest symptoms may be those of gastric disorder. I have more than once been asked to prescribe for sickness which has been in all probability cerebral, from the occurrence of subsequent brain symptoms. In these cases the vomiting is often very characteristic, being little more than the stomach evacuating its contents without any spasm, pain, or effort on the part of the patient. He eats his dinner, and then, whilst sitting quiet or lying down, the whole of it will return. The diagnosis of cerebral vomiting is aided by the presence of other cerebral symptoms and the absence of any gastric disturbance, as furred tongue, &c.

Treatment of Chronic Inflammation and Degeneration of Brain.

Of course this must turn mainly upon our view of the case. In old people with diseased vessels, where any impairment of cerebral function is seen, good nourishment will be required. In younger persons it is important to consider the question of syphilis or injury, because under these circumstances more active treatment is necessary. In obscure cases also I should advise that you commence with such remedies as mercury or iodide, for now and then most remarkable results may be obtained. But lately I had to see a gentleman, æt. 48, who after sundry other symptoms, such as headache, tottering in his walk, and strabismus was obliged at last to lie up, and a tumour in the brain was diagnosed. He was ordered Liq. Hyd. perchlor., with iodide of potash, and got quite

well. Another middle-aged gentleman had serious nervous symptoms which culminated in the state in which I found him—semi-comatose, with partial paralysis of the left side. He was ordered the same medicine and slowly recovered. In doubtful cases, therefore, of cerebral disease, I think it wise to use these more active drugs.

Meningitis.—Now, what is meant by inflammation of the membranes of the brain? What is meant by arachnitis or meningitis? You will find that many writers and most members of the profession use these as convertible terms, and thus I well remember, when a student, how sorely puzzled I was to unravel the mysteries of such a subject as inflammation of the brain. I believe the term arachnitis was adopted by those who wished to compare this inflammation with that of other inflammations, implying that the exudation proceeded from the arachnoid. Those who did not pretend to assert the exact seat of the process were content with the expression meningitis. I think, however, we shall find some broad distinctions in the seat of the inflammation, with corresponding pathological differences. The first main distinction is between the cases where the inflammatory product is found in the meshes of the pia mater, or is subarachnoid, and those where it is in the arachnoid cavity. The difference is highly important pathologically. The latter always arises from without, the source of the secretion being the dura mater, whilst the former is the only variety which is idiopathic, although it may arise also from injury. Where the effusion is found in the arachnoid cavity, I have adopted the name arachnitis as a term equivalent to the inflammation of other serous membranes; and, having no term of strict application to the case of idiopathic inflammation where the effusion is subarachnoid, I have used the old expression meningitis. The latter may be traumatic as well as simple or tubercular.

I should like to be clearly understood on this point, as it is one of great practical importance. If I asked any novice what part was affected in inflammation of the membranes of the brain—as in meningitis, arachnitis, or by whatever name you choose to call it—he would, no doubt, remembering that in pleurisy or pericarditis the inflammatory exudation was contained in the serous sac, state that the same was true of the brain. But it is not so; the exudation does not lie in the serous sac, but altogether beneath the serous covering of the brain. There is such a case as you picture to yourself, but this arises altogether in a different manner, and has its origin from without. The simple explanation is this—that in inflammation of other serous membranes the character or seat of the inflammation may be twofold, although you cannot distinguish

between them; but in the case of the brain you can. Take the instance of pleurisy, where you find serum in the chest or lymph covering both pulmonary and costal pleura. This may have had two sources, and may imply two very different pathological processes. One patient, for example, has a pleuro-pneumonia, implying a general and severe disturbance of the whole constitution, whilst another in perfect health receives a stab in the chest (not touching the lung), and has a severe pleurisy as the consequence. In the first case, if the lung recovered itself it might be impossible to say whether the lung or the thoracic walls were the source of the exudation in the pleura; but supposing the lung had a wrinkled or convoluted surface, then the lymph would be discovered beneath the serous membrane which stretched over it, and its source would be evident.

The same difficulty exists in pericarditis and peritonitis. In the case of the brain, however, it is different. The pia mater, stretching down among the convolutions, is the source of the exudation in idiopathic inflammation, and there being much space beneath the smooth surface of the pia mater, commonly called arachnoid, the exudation remains for the most part beneath it. In the case, however, where an injury has been received to the skull, or where the bones are carious, so as to implicate the dura mater, an inflammation may be set up in the latter membrane, and an exudation poured out from its smooth surface (also styled arachnoid), so as to fill the cavity. If, then, on making a post-mortem examination, and removing the dura mater, purulent fluid trickles down, and you find both serous surfaces covered with the inflammatory product, you may be sure that this is not an idiopathic arachnitis, but has its origin in the dura mater, and you at once look to the bones. The idiopathic arachnitis or meningitis, you see, is not analogous to pericarditis or peritonitis, for the serous surface shows scarcely any exudation, the lymph being for the most part in the pia mater, and beneath the arachnoid. Remember, then, simple arachnitis, or intra-arachnoid inflammation arises from without; whilst subarachnoid inflammation is generally idiopathic. You ask, no doubt, if the converse of the first proposition is true. No, it is not. Injury may give rise to subarachnoid inflammation, as well as to intra-arachnoid.

In the latter or simplest form it is possible that the brain is only finally affected; hence the reasons why the symptoms are so obscure. For example, after injuries, signs of cerebral disturbance are often altogether wanting until the final coma appears. It is possible for a large amount of lymph or purulent matter to be poured out into the arachnoid cavity, and for the pia mater, with the adjacent

cineritious substance, to hold out against the inflammatory process for a long time, and thus it is only at last, and just before death, that any well-marked symptoms arise. On post-mortem examination surprise is expressed at the large amount of effusion with so slight and recent symptoms. The explanation is to be found in the fact that simple arachnitis arising from external causes is altogether a local affection, and also that the inflammation is often unilateral—that is, one hemisphere is found covered with lymph whilst the other is perfectly free. This never occurs in idiopathic inflammation. You must understand that although this simple arachnitis of which I have been speaking always arises from without, yet the same form which constitutes the idiopathic variety may also arise from injury. A blow on the head may, indeed, set up an inflammation of the brain and its membranes not to be distinguished from an idiopathic inflammation, but a simple arachnitis always arises from an external cause. In order to get rid of the confusion the inflammation of the dura mater may be technically called a *pachymeningitis*, whilst that of the pia mater and appendages may be called a *leptomeningitis* (παχυς, thick, and τλεπος, thin). We see from this that although we are in the habit of speaking of an inflammation of the substance and of the membranes as distinct affections this is only true of pachymeningitis, for in the cases of leptomeningitis or the idiopathic form there is also cerebritis, and therefore the more correct term would be meningo-cerebritis.

That the brain to a certain extent is involved all must allow, for in inflammation of the pia mater the implication of the grey matter produces many of the most marked symptoms; there are others, too, which are evidently due to the state of the ventricles. In fact, a meningitis is characterised by marked cerebral symptoms.

It will be observed that the idiopathic forms of inflammation of the membranes are mostly met with in children. In adults the affection is more rare, and is found generally in connection with various diseases or injuries of the skull and brain. It may be as well, therefore, for practical purposes, to consider these acute cerebral affections of children together, although they may not strictly come under the head of meningeal disease. You know that tubercular meningitis is often styled acute hydrocephalus, in consequence of the effusion in the ventricles being one of the most striking changes found in the brain. There is, however, a not infrequent fatal form of disease in children, accompanied by cerebral symptoms, where an increased ventricular effusion is found without any marked inflammatory products; so that, although in such cases we attribute death to the brain, it is very probable that this organ has merely participated in some other more general changes in the body.

These cases may be called simple hydrocephalus, in contradistinction to the tubercular. We have, therefore, amongst the more rapidly fatal forms of brain affection, *acute simple meningitis, tubercular meningitis, or acute hydrocephalus*, and, thirdly, *simple hydrocephalus.*

In *simple meningitis* the whole surface of the brain is found covered with a thick layer of lymph, which also dips in amongst the convolutions with the pia mater; there may be some opaque fluid in the ventricles, and a slight softening. This simple acute affection is not very common, but is sometimes met with in connection with scarlatina and the other exanthemata. Occasionally, also, children will die with all the symptoms of meningitis, where the post-mortem appearances do not reveal the characteristic conditions of either the simple or the tubercular form of the disease, the effusion in the ventricles and marks of inflammation on the surface being but slight. As these, however, correspond to those found in a greater degree in tubercular meningitis, it may be a question whether they may not be of a like kind with it, seeing that in the latter the tubercle is often little more than a granular lymph.

Case.—A little boy, æt. 7, was admitted into the hospital on March 6th. The mother stated that he was well on the morning of the 4th, but during the day became feverish and drowsy; on the 5th he became almost insensible, and on the 6th he was brought to the hospital. He was then in a high state of fever, with quick pulse and contracted pupils. He had no convulsions, but remained in a state of coma until the afternoon of the 7th, when he died. The mother could give no cause for his illness; said he was a delicate boy, and as an infant had had inflammation of the lungs, with convulsions. *Post-mortem examination.*—No mark of injury could be found on scalp or bones. On removing the dura mater the whole surface of the brain beneath the arachnoid was seen to be covered with a thick layer of yellow lymph. This was in such abundance that the hemispheres appeared of a light colour, the cortical substance being quite hidden. The sides and base in like manner were covered with the effusion, though to a less amount than in the hemispheres. The inflammatory exudation proceeded downwards to the corpus callosum and between the convolutions, so that sections of the brain showed the lymph existing in large quantities in the pia mater between them. The ventricles contained a slight increase of fluid, and this was opaque and turbid, as if some inflammatory exudation had mixed with it. The whole cerebral substance was soft, and this softness very different from that due to ordinary post-mortem change, for the brain-matter was tenacious and sticky, adhering to the knife and fingers when touched; it was at the same time dry, giving out no watery exudation. This condition of the cerebral substance was seen more markedly in the attempt to bear off the pia mater when it stuck to the latter, so that they could not be clearly separated from each other. The parts forming the ventricles did not appear softer than the rest of the brain. The whole brain was of rather a dark colour from hyperæmia. A careful examination was made for tubercles, but none were found. All the other organs of the body were perfectly healthy. The lungs also were carefully examined for tubercles, but none were discoverable.

Case.—A child, æt. 3, was brought to the hospital from the workhouse, and no other history could be obtained than that she had been ailing for three weeks. She was then brought merely for advice, but appearing extremely ill, she was taken in. She was in a dull, drowsy condition, resembling that of fever, and it was not quite certain that this was not her complaint. She only lived 24 hours, having a severe attack of convulsions shortly before death. On making inquires as to any injury the child might have received, it was stated that, when 15 months old, she had a fall and struck her head, but suffered no manifest symptoms in consequence. *Post-mortem examination*—On removing the dura mater, the surface of the brain was seen to be covered with a thick layer of green-coloured lymph; this entered deeply between the convolutions, so that only small portions of the grey matter were here and there apparent amongst the effusion; this was altogether beneath the arachnoid, the surface being quite free. This exudation, which was to a great amount, covered also the sides of the brain and continued round to the base, where it was very slight, the under part of the organ being comparatively unaffected, compared with the surface of the hemispheres. The ventricles contained a slight excess of fluid, and this was clear. The walls of the cavity were natural, not being softer than other parts of the brain, which as a whole was rather soft. No tubercles could be discovered in any part. On examining the septum lucidum, fornix, &c., by the microscope, nothing more was found than numerous granules surrounding the capillary vessels. The whole of the veins of the brain presented a remarkable condition, from being closed by blood, which had evidently coagulated before death. The smaller veins of pia mater on surface were much distended by clots, the larger branches were in like manner occluded, and the longitudinal sinus itself was completely filled by a firm clot of blood. This was slightly adherent to the walls, and the centre was whitish and soft. The lateral sinuses were in like manner filled, and in these the clot was more broken down and softer than in any other part; the coagulum ceased with the sinus, the jugular vein being quite natural. The bones of the skull were carefully examined in order to discover if any disease existed in them which could have given rise to the meningitis, but none was found. The temporal bones were healthy, as well as upper cervical vertebræ and other parts. *Lungs.*—At lower parts there were many condensed portions of tissue; these were of dark colour, sank in water, airless, and dense; they were at the same time granular when incised, and showed by the microscope exudation-corpuscles. Heart had firm, white clot on right side. The stomach showed post-mortem solution, with contents of the organ in the abdomen. No tubercle discoverable in any part of the body.

Tubercular Meningitis.—After removing the calvaria and taking off the dura mater, you might for the moment doubt the existence of inflammation, as the hemispheres may exhibit no evidence of exudation; but on placing the finger on the surface a slight greasiness may be felt, and on looking at the sides towards the temples some streaks of lymph may be observed in the sulci. It should also be noticed that the convolutions are flattened, showing a pressure against the cranium from effusion of fluid within the ventricles. On removing the brain from the skull a large patch of lymph, or sero-fibrinous exudation, is seen at the base, covering the optic commissure and neighbouring parts; occupying, indeed, the large sub-

arachnoid space situated there. From the position of the lymph, this form of inflammation is called Basilar Meningitis. Along the margin of the Sylvian fissure also lymph may be seen, and on lifting up the middle lobe the lymph is found to proceed quite into the fissure. The ventricles contain a large quantity of opaque serum, and the adjacent parts are very soft. The septum lucidum may be broken down, while the fornix is semi-fluid, and the walls of the ventricle all around are softened. On stripping off the pia mater from the convolutions, and more especially in the fissure of Sylvius, tubercles may be found. These are not seen on the surface of the brain, but in the meshes of the pia mater which dip down between the convolutions.

A closer examination shows that these tubercles are formed in the small blood-vessels, and possibly also in the lymphatics. As these systems of vessels are closely associated it may often be difficult to say in what structure they first appear, but investigations seem to show that they are formed in the interior of the vessels and in the lymphatic spaces around these. They are generally found following the course of the vessels, more especially in the branches coming from the circle of Willis in the Sylvian fissure. Now and then tubercles may be found in the brain itself following the branches of the blood-vessels. The brain on the surface may sometimes be found to contain small hæmorrhages, and the medullary substance numerous white corpuscles, as if the cerebrum itself was to a certain degree implicated. Other organs generally contain tubercles, and sometimes there is evidence of scrofulous deposits in bones, lymphatic glands suggestive of these being sources of inoculation. It is remarkable that tubercles are not found accidentally in the brain, as they may be in other structures, and apparently inert; when met with they are always associated with a fatal inflammatory process, proving that they cannot exist long without exciting inflammation, unless, indeed, they be but a part or product of the inflammatory process itself, and therefore to be styled a granular inflammation of the membranes.

General Symptoms of Meningitis.—For the sake of saving the memory it is as well always to have a rational knowledge of symptoms, and not merely to keep in mind a meaningless category; from what I have already told you, therefore, of the functions of the brain, you might infer the existence of many of the phenomena which occur in meningitis. For instance, from the surface being involved, you would suspect delirium, passing on to a torpid state of mind, and finally unconsciousness; also, from what I have said, you might expect convulsion, either in its extreme form or a rigidity of particular muscles. From the centre or ventricles being involved

with a large secretion of fluid you might expect coma, or, owing to the softening of the ganglia on either side, right or left hemiplegia. This, of course, is towards the termination of the case. Then, from the inflammation at the base, with exudation and implication of cerebral nerves, you might not be surprised to find strabismus, inequality of pupils, and their inaction to the stimulus of light, or, from implication of the pneumogastric nerves, an irregular respiration, a slow action of the heart, and much disorder of the stomach. Now it so happens, as you might suspect, that many of these symptoms need not necessarily be present, and thus, if you abstract those which are not universal, you are left with symptoms which have no characteristic features about them. The brain, indeed, may become inflamed throughout (usually styled meningitis), and the patient fall into a drowsy condition, which ends, in a day or two, in fatal coma. These may be the totality of the symptoms of inflammation of the brain, as I have witnessed over and over again, both in the traumatic and idiopathic variety. For instance, the surgeon will have a case in his ward of fracture of the skull, and the patient is apparently doing well, when he becomes listless, then drowsy, insensible, and dies. The dresser will inform me that he can give no explanation of the cause of death, for there were no symptoms of inflammation of the brain ; but on making the *post-mortem* examination its whole surface is found covered with lymph. Then, again, cases are brought to the hospital under various names of delirium tremens, drunkenness, &c., which turn out to be examples of meningitis. For example, a sailor goes to a lodging-house, and on the following day is found in bed, talking strangely, or in a stupor, and is brought to the hospital with a suspicion of foul play, and then arachnitis is discovered. Only this day you have seen an example of this kind. A man was brought in from a neighbouring linendraper's because for two days he had been acting strangely, in consequence, it was thought, of intoxication. He was placed in the spare ward, as on admission the case looked like one of delirium tremens. He would not speak, but was constantly moving in bed. There was not one single other nervous symptom. I suggested that he had had a blow on the head, and probably some effusion of blood on the brain, as I have seen exactly such symptoms arise from this cause. In a few hours he fell into a state of coma and died, and we have found an acute arachnitis, probably of a tubercular character. If you meet with an obscure case of recent disease to which you can only apply the term cerebral, without being able to declare the existence of any special lesion, it will generally turn out to be a case of meningitis, or rather cerebro-meningitis. You must remember, then, the tendency to the final coma may be the only symptom in some cases ;

in others, the symptoms may be many and marked, and in others such a combination of characteristic phenomena that the nature of the disease cannot be mistaken. These are mostly seen in cases of tuberculous meningitis, in which, as it runs a course often of a fortnight, the symptoms may be made the subject of careful observation. But even here all the usual symptoms may be absent. A child may be seized with sickness, and then lie for a whole fortnight ejecting immediately everything it takes; then falling into coma and dying. In such a case I have seen the membranes stuffed with tubercles. This disease, or acute hydrocephalus, as it is called, occurs in by far the majority of cases in young people of the tuberculous diathesis, is not common in infancy, is seen more in growing children, and not unfrequently in young adults, and not so seldom as is thought in middle or advanced age. I have several cases in individuals above fifty years of age.

A good deal has lately been written by French and German authors on "cerebral murmurs" or bruits heard in the heads of children. There seems to be no agreement whether they are natural or morbid, or whether they are seated in the arteries or sinuses. Lately a case was reported of abscess of brain from fractured skull where a loud bruit was heard. Nothing very decisive either has come out of cerebral thermometry.

Symptoms of Tubercular Meningitis.—It is convenient to divide the disease into three stages. You will observe that a division of this kind is made in several other affections, as it is to a certain extent founded on a natural separation of the symptoms which occur in inflammation of special organs. First of all, there is the general constitutional disturbance denoting the onset of a severe disease; secondly, there are symptoms which indicate the disturbance of a particular organ; and, thirdly, those which mark the paralysis or arrested function of that organ.

Thus in inflammation of the brain there would be—first, the premonitory symptoms; secondly, the invasion of the disease, with its special symptoms; thirdly, those of profound cerebral mischief, or, in other words, a general constitutional disturbance; then marked brain symptoms, and, finally, signs of collapse or paralysis of the brain.

In the first place, the child may be fretful, listless, have stomach disturbance, and other troubles, which bear no especial characters; afterwards there may be feverish symptoms, marked by hot skin, quick pulse, furred tongue, and headache. At this period the case is generally, I might say always, styled one of typhoid or gastric fever. It is not the exception, but the rule, to make a mistake; the stomach disturbances are so common, and these cerebral affec-

tions commence so insidiously, that the severe nature of the case is not suspected. I believe, in the majority of cases to which I am called, the case is regarded as one of fever in which cerebral symptoms have become developed, and I think, with the utmost acumen which you can use, you cannot positively determine the disease at this early period. Some time ago I was asked by a more than ordinarily acute practitioner to see a young man who, having been ailing a few days, was causing some anxiety to his friends. He had febrile symptoms, and the question, as in all such cases, was whether these arose from a local inflammation or not. We could discover no cause, and were therefore obliged to style the case one of fever. We were both alive, however, to the possibility of tubercle formation, and of early meningitis, but failed to discover any proof of either. On the next day there was some suspicion of head affection, and on the following day there could be no doubt of its existence. You will see that the diagnosis of continued fever is as often made for negative reasons as for positive ones. A person is in a highly febrile condition, and if a characteristic rash is at the same time present the nature of the case is apparent; if there is no rash we look for some local inflammation to account for the symptoms; if none be discovered we have again recourse to the term fever.

Since, then, at the commencement of tubercular meningitis the head symptoms are not more marked than in ordinary fever, a positive diagnosis cannot be made. I am justified in this opinion by having to-day looked over my note-book, used when I was a student, and reading the particulars of the case of a child who was in the hospital under Dr Addison, to which are appended some notes of his clinical lecture. He alluded to the difficulties attendant on the diagnosis of tubercular meningitis and gastric fever, and after commenting on the case stated his belief that the symptoms present denoted a cerebral affection which would be necessarily fatal. It so happened that on the very next day these head symptoms passed off, and the child got rapidly well. I know that Cullen and some of the old writers speak of meningitis being ushered in by well-marked cerebral symptoms, as a violent convulsion or a fit, to which they could give no other name than "apoplexia hydrocephalica." Now I believe these were not head cases at all, for you will find that such sudden cerebral symptoms as delirium and convulsions do not attend the onset of inflammation of the brain. They denote merely a poisoned blood acting on the brain, and generally imply that an exanthem is about to appear, that the kidneys are at fault, or that there is some exciting cause in the coming teeth or in the intestine.

In *the next stage* and subsequently to the fever the more charac-

teristic symptoms appear: the child is obliged to lie down, complains of severe pains in the head, rolls it about, often moans and screams out suddenly, and in the night grinds its teeth. The headache is often now too severe to be the accompaniment of a mere febrile disorder, and the distressing rolling of the head is never seen in simple fever. At this time lymph is forming at the base of the brain, and effusion is occurring into the ventricles. A strabismus or irregularity of the pupils may occur as a very early symptom, and various organic functions are now interfered with, probably through the pneumogastric nerve and its associations. The heart-beats are lowered in number, and from being 90 to 100 during the onset of the fever, are perhaps only 60, although sometimes, if disease approaches insidiously, the pulse is slow from the beginning. This is one of the most important symptoms to note, and on this alone I ventured a diagnosis the other day, which turned out to be correct. I was asked to see a young man with fever. I found him in bed, almost unconscious, and therefore not able to make any complaints, and the febrile symptoms ran very high. I confessed my difficulty in being able to state positively whether the patient had continued fever or meningitis, but, on feeling the pulse and finding it 58, I decided at once on the latter. This turned out to be correct. Two days afterwards it was 120. It is usual for the pulse afterwards to rise. Then the character of the respiration is to be noted. This may be variously altered in number and rhythm by diseases involving the mechanism of breathing; but an irregularity in the process, or a sighing, may be usually referred to a nervous cause, and this in a child is strongly indicative of a cerebral affection. The temperature is never very high, except in some instances just before death, nor is it so, indeed, in any form of meningitis, although it has been observed, in cases connected with injuries, to be as high as 106°.

Case.—That the worst cerebral symptoms are due to high temperature rather than inflammation, was well seen in the case of a little girl who was in the clinical ward. She was at home sitting over the fire in a listless state, when she suddenly had a fit and was brought immediately to the hospital at 6 o'clock. She was insensible with temperature of 100°, and very rapid breathing. In the night she had several fits, and the temperature rose to 104°, pulse 156, and respiration 54. At 11 o'clock the temperature was 105°, and at 12 o'clock 108°, and at 1 o'clock 109°; she soon after died. On post-mortem examination no morbid condition whatever was found. She died of hyperpyrexia, but the cause of this was never ascertained.

Then, again, and produced in all probability through the pneumogastric, there is the vomiting; this, if marked, is one of the most important symptoms in head affections. It does occur occasionally

in gastric fever, and sometimes very severely in typhoid; but these are exceptional instances. At the same time, as the stomach nerve-supply is affected, so is that of the whole intestinal canal. The latter undergoes violent spasmodic contractions, so that after death intussusception is frequently found. With this narrowing of the intestines the abdomen is much flattened or hollowed, and the bowels are confined. Here, again, is a point for diagnosis. If the question be between fever and meningitis, the state of the abdomen will enable you to distinguish: in the one it is full or tumid, with gurgling on pressure; in the other disease it is flat or scooped out. In some exceptional cases, however, for reasons I cannot explain other than that the nerves are paralysed, the abdomen is tympanitic. You may remark also, as a help to the diagnosis between these diseases, an extreme irritability of the patient and sensitiveness of the skin. This is made an especial circumstance in the aid to diagnosis by Mr Stocker, who says that if you wish to examine the patient's body for the presence of a rash, you will find the fever patient assist in raising his nightdress, whilst the cerebral patient will whine and resist; for you know that the patient suffering from fever is in a semi-conscious state; his blood is diseased, he lies in bed in a torpid state, and with a confused state of mind; but he has sufficient sense to discern your wishes, and assists you in your effort to examine him, whilst the patient with head disease is suffering pain, and is unwilling to be disturbed.

The *final symptoms* appear in a few days by the child or young person being still worse. No food is taken, there is wasting of the body, repeated sickness, delirium, pupils disposed to dilate, or, if coma have come on, widely dilated, and scarcely at all acted on by the stimulus of light. On raising the eyelid you may often notice a mucoid film on the eye, which, I apprehend, implies that the fifth nerve is losing its function or becoming dead. Before the coma comes on, or accompanying it, there are often convulsions, sometimes of a general kind, with great distortion of the face, and, if the chest be involved in the spasm, much congestion of the skin and violent perspiration. A modification of the convulsion is seen in the rigidity of a limb or the turning in of the thumb on the palm of the hand. At this time, if you make a mark down the skin with your nail, a red stain remains. This was first mentioned by Trousseau as a diagnostic mark of cerebral disease, and is styled "tache méningitique." I never saw this well shown except in the later stages, where no doubt existed as to the nature of the disease, and you may sometimes observe it in other febrile disorders. I therefore do not attach much value to it as a diagnostic sign. We

may sometimes observe also a bright and extensive flushing of the face and sometimes of the upper part of the body, when the child is disturbed or moved, a fact probably of similar significance to that just mentioned. Towards the close of the case it is not unusual to find the patient hemiplegic; at this time the ventricles have become distended with fluid, and the surrounding parts softened. I apprehend this symptom may be accounted for by the central ganglia on one side being involved in the softening process. If tubercles exist on the choroid they may be sometimes observed by the ophthalmoscope. I have seen them in one case on the eye, removed after death, in such numbers that I have no doubt their presence could easily have been ascertained during life if looked for. It has been found, however, that their presence is very rare; well-recorded cases of their discovery during life are excessively few. More commonly a hyperæmia or an optic neuritis exists.

Towards the close of the case, when the more marked symptoms have passed off, some hope is expressed of recovery, but this is what so often occurs in other inflammatory diseases.

To summarise.—1. The child is getting out of condition, is wasting and fretful, with loss of appetite and constipation. 2. Pyrexia, but tongue not much furred, nor temperature high, headache, delirium, crying out, throwing head about or rolling it on the pillow, restlessness, pupils contracted, strabismus, vomiting, constipation, with retraction of belly, general hyperæsthesia, respiration irregular or sighing, face flushed, tache cérébrale. 3. Insensibility, pupils dilated, grinding teeth, convulsions or twitchings, pulse perhaps slow, face sunken, skin clammy, paralysis.

It has been thought by many writers that, since meningitis may occur without very marked symptoms, many of those just mentioned are due to the part of the brain affected, and therefore in making an analysis of all cases of meningitis, the following symptoms may be regarded as especially denoting an inflammation at the base of the brain, viz. intolerance of light, eyes red, covered with mucus and turned up, strabismus, irregular pupils, headache, convulsions or spasms, and vomiting.

I need do no more than give one illustration of tubercular meningitis.

Case.—A child, æt. 4. When first seen had been ill a fortnight, and was now suffering from well-marked symptoms of cerebral disease. During this period he had complained of pain in the back of the head, sickness, screaming at night, &c. Now he lies on his back and is in constant fear of being moved, as it increases his headache; constant sickness as before. He occasionally draws up his legs and arms, and then extends them; no decided convulsions; thumbs turned in on palms. He afterwards sank into a state of coma, with pupils widely dilated.

Post-mortem Examination.—Surface of hemispheres almost dry, or only a little greasy exudation to be scraped from them. At base a considerable quantity of inflammatory effusion within the pia mater; the optic commissures and parts around covered with an exudation of lymph. Upon stripping off the pia mater from the convolutions, tubercles were found in the membrane, especially in the fissure of Sylvius. Brain itself flat on superior surface from the pressure of fluid within the ventricles, and corpus callosum bulging out for the same reason. The fluid within amounted to about three ounces, and appeared to consist of little else than water, having a specific gravity of 1001, and becoming only slightly opaline by heat. The septum lucidum, fornix, and the ependyma, very soft, being in fact semi-fluid. Examined microscopically, these were found to contain exudation-globules, and fatty granules surrounding the capillary vessels. The cerebellum contained three or four hard scrofulous masses in the cineritious substance, each being about the size of a pea. The *lungs* contained miliary tubercles. Bronchial and mesenteric glands also. Spleen and kidneys contained a few tubercles. There was also post-mortem solution of the stomach and discharge of contents into peritoneal cavity.

Tubercular Meningitis in Adults.—You must not suppose that this disease is confined to children. It is by far more common in them, but I have frequently met with it in young men and women, and even in two persons between the ages of fifty and sixty. I make especial mention of it because it is more likely to be over-looked in adults, and for other complaints to be suggested as a cause of the symptoms, as, for example, fever, or uræmia on account of albumen being present in the urine, or delirium tremens from a consideration of the habits of the patient. It would seem also that there is less likelihood of finding tubercles universally spread throughout the body than in children, in whom they are all but invariably found in every organ, as well as in the brain.

Case.—A young man who had always lived in the country, came to London three months before his illness to be an apprentice in the city. Sixteen days prior to his death it was observed that his manner was odd, he spoke in a strange style and was unfit for business. He soon became very ill, but it could not be learned that he had any well-marked cerebral symptoms, and the case was considered to be one of typhus fever. It was principally from fear of contagion that he was moved to the hospital. This was on the twelfth day of his illness and three days before his death. He was then all but unconscious; he would put out his tongue when requested so to do, but was too ill to make any rational complaint. He was very restless and continually screaming out, generally moaning in a low tone during the day and being very noisy at night. His tongue was furred and brown; pulse above 100; skin hot; bowels confined for a week; and he had retention of urine. His chest was examined, and the lungs appeared healthy. There was no trace of maculæ, and it was very evident that the case was one of meningitis. In the absence of all direct exciting cause, such as injury or disease of the temporal bone, this was believed to be most probably tubercular in character. The patient remained much in the same state, unconscious but continually raving. His bowels were not moved by repeated doses of croton oil. Finally, the pupils became dilated, and the breathing laborious, death

ensuing through congestion of the lungs. He had no convulsions. His friends denied his ever having had a cough, or being delicate, and repudiated the idea of any of his family being scrofulous when a tuberculous disease of the brain was suggested. On this account they allowed a post-mortem examination.

Autopsy.—Body extremely wasted. The brain presented in a well-marked degree all the features of tubercular meningitis. The superior surface of the hemispheres was somewhat flattened; the arachnoid greasy to the touch. At the temporal regions some lymph was seen in the sulci. On removal of the brain a large patch of tenacious lymph was seen to occupy the base, forming a covering to the pons Varolii and optic commissure. The fissure of Sylvius was filled with lymph, and the pia mater covered with tubercles. The pia mater, when stripped from other parts of the surface, was also seen to contain tubercle. The ventricles were occupied by a large amount of fluid, and the surrounding walls were very soft. The lungs were much congested, with tubercles scattered throughout them. The liver, spleen, and kidney were full of tubercles.

Case.—A young woman, æt. 15, was admitted on May 15th and died on May 25th. She was a dressmaker, and had been in apparent good health until about a week before admission, when she began to complain of her head, and soon became very ill. When taken in, the case was looked upon as one of fever, and wine was given to her. It was soon apparent, however, that the case was a cerebral one. She lay coiled up on her side in bed, disliking to be touched or moved, and complained much of feeling cold. Although sensible she was very drowsy; one eyelid fell, and both pupils were dilated. This dilatation and inactivity of the pupils when they were approached by a candle remained constant throughout. During the last two days she became unconscious; finally the breathing became difficult, and the skin intensely congested. She had no convulsions nor paralysis.

Autopsy.—The surface of the brain was slightly flattened, and the arachnoid was greasy to the touch. On each side of the temporal region there was a little lymph in the course of the vessels of the pia mater. At the base there was a patch of yellow tenacious lymph, involving the optic nerves and surrounding the crura cerebelli and covering the upper part of the cerebellum. The Sylvian fissure was filled with firm lymph, in which abundance of tubercles were embedded. The pia mater of the hemispheres was also full of tubercles. The ventricles contained a considerable excess of fluid, but the central parts were not much softened. The lungs were very carefully examined in order to discover the presence of tubercles, but none could be found, nor were any to be seen in other organs of the body.

Simple Hydrocephalus.—This is a disease often met with in children at a younger age than those who are liable to be attacked by tubercular meningitis. It is the case where the post-mortem appearances are of the most trivial kind, there being often little more discernible of an unusual nature than an increased amount of fluid in the ventricles. The child is usually a year or two years old and has been weaned, when it is seized with a feverish attack, accompanied, it may be, by sickness and constipation. The illness is supposed in the first instance to be simply gastric, but shortly there appear symptoms of a cerebral nature, such as con-

vulsive movements and increasing lethargy. Such symptoms as these and even worse may arise from eccentric causes, as irritation of stomach, teeth, &c., and may be recovered from. If they increase in intensity the lethargy ends in coma. Combined with this there may be strabismus, dilated pupils, and other symptoms indicative of brain disturbance. After death very little is discoverable, and only in exceptional cases do we find any products of inflammation.

Closely resembling this form of disease, which, in our present state of knowledge, is usually classed amongst the inflammations, is another of a purely passive nature, first separated from the inflammatory by Dr Gooch, and subsequently by Dr Marshall Hall, who gave it the name of *hydrencephaloid.* The children have been delicate and exposed to various debilitating causes. The physician finds the child lying on its nurse's lap, unable or unwilling to raise its head, half asleep, one moment opening its eyes, and the next closing them again, with a remarkable expression of languor; the tongue is slightly white; the skin is cool or cold. If depletory measures are used all these symptoms increase, and coma with dilated pupils comes on. On the other hand they are often relieved or cured by nourishment and stimulants. In some of these cases no morbid condition of the brain may be found, whilst in others there is an increased amount of fluid in the ventricles.

I have examined the heads of several infants who have died of *convulsions*, and have failed to find any marked morbid appearances. These occur in connection with intestinal irritation, teething, &c. The convulsions of whooping cough are often fatal, and in some cases hæmorrhage has been found.

Simple arachnitis or pachymeningitis.—I have already informed you that in idiopathic meningitis the inflammatory product is found mostly beneath the visceral arachnoid, and although such an inflammation may arise from an injury, yet, whenever the exudation is found in the arachnoid cavity, or is intra-arachnoid rather than subarachnoid, the morbid process has begun from without, and you must look to the dura mater and bones for the cause. The following is an example:

CASE.—A boy, æt. 7, had a poker thrown at his head; the point struck the left side of his head, producing a small hole. No marked disturbance attended the injury, but soon afterwards cerebral symptoms came on, and he was admitted two days after the receipt of the accident. He was then evidently suffering from arachnitis, being in a feverish state, drowsy, and occasionally shrieking out. A small piece of bone was removed, corresponding to the spot which received the blow. The symptoms continued, and he died five days afterwards.

Post-mortem examination.—On the left side of the head was a small opening, through which a probe could pass, and in the corresponding dura mater also. On turning back the latter the most acute arachnitis was seen, the purulent effusion

being in so great an abundance that it poured down on the ground in a stream. The inflammation had extended all over the brain, but was more on the left side, the inner surface of dura mater being coated with a thick layer of soft lymph. On washing off the effusion from the free arachnoid there was found also to be some inflammatory exudation in the subarachnoid space, though this was comparatively little. This, however, was seen to pass down in the course of some of the pia-mater vessels, along the sides of the brain. The brain opposite the fractured bone was slightly contused.

Meningitis from special causes.—I would by no means say that because I have spoken of tubercular meningitis and a simple meningitis in children I have included in them all forms of inflammation of the membranes. We occasionally meet with a meningitis, both in children and adults, which would not come into either category, viz. a rapidly fatal meningitis where the signs of inflammation are slight and confined to the basilar region, and yet where no tubercles are discoverable. In such cases we are at a loss to discover a cause; in some there may have been an unknown injury, and in others an unrecognised blood-poison in the system; an extension, also, of inflammation from the brain to the cord and *vice versâ* is not uncommon. I have met with more than one example of meningitis in connection with ulcerative endocarditis. Then you should remember the very common case of meningitis resulting from disease of the ear.

A man had a compound fracture of the skull injuring the brain; an inflammatory softening took place, which reached the ventricles. This extended through the third and fourth to the spinal canal, so that on post-mortem examination lymph was found surrounding the cauda equina. A blow on the head had given rise to an inflammation, which reached the sacrum.

A young man lying in bed with caries of spine and lumbar abscess died from an extension of the meningitis of the cord to the brain.

A woman with bedsore after fever suddenly became ill and died in a few days. The cord had become implicated in the disease of the sacrum; the canal was laid open, and the inflammation had extended to the brain.

Treatment.—Now, as regards treatment, there is no use in endeavouring to evade the only conclusion which can possibly be arrived at, after fully considering the subject in all its bearings—that we in all probability have no means of arresting inflammation of the brain when its nature has become manifest. It is easy to talk loosely about inflammation of the brain, and confound together cases of convulsions, cerebral symptoms of the exanthemata, and true meningitis. I have already said that the violent onset of

cerebral symptoms in a child previously well generally denotes anything but a head disease, and yet it is to such cases that remedies are actively applied to which the recovery is credited. It is a question whether an inflammation of the brain or of the meninges, when once it has evinced its characteristic symptoms, can ever be recovered from. It is a fair question, however, to ask whether, at the very onset, such inflammation might not be arrested. But, then, again, we must inquire whether we are speaking of simple or tubercular meningitis. In the latter case the body is full of tubercles before the final inflammation sets in, and the beginning of the end has arrived before the doctor has even diagnosed the case. It may be a question whether, even if recognised at its very earliest stage, it could be arrested, seeing that at the very next moment it would be ready to be lighted up again. I therefore regard the diagnosis of tubercular meningitis as equivalent to pronouncing the child's doom. I have no knowledge of an instance of any person recovering from it. I do not know that it should in any way tend to weaken our faith in our art, that we are unable to withstand disease when the mischief is done; for this would be like saying that a fire-engine is of no service in saving a house from destruction because it is rarely known to be required until the whole premises are in a blaze. The fact is, it is becoming more and more the duty of the medical man to be the custodian of the public health, and thus to endeavour to divert the morbid processes at a time when they are recent, and prevent their development into disease. I believe, as regards pulmonary consumption, that attempts in the direction of prevention would be of far more service to the public health than the adoption of fanciful remedies when the disease has set in.

We might fairly ask, however, whether simple meningitis (as there appears to be such a disease) is not amenable to remedies, and to this I would answer in the affirmative. In the first place my own experience and that of others is corroborative of this opinion, and, secondly, I have met with appearances on the post-mortem table which seemed to leave little doubt of the existence of previous inflammation long cured. About two years ago a little child was in one of my cribs, partially amaurotic and deaf, and showing other cerebral symptoms, the result apparently of an acute meningitis following scarlatina. In the course of time, and whilst taking the iodide of potassium, the child gradually recovered, and at the end of three months had regained its sight, and was running about the ward. From some unknown reason severe cerebral symptoms suddenly set in, accompanied by convulsions, and in a few hours the child died. On post-mortem examination I found a

quantity of lymph in the subarachnoid space, covering the optic commissures and neighbouring parts. This was hard and tough, and evidently of some age.

If you ask how this inflammatory process is to be arrested, I say I am looking forward to the time when the use of such remedies as I have before mentioned as having a control over the vaso-motor nerves may be found of practical service; but in the mean time I should recommend the old-fashioned methods. Having witnessed such marked subsidence of symptoms after the use of bloodletting, I would adopt it, and I should be strengthened in its recommendation by such an authority as the late Dr Alison, who, I remember, related some striking cases in its favour. I believe also antimony is an anti-inflammatory remedy, or one possessing an influence over the capillary or minute arterial circulation. I believe, therefore, that at the present day, if you think a child has acute meningitis setting in, you will have no better treatment at hand than the application of leeches and the saline with antimony.

As regards calomel, I cannot speak with any satisfaction of its administration. One of the very few cases I have seen of salivation in children was that of a little girl with tubercular meningitis. To her was given a grain of calomel every four hours, and this was continued for above a week without the slightest influence on the disease. In such cases we usually apply cold to the head, and have assumed that, because inflammation exists within, it is the correct remedy. I should judge myself by experience, but even then it is unfortunately very difficult to test its value. I believe myself that heat and cold are very important agents in controlling or modifying morbid processes, and that therefore the subject is deserving of all our attention. I think it very probable that the piece of wet rag which generally adorns every one's head who has cerebral symptoms is not very potent in its action; and if we eventually discover that such means as I speak of are serviceable, we shall apply them in a much more effective and rational manner. As regards any criterion to be gained from the feeling of the patient, it has rather been in cases of purely functional brain disturbance that I have seen relief by cold afforded. We hear, for instance, of persons exposed to the heat of India plunging their heads in cold water, and we find that women with hysterical headaches seek the application of cold. Then with sick headaches or headache following a debauch cold is used with relief. One such case I had an opportunity of witnessing not long ago in the person of a medical man. He often suffered with headache, he had been overtaxed with work, and often had recourse to drops of brandy. Under the combined influence of these three causes, he, one evening, became almost raving mad. I

found him rolling about in bed, complaining frightfully of his head, and asking for cold to be applied. On putting cold water on his head, he called out for more, so that we hung his head over the side of the bed, and, standing on a chair, let it fall in a stream upon him. He said it was most delightful, prayed for its continuance, soon said his head was better, and sank into a sleep. He subsequently confirmed his statement as to the value of the treatment. I believe, however, that putting a drunken man's head under the pump is an old and approved popular remedy.

As regards medicines, I have seen many given, but without much success, such as colchicum, digitalis, and iodide of potassium. I am constantly asked to see cases of acute hydrocephalic disease or tubercular meningitis, and have largely prescribed the iodide of potassium, but I am sorry to say that it is the rarest possible exception to see any good result. I have seen one or two cases of children with head symptoms recover after its use, but in all probability they were not tubercular, even if cases of meningitis.

My experience is this—that active treatment is never adopted in the most usual form of meningitis, simply because the disease is not recognised, and even if it were adopted early I am not aware that it would be of any use. The cases in which active measures are used are those in which cerebral symptoms appear at the very onset of the illness, and in such a recovery often occurs. Now, as I before said, in many of these cases there is no inflammation of the brain at all,—it is in a state of "irritation," to use the ordinary expression, arising from remote causes. There is, however, a residuum of cases in which such well-marked cerebral symptoms are present, indicative of inflammation, that I cannot but think that the remedies are sometimes useful. Idiopathic simple meningitis is not a common disorder; when it does occur it sets in with violence, and is over in a few days; in such cases I have every reason to think that the old-fashioned so-called antiphlogistic method was eminently useful.

My experience has been mostly with the unfortunate cases of tubercular meningitis which are invariably fatal. I have seen all the medicines I have named given without success, as well as sundry local applications, as blisters and iodine to the head. In a large majority of instances, when a post-mortem examination is made tubercles are not only found in the meninges but scattered through the body; our helplessness is evident; we have only been called in for advice at the beginning of the end.

It is a curious circumstance, as showing how little expectation we have of curing certain complaints like meningitis, that if the patient recover we think it more reasonable to suppose that we were mistaken in the nature of the case than that the medicine has arrested

the disease, and on this idea there is a plan of treatment often adopted which has a very ludicrous side to it—that is, we treat a patient for a particular disease in the most orthodox manner, hoping that he is not the subject of it, but of another.

I think I have told you that tubercular meningitis is not often a disease of infancy, and therefore you have much more hope of recovery in a child a few months old suffering from cerebral symptoms, since these may be set up by external causes. You may remember, also, that in simple exhaustion or anæmia of the brain convulsions may occur, and that such must be combated by very different remedies from those I have been mentioning. The child may be atrophied or in a depressed condition from many causes, and the head may grow large from a passive collection of fluid in the ventricles; at all events, you may find a child in a very feeble condition, with a sunken fontanelle, and yet having convulsions. In this case a stimulant is the remedy. I saw a case only lately where a child was in constant convulsions which had been aggravated by depleting measures. An immediate change for the better occurred after the administration of a few doses of brandy and ammonia. I might here say that there is a state of atrophy in children where alcohol will cure when all nourishment and cod-liver oil have failed. I used to keep for the purpose at the Infirmary for Children a mixture made of rectified spirit. I should also say that the constant convulsions of children are much relieved by the inhalation of chloroform. In those cases where the whole body is constantly distorted to the great distress of the mother, chloroform will cause the movements instantly to cease, and sometimes with their arrest the child may fall into an apparent sleep. I have given it in many cases with the greatest advantage and relief.

Results of Inflammation.—It is a very important question to determine, if it be possible, what are the changes which permanently remain after recovery from different forms of inflammation of the brain. It may be that instances of impaired mental and even bodily development, which we meet with in adults, may have originated in an acute inflammation, and that cases of so-called idiocy, especially when combined with crippling of the limbs, are only the results of an infantile cerebritis or meningitis.

You must know, however, that in many cases of enlargement of the head the effusion is a merely passive condition. An infant inherits a sickly constitution, or becomes cachectic from deficient food, and a change in the framework takes place—the chest falls in over the non-expanded lungs, whilst the belly and the cranium give way, the one being distended with gas and the other with fluid. This fluid may again be absorbed, or the head may remain per-

manently enlarged. I know now a highly intelligent youth with a good-shaped head, in whom the skull became much enlarged after a severe illness when he was about two years old. I am also seeing a child two years old with an enormous head; she speaks well, and is more than ordinarily intelligent. In two cases where the head was excessively large I had recourse to tapping but without any success, so that I think I shall never do it again. It is remarkable, however, that no ill results followed.

The effects on the intellect I have several times seen.

CASE.—A little girl, now ten years of age, was well until three years ago, when she had scarlatina, and whilst in bed severe cerebral symptoms came on. She was unconscious, was continually screaming out, and had all the symptoms of acute head disease. She remained very ill for several weeks, and then gradually lost the severe symptoms; she was, however, perfectly helpless, and for a very long time had difficulty in standing, holding, or eating, and there was slight strabismus. She gained a partial amount of strength, and then passed into the state in which she now remains. She totters in her walk, is feeble in her limbs, and is dull in intellect.

CASE.—A boy, æt. 13, was very well until three years ago, when he had a severe illness, the nature of which was not very clear, except that it was attended by cerebral symptoms; subsequently his arms became rigid, so that he could scarcely move them to his head, and the legs contracted with the feet turned inwards, so that he has not stood since. He can scarcely speak except in monosyllables, and then his words are suddenly jerked out. His appearance now denotes one of congenital idiocy, with paralytic contraction of the limbs, and suggests the question whether cases of this kind observed in infancy may not have had a definite cause at a previous period, and so be not, in fact, truly congenital.

CASE.—Thomas M—, æt. 18, a very intelligent young man, was at work during the hot weather in the summer, and thought the heat affected him. He went home complaining of his head, and very soon acute symptoms set in, which the doctor attributed to inflammation of the brain. He was delirious, sometimes almost maniacal, and unconscious of everything around him for nearly a month. After the urgent symptoms passed off he appeared perfectly idiotic. He very slowly improved, and when I saw him, six months afterwards, he had a vacant look indicating an almost blank state of mind, like that of an idiot. He was too weak to stand, and sat up in bed; he understood what was said to him, and he did as he was bid, but acted as an automaton or a cataleptic. When told to put out his tongue he would thrust it out, and keep it out; he would also keep his arms in any position in which they were placed. He had a book before him, at which he looked, but it was evident that he was not appreciating a single word. He resembled a person recovering from a fever or anæmia of the brain. A month afterwards he was walking about and his intelligence returning.

When recovery takes place after acute head affection it is impossible to know what amount of inflammation may have occurred or what may have been its exact site. In the following case,

although the boy was admitted for meningitis, his complaint might have been a local one confined almost to the ear; for since we recognise a fatal meningitis resulting from an otitis, so it is possible that we might have a more limited and recoverable meningitis from the same source, and therefore the deafness would be due to a primary otitis.

Case.—A boy, æt. 12, was admitted under my care extremely ill with cerebral symptoms. He was in a high state of fever, was in a drowsy state, continually throwing his head about, and very deaf. He had frequent vomiting, bowels costive, tongue thickly coated, &c. After lying in a most precarious state for some days the fever passed off; he appeared to recover his consciousness, but he was perfectly deaf. He then rapidly improved, and left the hospital absolutely deaf. Both tympanic membranes perfect. I saw him eight months afterwards and he was "stone deaf."

Case.—A child, æt. 7, was lately brought to me perfectly deaf, not hearing apparently the slightest sound. A year and half before, she was quite well, pleased with music and sang airs; she then became ill, very irritable, and often screamed out as if in pain. When she recovered from this state she was found to be absolutely deaf.

Case.—I saw also the case of a little boy, the son of an artillery officer at Woolwich, who was thought to be suffering from meningitis. He had headache, sickness, and febrile disturbance, followed soon by complete deafness. After lying very ill for two or three weeks he regained health, but was found to be absolutely deaf. At the present time after several months there is no sign of the returning sense. There have been no symptoms connected with the external ear.

Case.—But just now there was a little boy in Stephen Ward who was sent in for rheumatism, but who really had pyæmia. He had caries of the tibia, followed by numerous abscesses in various parts, and lay for some weeks in a most precarious state. He then became dull of hearing, and very shortly absolutely deaf. He gradually recovered his health and strength and left the hospital stone-deaf. Mr Purves could find no clue to the cause by an examination of the ear.

These cases are very difficult of explanation. It is as difficult to understand the cause of primary simultaneous affection of both internal ears as it is for a meningitis to extend at the same moment to the nerves of both ears.

A persistent hydrocephalic condition is one of the most evident results of a morbid action in the brain, and is either shown by the large head during life, or by the increased quantity of fluid found in the ventricles after death. In these cases it may be difficult to pronounce upon the exact importance of this undue quantity of fluid in the brain, or how far it may be merely the most striking feature of a more general and less evident atrophy of the whole cerebral

structure. In a very large head, even with this excess of fluid, we can suppose the brain to be of normal weight, but in an average-sized skull a large ventricular effusion must necessarily imply a diminution of brain substance. Mr Hilton thinks that a local inflammation may give rise to the dilatation of the ventricles by a closure of the iter ad quartum ventriculum, and that all the subsequent symptoms complained of by the patient might in this way be readily accounted for; that the relation between the amount of subarachnoid and ventricular fluids and the blood in the vessels being most intimate, any impediment to the flow of the serum into and out of the cranium caused by congestions would necessarily be productive of important and serious consequences. For instance, if the ordinary causes productive of increased vascularity of the brain were present, which would in health necessitate a removal of part of the ventricular fluid, and the fourth ventricle were closed, the fluid could not escape, and serious cerebral symptoms would result. It is certainly true that the most appreciable condition resulting from infantile cerebral disorders is an increased ventricular effusion, and therefore it may be allowable to associate the symptoms with this alone. Mr Hilton's theory has attracted the attention of subsequent observers in this country and abroad; their opinions are divided as to the correctness of his views. Some have recorded cases of hydrocephalus in which there has been a clear history of an inflammatory attack, and where the results of this inflammation have been seen in the thickening of the membranes at the base of the skull; they have not, however, always shown that there has been an occlusion of the subarachnoid space. In whatever way the hydrocephalus has been produced, the results of a previous morbid process are often witnessed in our workhouses and lunatic asylums where we see so many big headed children half idiotic and constantly having fits. They are thought by some to denote the offspring of drunken parents. In the 32nd vol. of the 'Trans.,' of the Path. Soc., will be seen the portrait of a woman who had spent most of her life in a lunatic asylum. She was fifty-three years of age, had an enormous head, and had been hydrocephalic from infancy. The following cases show on what a precarious tenure these patients hold their lives, how a slight disturbance is enough to arrest the impaired machinery of the brain, and therefore, with what consideration they should be treated.

Case.—A gentleman, æt. 34, had always had delicate health; the nails of his fingers were peculiar in form; as a child he was active but very irascible, as a man very spare and delicate. He had a fancy for turning and gardening, but disliked the excitement of London. At the age of sixteen he had a severe nervous illness, with great depression, brought on by application to business in

the city; this business, however, was not heavy, and would have been thought nothing of by ordinary youths. His food was of the simplest kind; even tea deranged his stomach. Winter and cold always affected him injuriously; he got torpid in the winter, and it was difficult to rouse him, when he scarcely knew where he was. He was subject to headache, derangement of stomach, and occasional deafness. He had a peculiar restless look of the eyes and a stare, became feeble, and stooped in his gait. A few months before his death he had a severe attack of vomiting, with great prostration, without any apparent cause. The last month or two were marked by a morbid activity and restlessness. On the day of his death he had been to the Crystal Palace; whilst there he vomited. He walked home, some distance, and when he entered the house he staggered and said he felt giddy and oppressed. He was placed in bed, but very shortly stertorous breathing came on, and he soon afterwards died.

On exposing the brain the convolutions were found flattened, and were apparently large and few; the brain structure appeared healthy. On opening the ventricles they were found to contain about 4 oz. of fluid. The ventricles were greatly enlarged; the foramen of Monro was large and rounded; the fourth ventricle greatly dilated. The cerebro-spinal opening between the under surface of cerebellum and the upper surface of medulla oblongata was completely closed by a tolerably dense membranous structure, which formed a kind of pouch, projecting downwards, and showed the direction of the fluid tension upon it to have been from above to below. The other organs were healthy.

Case.—A gentleman, æt. 50, had been of feeble intellect since childhood, which incapacitated him from earning his livelihood. He was taken charge of by a domestic, who assisted to dress him, and accompanied him in his walks. He had a very large head, which was noticeable by strangers, especially as he wore his hat at the back of it; this, with a peculiarity in his gait, made the state of his mind at once apparent. After having been ailing for a week or two with headache, he one day returned home from a walk, about 2 o'clock, not feeling well. He, however, partook of a hearty dinner, and then retired to his room. He was seen by the servant about an hour afterwards sitting on the stairs, when he was conducted to a sofa, and he sat there some time in a half conscious state; he soon fell back insensible, was carried to bed, when stertor came on, and he shortly died.

On post-mortem examination the ventricles were found of great size, and holding half a pint of fluid. The brain was thought to be healthy, as well as all the other organs of the body. The medical men had some doubt as to the ventricular effusion being sufficient to cause death, and an inquiry was instituted.

Case.—A young man, æt. 23, an engineer, was said to have had good health until a year ago, when he began to have numby and other strange feelings in his limbs. Whilst at work he would suddenly have to stop, but without losing consciousness; once he stood a whole hour without moving. Later on he had fits, in which he lost his consciousness. On admission, we were immediately struck by his large head and cerebral aspect. He had a vacant look and slight strabismus. When spoken to he answered slowly and coherently, but it was found that his statements were often incorrect. He had general muscular debility, moved his arms slowly, and had difficulty in chewing his food; he passed his urine in bed, but whether this was due to actual paralysis or not was uncertain. The pupils were dilated and the optic discs ill-defined, and there was some hæmorrhage in

the retina. He remained a few days in this condition, indicating an extreme feebleness of body and mind, when he had a slight fit and died.

The post-mortem examination was made by Dr. Fagge. The body was well-nourished and muscular, the bones of skull exceedingly thin and having no diploë, like a child's skull; dura mater easily removed. The brain was flattened, owing to the presence of a large quantity of fluid in the ventricles; this was clear, and scarcely altered by boiling. The ependyma thick, and in places granular. All the ventricles were dilated; the third formed a wide cyst-like expansion at the base of the brain, on which the optic nerves were stretched. The iter a tertio ad quartum ventriculum was large enough to admit a pencil. The fourth ventricle was enlarged so as to excavate the cerebellum. The medulla oblongata looked soft, but showing no very evident disease; the cord below was firm and healthy.

I have already said that although a ventricular effusion may be the most manifest result of a morbid action of the brain, it is far from certain that this is the only effect, as it may be only a part or consequence of a general morbid change throughout. It is difficult, therefore, in many cases to give the correct proportion of credit to the inflammation for the changes found in the membranes, the substance, or the ventricles, respectively. We must be content, therefore, with the term hydrocephalus when we find that the main results are in the ventricles.

Case.—A boy, æt. 17, was said to have been lying ill at home for several weeks with fever before he was brought to the hospital. He was then lying on his side, coiled up, sensible, and complaining severely of his head, and in a few hours he died. The body was much wasted. On opening the skull the surfaces of the hemispheres were seen to be flattened and sulci almost obliterated. There was no effusion on the pia mater and no tubercles; the ventricles were distended with several ounces of fluid. The serum was slightly more opaque than the natural ventricular fluid on boiling. The foramen of Munro was very large; iter a tertio large, and fourth ventricle much distended. Surface of all the cavities was granular.

Case.—A young man, æt. 20, had all his life suffered with his head, having occasional pain, oppression, and at times appearing as if his mind were enfeebled. During four months all these symptoms increased, and at last assumed an inflammatory character. After death the only morbid appearance discernible was an immense effusion into the ventricles. There was no opportunity of measuring it, but the quantity was thought to equal a pint.

Case.—A few years ago, a schoolmaster was put on his trial for causing the death of a pupil by flogging him; he defended himself by describing the boy's peculiarities; the boy, he said, was wilfully obstinate, determined not to learn, and at the age of sixteen did not know, or pretended not to know, a sixpence from a shilling. It was also stated that he was a nervous, timid boy, was frightened to go over a plank by himself; he also suffered from chilblains in the winter. His head was large, and he had the appearance of one who had water on the brain. He died almost suddenly after the beating. On post-mortem examination several ounces of fluid were found distending the ventricles, the arachnoid at base

somewhat thickened, and it was thought by some who were present that this might have obstructed the lower opening of the fourth ventricle. The pons and medulla were flattened and compressed by the central effusion. Brain and other organs healthy.

Chronic Hydrocephalus from Injury.

Case.—A man, of middle age, was brought in in a fit; after this he lay in a drowsy state with a slow labouring pulse, so that it was thought he was suffering from concussion, as he had severely struck his head. It was learned that he had several fits previously; also that he had a severe fall on his head some years before, but it was not known that he had any cerebral symptoms. He never got out of this drowsy state, but remained lying quietly in bed until his death. His pulse was very slow, sometimes 40, but he had no fits nor any other marked cerebral symptom. After death an old fracture of the skull was found at its posterior part and base. The brain appeared structurally healthy, but the ventricles contained fourteen ounces of fluid. This was of the ordinary natural kind, and showed no evidence of its having had an inflammatory origin, and there was no apparent obstruction in the veins of Galen, or at the fourth ventricle.

Dr Fagge had also a case under his care of a man who evidently was suffering from some obscure cerebral disease, but his only symptoms were headache, and for many months constant vomiting. He finally had convulsions and died comatose. The principal condition found was a most enormous distension of the ventricles with fluid.

I had some knowledge of a lad aged 14 who had an enormous head and was feeble in intellect. He was knocked down in the street, and, as he died soon afterwards, an inquest was held. His head was found bruised, and the ventricles said to contain four pints of fluid. This was probably an exaggeration.

Chronic Hydrocephalus.—What is generally meant by chronic hydrocephalus is the affection seen in infants, coming on soon after birth, where the head may reach an enormous size. The patient may live and appear little the worse for having his brain expanded by this large quantity of fluid, as in the case of Cardinal, whose skeleton is in the museum. In delicate children an effusion of this kind is of a passive nature, and is again removed as they grow stronger. This I have several times seen. When all other remedies have failed, an operation has sometimes been had recourse to. It came somewhat into favour on account of its alleged success in the hands of Dr Conquest, who was said to have cured four cases out of nine in which he performed paracentesis. I have myself tried it in two cases, but should never propose it again—not on account of the severity of the operation, but from the want of possible success. In my first case it could not be said that the child suffered in any way from the operation, for no apparent effects

were produced by it: there seemed no danger from any entrance of air or collapse of the brain. The child eventually died, but never had any marked brain symptom. In the second case the difficulty was with the after-treatment. You see, if fluid is rapidly formed in a skull which cannot give way coma ensues. Now, in these young children the bones separate, and no injury to the brain results. When the fluid is drawn off it will again form, and if, in order to prevent this, a bandage be applied, symptoms of compression follow. Our difficulty was so to regulate an elastic bandage as to exert pressure sufficient to prevent expansion, and yet not to cause undue compression. This was a problem we could not solve, and the child left for the country unrelieved.

Arachnoid and blood cysts, or Hæmatoma of Dura.—I might here allude to the cysts sometimes found on the surface of the brain, which have given rise to much controversy as to their origin. They have for the most part been met with in lunatic asylums, in connection with old cases of dementia or general paralysis, the opinion being held that they have resulted from the organisation of blood clots which have had their origin in diseased vessels of the pia mater. If after an effusion of blood on the brain an organisation should take place a cyst will arise which, by involving the surface of the brain, gives rise to a variety of symptoms. In childhood such an occurrence would be the cause of a structural change and functional derangement. I mention this that you may be prepared for such a discovery in cases of obscure cerebral disease. I have described this affection, with a good specimen of it found in our dissecting-room, in the 'Journal of Mental Science.' You can easily see why these cases have been met with in lunatic asylums, and associated with insanity. An effusion of blood organising on the surface of the hemispheres would necessarily lead to disturbance of the intellectual functions; and, again, effusions of blood would be more likely to occur in those who had previous disease of the softer cerebral membranes. Thus it has been frequently observed that in the general paralysis of the insane apoplectiform and epileptiform attacks are very likely to occur, and it is in this class of patient especially that the membranous exudations have been found. Dr Hodgkin believed that they were caused by inflammation, but it has been shown in many instances where effusion of blood has resulted from injury, and experiments on animals have also proved, that blood may organise in the manner mentioned; and it is very remarkable to notice how membranes forming on each surface of the arachnoid in this manner may produce in time distinct cysts. A very old specimen in our museum of this nature, which came from an epileptic patient, was thought to be formed by a sepa-

ration of two layers of dura mater, but it is clearly a cyst formed from an old effusion of lymph or blood. This explanation of their formation does not preclude the possibility of fresh effusions of blood occurring from the vascular membranes already existing. It was Mr Prescott Hewett who first showed how they were formed from blood. Foville had also observed them, and stated that all his patients were remarkable for their dulness or stupidity; that they resembled statues, with this difference, that when pushed they walked, when set upright they kept their place, and when food was put into their mouths they swallowed it. The case I have alluded to and elsewhere described, was one which came from our dissecting-room, and therefore there was but little history attached to it.

Case.—The body was that of a young man who had died of phthisis, and had come from the workhouse. He had there been regarded as half-witted, and quite incapable of following any occupation. He was fond of frolicking and tumbling about. When spoken to he answered with a rude sharpness. During the seven years he had been an inmate he had never had any illness. On removing the calvaria and touching the dura mater it felt boggy; on opening this there proved to be a cyst closely incorporated with the dura mater above and the surface of the brain below. It looked as if a cyst had been formed in the dura mater, that is, by a splitting of its layers, if this had been possible. It could, however, be completely stripped off the dura mater as well as the brain, leaving the cyst perfect. Its shape was that of the right hemisphere, to which it was applied and adherent by tough fibrous tissue. The interior surface was smooth, contained three or four ounces of an opaque-white, glistening fluid which, on standing, deposited about half an ounce of cholesterine.

Syphilitic Meningitis and Arteritis.—This constitutes the chief syphilitic disease of the brain, and that which is understood when this expression is used. Gummatous masses as distinct tumours are not met with in the cerebral substance; they are seen on the surface of the brain in connection with the pia mater, and these may enlarge by growing inwards in connection with processes of the dura mater and the blood-vessels. In this way there is formed a hard, tough, yellow material, varying from the smallest size to that of the palm of the hand, and uniting together the membranes and cortex of the brain. The dura mater is found closely adherent, and if we attempted to remove it forcibly it would carry with it the other membranes and some of the grey matter. The most usual seat for this syphilitic inflammation is the temporo-sphenoidal region, in relation with the middle cerebral artery. This is the reason probably that syphilitic disease of the brain is so often productive of fits and convulsions. When it occurs at the base it is apt to involve the cranial nerves, which may become paralysed in consequence. The gummatous mass itself is composed of fibrillated material containing small, round cells; the brain around

may be infiltrated and hardened, or, on the contrary, be softened, owing to the occlusion of vessels by disease or thrombosis.

The change in the vessels constitutes one of the most essential characters of the disease, and this may be found in the blood-vessels running through the brain. It has been the only condition found in some cases of syphilitic insanity. The vessels are found to be thickened or nodular, so that sometimes distinct tumours may be seen growing from their walls. English observers agree with Heubner as to the nature of the formation. It seems to be due to a cell proliferation towards the interior of the vessel on the inner layer of the internal coat, immediately beneath the endothelium; so that a section shows the adventitious and muscular coats natural or but slightly infiltrated, whilst the great change is in the intima. Immediately beneath the endothelium the new growth occurs which causes the thickening, and is found to be composed of nucleated cells and fibrillated tissue. The thickening occurs irregularly, so that the calibre or lumen of the vessel is much altered, making the channel most irregular and even obstructed; the inner coat often becomes twice as thick as the middle and outer coats together.

Besides the coarser changes of syphilis seen in the gummata and blood vessels, it is thought by some that the disease may effect some subtle change in the cerebral tissue. They believe this on account of the occurrence of mania, and some other affections in connection with syphilis, where no coarse changes are discovered in the brain.

THROMBOSIS OF THE CEREBRAL SINUSES.

This is a condition not infrequently met with in connection with disease of the bones of the skull, especially of the petrous bone, and occasionally associated with various inflammatory affections of the brain. It is, however, also, but less frequently, found as an apparently primary state, where no local morbid process exists from which it may have proceeded. I have met with it two or three times in children as apparently the main disease. Various cases of this kind which have been reported tend to show that it has occurred under conditions of great debility, suggesting that a mere retardation of impoverished blood may have caused the coagulation in the sinuses of the brain. This, however, is somewhat conjectural, and, therefore, this form of disease must be put in the same category with the so-called cases of phlebitis occurring in the limbs, and whose pathology and causes are in very many instances very obscure. There might be instances where there was evidence of blood disease in

other parts of the body, and others where an excessive hæmorrhage or anæmia might be regarded as the cause. There may be also states of the brain itself where a stasis commencing in the tissue might be propagated to the larger vessels. Most of the evidence, however, at present tends to show that the cause is to be found in an impoverished state of blood.

Case.—The following case has lately come under my notice:—A lady, below middle age, had been for some time a little out of health, when she was seized with headache, a complaint to which she was not used. When it had existed a week I saw her. The pain was all over the head, and especially at the back; it was constant, but with paroxysms of greater severity. She was anæmic, had a weak pulse, temperature normal, no fever, no rigors, and, in fact, no feverish or other symptoms besides the headache. On the following day she was exactly the same, but in addition had occasional sickness. On the next day she thought she had a little weakness in right arm and leg, but this passed off. During the next two days the headache continued, but there was no fever, and the pupils were rather contracted. Her intelligence remained intact. During this time she was seen by several of the most distinguished physicians in London, who, individually and separately, expressed their opinion that she was not suffering from any organic affection of the brain, as there was not a single symptom to indicate it, nor any acute inflammatory affection; in fact, that she was the subject of a functional disturbance only. On the day after this she became very sick, and towards evening sank into a half-conscious state. On the following day her limbs became rigid with legs flexed, then convulsive twitchings came on, and she died. She had thus been ailing for about twelve days.

Post-mortem examination.—The surface of the brain was turgid with blood; the vessels of the pia mater were everywhere tightly filled with coagulum, and felt like so many worms under the fingers. On opening the longitudinal sinus this was found to be completely closed by fibrin, which was adherent to the walls, and in some places softening in the centre; the lateral sinuses in the same manner were filled with fibrin; this was traced as far as the jugular vein, and there ceased. In the meshes of the pia mater there was a little yellowish serum, and in one or two places a patch of recently-effused blood. There was no disease of the bones of the cranium. The body was healthy, and there was no sign of coagulation in any of the vessels.

A case like this is in the highest degree obscure, both as to its pathology and diagnosis. No cause for so sudden a morbid state being lighted up in the brain was apparent, and as regards any suspicion of such a condition existing during life I have already said that the complaint was regarded by all who saw her as functional. The error appears at first sight very grave, but a little consideration will show that this opinion is not a just one, and that the mistake really occurred in consequence of the advanced knowledge which we have of late made in the pathology of cerebral disease and its diagnosis. There was a time when a case characterised by so long continued headache would have been construed into an evidence of

inflammation of the brain or similar severe disorder, but such an opinion would have been founded in ignorance and on a false pathology. We are now in a position to state that none of the important centres of the nervous system are involved in disease if paralysis is altogether absent, and also that the hemispheres are not the subjects of disease whilst the mind remains unclouded. Again, we deny the existence of any inflammatory disorder of the brain whilst there is an absence of fever or mental disturbance. In such a negative condition as here existed we could not declare more than that there was disturbance of the cerebral hemispheres. Now, in all probability, at the onset of the symptoms no more derangement existed than an increased vascularity, and therefore the diagnosis was so far correct. That this stasis of blood should go on to a coagulation and blocking up of the vessels, ending in death, of course was not suspected. A careful consideration, therefore, of the case clearly shows that, under an apparent error, a remarkably true and scientific diagnosis was made.

The two following cases, taken from the tenth and sixteenth volumes of the 'Transactions of the Pathological Society,' somewhat resemble the one which I have related. They are described by Dr Crisp and Dr Andrew respectively. In the second case it will be seen that there was evidence of blood coagulation in other parts of the body.

Case.—A girl, æt. 16. A month before her death she went into the country, and whilst there was seized with pain in the head, confusion of intellect, vomiting, and other symptoms indicating cerebral disturbance. She was sent home, and then found to be suffering from some paralysis of right side, with loss of speech and inability to protrude the tongue; there was pain in the head, especially of left temporal, occipital, and post-aural regions, extending down the side of the neck, and aggravated to extreme suffering on motion. There was frequent screaming and moaning, and the left hand was frequently applied to the left side of the head and neck. Perception of external objects existed, expressed by signs. Pulse never above 80. No fever, pupils natural. Death occurred rather quickly, but before this it seemed as if the power of the limbs had become restored, as she moved them and afterwards spoke. Her symptoms had lasted altogether a fortnight.

Post-mortem examination.—Body well developed. On opening the head the superior longitudinal sinus was found filled with coagulated blood, interspersed with portions of fibrin, closely adherent to the walls of the sinus. The superior cerebral and cerebellar veins were found to be distended and of a cord-like form; portions of straw-coloured fibrin could be readily seen through their thin walls. The superior cerebellar veins were all plugged with fibrinous coagula, and all the cerebral veins entering the longitudinal sinus were firm and cord-like from the same cause. The cerebrum apparently healthy, and without any preternatural vascularity of its substance.

Case.—Eliza S—, æt. 20, had suffered from anæmia and amenorrhœa for a

twelvemonth, when, about ten days before her death, she complained much of headache, which afterwards became most intense. This was her principal symptom until delirium and vomiting came on, and at last coma.

Post-mortem examination.—Lateral ventricles contained an excess of blood-stained fluid; optic thalami were filled with firm dark clots, and left corpus striatum also. The veins of choroid plexus, and velum interpositum, together with venæ Galeni, were distended by firm, partly yellow and fibrinous clots. These extended continuously along the straight sinus, and for about an inch into the commencement of the lateral sinus, the latter not being entirely filled with them, but the smaller veins being greatly distended. Several of the branches of the pulmonary artery had old clots in them.

Dr Church describes in the 'St Bartholomew's Reports' the case of a girl, æt. 16, who three days before death was seized with headache and sickness, afterwards with convulsions, and finally with coma. The brain was found to be of a pink colour from intense congestion, and all the sinuses were full of clot. The ventricles were empty, all the viscera healthy, and the case was regarded as one of fatal congestion.

Dr Church also alludes to another case of a girl, æt. 20, who was admitted for amenorrhœa and anæmia. Whilst in the hospital she became dull, then drowsy, and sank into a state of coma. The lateral sinuses were found full of clot and the brain contained small extravasations.

Dr Coupland also has related the case of a man who died at the Middlesex Hospital with thrombosis of the sinuses and extravasations of blood into the brain. These were extensive and produced definite paralysis.

I might say, too, that I have lately seen a lady at Streatham who was suffering from intense pain in the head and sickness. She had no marked symptoms indicative of any cerebral disease, and the case was regarded as functional. Being no better, she was visited by two or three eminent men, who coincided in the opinion that there was no evidence of brain disease, and that the headache was probably of a functional kind. She, however, died, and there was found extreme congestion and thrombosis of the sinuses in connection (it was said) with ossification of the dura mater.

The best representations of this extreme vascular congestion as seen both on the surface and in sections of the brain are to be found in Plates v and vi of 'Bright's Medical Reports.' They are taken from the brain of a child who was admitted in April, 1828, with pain in head, screaming, convulsions, and coma; she died in three weeks, and was always very pallid. The brain was very congested, with minute extravasations, and the sinuses were full of coagulated blood and yellow coloured firm fibrin formed during life. Dr Bright says he hesitated to bleed owing to the anæmic

state of the patient, and the correctness of his judgment was proved by the post-mortem, for he remarks that there is a tendency for the blood to coagulate under the influence of debilitating causes.

Abscess of the Brain.—This is not one of the usual results of inflammation or cerebritis, and therefore its presence is not expected in cases where idiopathic inflammation has been known to exist, but only anticipated as a probable consequence of injury or caries of the bone, or as a secondary formation in pyæmia. This was the experience of Sir W. Gull many years ago, and I quite agree with him in this opinion. It is pretty certain, too, that an abscess may remain latent in the brain for a very long time without the production of symptoms, and it is only after death, when its existence is actually known, that we alight upon the cause in some long-forgotten injury or hidden disease. So long antecedent often is the occurrence of the injury that we are forced to believe in the possibility of the dormant presence of an abscess in the brain for months or even years. Indeed, I know of one case where the rupture of an abscess was suddenly fatal, and where fits had occurred ever since an injury to the head seven years before, so that the question was raised of the possibility of the abscess having been present in the brain during all this time. I am not aware that a dried-up abscess in the brain or *pus concret* has ever been met with.

Sir W. Gull says, in speaking of a case, "The only mental symptoms were a heavy expression of countenance, a disinclination to speak, and an indifference to surrounding objects." He also says, "An abscess may remain latent for many months, and then acute symptoms may suddenly set in, and the patient die in a few days." Cases have been mistaken for continued fever and intermittent fever.

One reason for the absence of symptoms in such cases is due to the fact that abscess is more generally found in the white substance, and more especially in the middle hemisphere, very rarely occuping the central ganglia. In these long-standing cases, too, the abscess is often encysted, and in this way it is cut off from the surrounding brain substance. As an example of how rapidly the cystic abscess may form, I may mention the case of a little boy, the specimen from whose brain is in the museum, who had fracture of the skull, and died eleven weeks afterwards. We found a cerebral abscess contained in a cyst whose walls were an eighth of an inch thick, and so strong that it could be taken out and held up by the forceps without rupturing. In other more recent cases the abscess is not encysted, but is surrounded by softened brain, and the pus, very often of a remarkably greenish hue, mucoid and fœtid. The

first class of cases where the abscess is circumscribed may arise from injury or disease, as in the one just mentioned, but yet need not be in immediate contact with the bone, as a portion of healthy membrane as well as brain may come between them. In other cases the abscess is in direct communication with the carious bone and the sloughing dura mater, as is so often seen in cases of disease of the petrous bone and other parts of the cranium. The abscess in connection with this form of disease depends for its site upon that of the bone, and therefore may be either in the cerebrum or cerebellum. The dura mater covering the bone is usually found green and sloughy, and the bone beneath it dark coloured and carious. The lateral sinus is sometimes also involved in the inflammation. It does not necessarily follow that abscess arises direct from disease of the petrous bone when the ear is affected, for I have seen an abscess with a perfectly healthy portion of brain outside of it under these circumstances, and it was therefore supposed, in this case, that purulent inflammation had extended to it from the internal ear by means of a vein in the aqueductus vestibuli. A simple meningitis may also be set up in connection with an otitis without any actual disease of the bone. In these cases of abscess their formation is quick and their existence generally surmised by the acute cerebral symptoms which precede death. For example, in a long-standing case of disease in the internal ear, when inflammatory symptoms come on with severe pain in the head accompanied by rigors, vomiting, convulsions, and other cerebral symptoms, the formation of an abscess may be suspected, although it is true that if attention had not been directed to the ear the interpretation of the brain symptoms might not have been clear. I have seen one case of the kind styled ague, on account of the severe rigors which were present, and two others called fever, because of the severe pyrexia and torpor. You may remember that I told you torpidity or lethargy may be the only marked symptom of inflammation of the brain or its membranes. It does not follow, however, that these acute symptoms need be present, as an abscess in connection with caries of the bone may come on most insidiously.

I have seen more than one case of cerebellar abscess where there were no nerve symptoms whatever except pain—no paralysis, and the patient was able to get out of bed and move about. You may remember that disease of the petrous bone may lead to death otherwise than through the brain ; for by involving the lateral sinus a phlebitis may be set up which may extend to the jugular vein, and so infect the lung and the system at large. It is very remarkable that just as cerebral abscess has been present without any symptoms, so in cases of disease of the internal ear a meningitis or abscess has

been thought to be present from the severity of the symptoms when the brain has been perfectly healthy. I have seen cases of otitis where the pain in the head has been so severe and the delirium so great that an inflammation of the brain was thought without doubt to exist, and yet such cases have recovered.

Now, besides these acute and fatal abscesses, there are those which quietly form and lie latent for a very long period. During this time there may be no symptoms, or, if any, not of so serious a kind as to suggest abscess. A young man, for example, was admitted into the hospital on account of an intense frontal headache; it occurred in paroxysms and had existed for four or five years. One day he suddenly died, and there was found an abscess in the middle lobe of the cerebrum, in connection with old disease of the temporal bone. Occasionally there have been symptoms somewhat similar to those met with in tumour—as fits, pain, stupor, but it is remarkable how seldom such symptoms occur in cerebral abscess compared with that of tumour. This may be in part owing to their usual position being in the medullary substance. If the cerebral ganglia were affected then of course there would be paralysis; and painful rigidity, as in apoplexy, might follow.

Case.—The following case related by Gull is very remarkable as showing how few may be the symptoms. A gentleman had an encysted abscess in the posterior lobe of the left hemisphere of the brain following a chronic disease of the lung. He had no nerve symptoms until three weeks before his death, when, one day whilst writing, he was surprised by noticing a violent clonic spasm of the right arm which lasted several minutes, and which obliged him to support it. He soon felt quite well, and went on with his duties as before. After some hours the movement occurred again, and in the evening a third time. On this occasion it affected the leg and face also. After this he seemed quite well again. On the following day he had another attack of clonic spasm of arm and face of right side. Subsequently he had a regular epileptic fit with loss of consciousness. After two days he had another fit, followed by partial paralysis of the right arm and leg. Besides these fits he had constant slight clonic convulsions of the right side without loss of consciousness. Sensibility of the limb was not much diminished. The fits increased, together with the paralysis of right side, he became aphasic, incoherent, and so died.

Case.—Quite lately a man was brought into the hospital in a state of semi-coma and paralysis of the left side and discharge from the left ear. He had been in this condition for about two weeks, but had been ailing some time before, and a year previously he had had a severe injury to his head. On post-mortem examination the dura mater was found closely adherent to the brain over the right temporal region, and beneath it lay an encysted abscess the size of an orange, encroaching on the central ganglia. The cyst was composed of tough thick walls, and was evidently of some age. On the left side the petrous bone was carious, and a large abscess was beneath it, passing down into the pharynx. It seemed, therefore, as if the first-mentioned abscess in the brain had been the result of the injury which occurred a year before.

Where the cerebellum has been the seat of the abscess there may have been no more definite symptoms than in abscess of the hemispheres; and no more than would warrant a diagnosis of meningitis or some obscure affection of the brain.

Case.—A boy, æt. 12, was admitted under my care looking very ill and thin. He was quite intelligent, but spoke sharply as if he did not want to be disturbed. He had been suffering for some weeks with intense pain at the back of the head, which had been called tic douloureux. He was quite deaf on one side and had a discharge from the ear; he was also sick and his respiration was irregular. He was so feeble that he could not sit in bed. He gradually died, when a large abscess was found occupying the right lobe of the cerebellum.

Case.—A woman, æt. 26, stated that, eight days before admission, she caught cold, and this was followed by rigors, languor, and nausea. She was sent to the hospital as a case of fever, but she had no eruption, and her abdomen was shrunken and bowels confined. She was quite rational; she gradually got lower, having no marked symptoms until two days before death, when she became drowsy and finally comatose. A large abscess was found in the cerebellum in connection with caries of the temporal bone. It had burst into the ventricle.

We had also in the hospital the case of a young man who for some time had pain at the top and back of the head. These were the only symptoms except weakness. He had no sickness and no paralysis. Shortly before his death he got out of bed, then slowness of breathing came on and he died suddenly. An abscess the size of a hen's egg was found in the cerebellum.

In one of our last cases the only symptom was pain at the back of the head; there was no defect of vision, no sickness, and no paralysis.

I have seen several cases of pyæmic abscess in the brain where the symptoms of cerebral disturbance occurred only a day or two before death. I remember two, if not three where the abscesses in the brain occurred during convalescence from empyema and suppuration in the lung. I must admit that I have met with an abscess in the brain without any apparent cause for it, but so exceptional an occurrence would only suggest that the primary source of infection had escaped notice.

An interesting case of abscess resulting from injury, and cured by an operation, has been reported by Mr Holden.

Abscess from Injury—Cured.

Case.—The patient was a young man, æt. 18, who was struck on the head with a piece of iron and received an injury over the left parietal bone, so that small portions of brain escaped from the wound. The latter soon healed and the patient left the hospital; subsequently some portions of bone came away, but he was at work five months after the accident. Twelve months afterwards he had a fit and then several others. They then ceased and for six months afterwards he

was fairly well. He then began to have other symptoms, as inequality of pupils, deafness, and attacks of shivering; presently he became drowsy and took to his bed. He was taken to the hospital, when his lethargy passed into coma and he appeared to be dying. This was one year and eight months after the injury. Mr Holden determined to trephine and without chloroform. During the operation his face was livid, the pulse reached 160, and then became too rapid to count; the respiration shallower and shallower until it almost ceased. The dura mater was now exposed and seen bulging up, whereupon a bistoury was inserted, and five ounces of pus of a very fœtid character spurted out. The relief was immediate; the breathing, which had almost ceased, recommenced, the lividity of face passed off, and the heart's action fell; the pupils also became equal in size. On the following day the patient knew his mother; the pulse was 68, and he had no bad symptoms. The wound healed, and he left the hospital perfectly well with his intellectual faculties in no way impaired.

Tumours of the Brain.—The symptoms connected with tumours of the brain are very obscure, although their presence after a time may often be pretty confidently anticipated. Abercrombie's knowledge of the morbid anatomy of tumours of the brain was very inferior to the clinical knowledge which he possessed indicative of their presence. "They are distinguished," he says "by long continued headache, the pain varying in its seat and severity, and one very remarkable character of the affection is that the pain sometimes occurs in regular paroxysms, having intervals of comparative or complete relief. It is sometimes referred to a particular spot, as the crown of the head or the occiput. The diagnosis is difficult, but the duration and violence of the pain leads to a suspicion that the complaint is something more than common headache. Sometimes the paroxysms are accompanied by vomiting. In other cases the organs of sense become affected, as the sight, the hearing, the taste, and smell, and occasionally the intellect. The loss of sight generally takes place gradually, being first obscured, and after some time lost. In other cases there are paroxysms of convulsion, which may occur with some degree of regularity like epilepsy or only at particular periods. There is nothing which enables us to explain the diversities of symptoms in the three classes. In some cases there were blindness and convulsion, in others blindness without convulsion, and in others, pain alone without either of these affections."

The symptoms of tumours will necessarily vary according to their seat, but as they are often situated in the depth of the hemisphere without involving any of the central ganglia, the symptoms may be of the most indefinite character. Thus, a patient may have pain in the head, and gradually become listless and torpid, until death at last ensues without a single other special symptom. Tumours even of some size may be found in the brain accidentally, when

there has been nothing to indicate a suspicion of their presence. If they grow to any size and involve the surface, convulsive fits are liable to come on; if they penetrate towards the base, special nerves may be implicated, or, as is very often the case, amaurosis ensues. But even if on the surface they need not necessarily produce symptoms. But lately I have had the case of a woman in Mary ward who had a tumour on the surface of the hemisphere, but she had no symptoms besides lethargy and general weakness.

The earliest symptoms are, as a rule, those of headache, or strange feelings in the head, or giddiness; subsequently weakness may come on, and if all these continue they point to some cerebral mischief. After a time the pain in the head may become most severe, and, what is remarkable, may take place in paroxysms. It is an intense fixed pain in the head, lasting for some time and then passing off. It would be an important matter to determine, if possible, the cause and seat of headache generally, as it might aid us very much in diagnosis. There can be no doubt that, as a rule, disease of the brain, or of the cerebro-spinal centres generally, is unaccompanied by pain, as witness abscess, softening, and the instances of injury to the brain where a portion has been removed without giving rise to any sensation; whilst on the other hand, when the outside of these centres is affected as in diseases of the membranes and nerves the most painful affections are set up. Still, we know that a non-sensitive part under abnormal conditions, such as stretching, pressure, &c., may become the seat of the most exquisite pain; witness the alimentary canal in gastralgia and enteralgia arising from colic; or the senseless muscle when in the condition of cramp. It may be therefore that the pain in cases of cerebral tumour is due to pressure on the neighbouring parts, but whether this be so or not, we must admit that this form of disease is often accompanied by pain of a most severe character. As regards the seat of the pain in reference to the position of the tumour, there seems to be no relation between them; for in the last case in the hospital, where the growth was in the anterior lobe, the pain was fixed in the back of the head in the course of the occipital nerves; and even in the same patient the pain may shift its position.

I have said that in a case of long-continued headache and sickness a cerebral disease might be suspected; this opinion would be much strengthened if after a time convulsions or epilepsy came on. If during the fit any special part of the body were always affected by the spasm, we might infer the possible seat of the disease. If subsequently amaurosis ensued it would render the diagnosis almost certain, since in a large number of cases abso-

lute blindness is a symptom of cerebral tumour. This had long been observed, especially in cases of tumours of the cerebellum in children, but we are indebted mainly to Dr Hughlings Jackson for having shown the reason of it in the fact of the optic disc becoming perfectly white and atrophied in consequence of spreading optic neuritis. He has pointed out that even before the patient has complained of any defect of sight, neuritis may have been set up, shown by the swelling and inflammatory change in the nerve. If this neuritis exist as well as the previous symptoms mentioned, we are almost justified in speaking with certainty of the existence of a tumour. The disc is observed to be red, swollen, and prominent; the edges indistinct, the arteries obscured by the swelling, and the veins tortuous and dark. The disc subsequently becomes more confused, the arteries not traceable, the veins larger, and sometimes effusions of blood are present. Finally, the disc merges into the fundus, and becomes permanently atrophied and white. The neuritis in these cases is usually double. In other cases of nerve blindness, and more especially when connected with spinal disease, the atrophy of the disc appears as the primary affection, there being no evidence of its having been preceded by active changes. I do not, myself, profess to be very ready in appreciating all these early stages of neuritis, but the resulting white disc in the complete cases is very striking. Allbutt seems to consider that this descending neuritis must be distinguished from other forms, and gives to it the name of "choked disc;" there being venous turgor with swelling and serous infiltration. The cause of the neuritis is not explained. Some have attributed it to pressure preventing the blood returning from the brain, and so causing distension of the sheath of the nerve. The difficulties of explaining the neuritis are so great that refuge is taken in the vaso-motor theory; nerves being irritated at a distant source may through their action on the blood-vessels affect the eye. It does not imply that any part of the optic tract is affected, and therefore we cannot from the fact of the amaurosis make any prognostication of the actual seat of the tumour; the impairment of vision gives us no clue to the locality of the disease, as would be the case if the hearing, smell, or any cranial nerves were affected.

I should say that optic neuritis does not necessarily imply the presence of a tumour or any form of brain disease. Dr H. Jackson says that optic neuritis strongly points to a coarse disease inside the head, but not necessarily so. Mr Higgens says he has seen many cases of optic neuritis and a white disc without any evidence of cerebral affection. I lately had a child sent to me on the supposition that she was suffering from a tumour of the brain. She

had been for some time amaurotic, had a widely dilated pupil, and a white disc. She was under notice a long time, and never had any symptom of disease whatever, cerebral or otherwise. Her appearance created a suspicion of hereditary syphilis.

The prevailing symptoms, then, of tumour are giddiness, headache, sickness, convulsion, and blindness. The intellectual qualities may be in no way affected, as seen in those cases, mostly of children, where the tumour is situated in the cerebellum. Paralytic symptoms should be connected with disease of some special portion of the brain, and in the case where the cerebellum is involved there might be only a general weakness of the body or staggering in the gait when walking. Dr H. Jackson has observed in some cases of cerebellar disease a tetanic condition, the legs being stretched out and hands and arms flexed. In one case there was frontal headache, sickness, and drowsiness. Sometimes great wasting is observed in tumour of the brain, as if some trophic centres were involved. Sometimes the symptoms attending tumour of the brain are almost negative, such as would arise from increased ventricular effusion, or show themselves only by some slight aberration of mind or change of temper. Such symptoms in an excessive degree may amount to mania, and necessitate the removal of the patient to a lunatic asylum. Perhaps this is the most curious and interesting circumstance connected with tumours of the brain, that the mental disturbances constitute their predominant feature, so that they come to be treated by the alienist physician. As far as my own experience goes, and from what I can learn from others, the mental symptoms show no special characteristics, and therefore patients in whom tumours have been found, on post-mortem examination, have represented all classes of lunatics; they have been demented, had delusions, been dirty in their habits, &c., and sometimes have been classed with the general paralytics.[1]

The diagnosis, therefore, of tumour of the brain is by no means always easy, since the combination of symptoms most frequently met with resembles very much what is often seen in various diseases accompanied by cerebral disturbance. For example; in Bright's disease we meet with headache, convulsions, amaurosis, &c. I had long under my notice a man whom I thought had Bright's disease, and then I changed my opinion to tumor cerebri.

Case.—A man was admitted on account of pain at the back of the head in the course of the occipital nerve. After some time his manner appeared strange, and he became very morose; he then ceased to walk about, but sat quiet in a

[1] See papers on Tumours in connection with Insanity, by Drs Clouston and Boyd, 'Journal of Mental Science,' 1872, 1873.

chair in a lethargic state. He subsequently took to his bed, and remained lying there in a simple passive state until he died. He had no paralysis, and except the pain at the early part of his illness his only symptom was a gradually increasing dementia. On post-mortem examination there was found a tumour the size of an egg in the anterior lobe of the left hemisphere. It occupied the medullary matter, and the convolutions were stretched over it.

I need not describe to you the various kinds of tumour which are met with in the brain, as you will find a description of them in most works on pathology. The most characteristic tumour is the glioma, composed of a delicate fibre originating in a growth of the neuroglia. It slightly projects when a section is made, and resembles in appearance and colour the structure of the brain itself, so that it is ill-defined, and appears to run gradually into and infiltrate the cerebral substance. In one case of glioma of the pons the cerebral structure was so infiltrated with the new tissue that it had not so much the appearance of a growth as of the pons gigantically enlarged. You may also occasionally meet with myxoma, the firmer fibroids, and more rarely carcinoma. Hydatid is rare, but sometimes met with ; also large scrofulous masses in the cerebellum and cineritious substance of the brain. I have seen several cases of tumour of the pons, and in these were present, as you might imagine, various lesions of the cranial nerves, as well as general paralytic symptoms. Syphilitic disease of the brain I have already alluded to, but, as the symptoms connected with it are so often of an epileptiform nature, I shall defer its further consideration until I come to Epilepsy.

If the tumour be at the base of the brain, so as to involve the cranial nerves or the spinal tracts, then of course special symptoms exist. In the following case the diagnosis was simply tumour, until it was evident that the fifth nerve was involved, when its locality became apparent.

Case.—Wm. B., æt. 5. For some weeks past had had pain in the head and sickness, the latter being the most prominent symptom. On admission he looked ill, and it was evident that his sight was bad; but he had no marked symptom except the vomiting. On examination of his eyes it was seen that he had commencing optic neuritis. When he attempted to walk he could not keep a straight line, and he carried his head stiff. He generally lay quiet in bed, resting his head on his hands, but was quite intelligent when spoken to. His sight gradually became more dim, with dilatation of the pupils, and constant oscillation of the eyeballs. At the end of four months after admission he lay quiet in bed, drowsy, and often complained of headache; when held up on his feet he fell down, and the optic disc had become white. At the end of another two months he had a fit, and about this time the right eye was observed to be inflamed. It then discharged, and subsequently the cornea became involved and sloughed out. On testing sensation it was found that the right side of the face

was anæsthetic. He had two more fits, and gradually sank, seven months after admission.

Post-mortem examination.—Convolutions flattened, corpus callosum bulging outward, and when incised eighteen ounces of fluid escaped. The right lobe of cerebellum appeared much swollen by presence of a soft gelatinous tumour, which flattened the pons Varolii, crura and optic tracts. The Casserian ganglion was stretched on both sides, but more on the right. All the interior parts in like manner were stretched, but the corpora quadrigemina and other structures were not diseased.

Our records contain several cases of a similar kind. A little girl came as an out-patient with gradually increasing paralysis of the facial nerve on one side and of the sixth nerve on both; after death a tumour was found in the pons. Another child with exactly the same symptoms with the addition of partial paralysis of the limbs had also a tumour in the pons. A very similar form of disease, again, occurred where difficulty of talking and swallowing was more marked. In a case quite lately under Dr Habershon, of a young man who had general tuberculosis, there was a hard yellow mass imbedded in the left half of the pons, which caused great stretching of the roots of the nerves on that side. His first symptoms of this were a slight falling of the face about a year before; afterwards he found he could not eat so well on that side, and then his hearing became deficient. When admitted, he had paralysis of the right seventh nerve and left fifth with absence of taste; also some weakness of both sixth nerves; gait unsteady; no optic neuritis, but retinal veins large.

Some of the commonest kinds of tumours met with are those which affect the cerebellum in children, and are of a scrofulous or gliomatous kind. They may vary as regards minor symptoms, but otherwise run a pretty uniform course, such as staggering, followed by blindness, then an inability to stand, and so the child lies for months in bed whilst the disease is progressing, with its eyes open though blind, intelligent, speaking very slowly, with tremor of the limbs when moved, ending in spasm.

Dr H. Jackson has lately given a lecture on tumour of the cerebellum, illustrated by the case of a man who suffered from this disease, and in whom the marked symptoms occurred only during the last three months of his life. They began with stiffness of the neck, so that it pained him when he moved his head, as in writing; then the pain extended round the throat. Afterwards the head used to fly back in paroxysms; then he had tottering in his walking, and the eyesight became dim. On examination an optic neuritis was discovered. He also had occasional vomiting. His principal symptom was the spasm of the head. After death there was found

a tumour, the size of a walnut, on the inner part of the left lobe of the cerebellum.

Dr Jackson said that the symptoms which localised the disease were the paroxysms of retraction of the head and unsteadiness of gait. The other symptoms indicated only cerebral disease situated in any part, as pain in the head, vomiting, optic neuritis, &c. He believed that when there was much spasm and rigidity the disease would be found to affect the middle lobe of the cerebellum. He had seen tumours of the cerebellum without any symptoms, but if rigidity or tetanic-like spasms followed a reeling gait, we might be tolerably sure of the existence of this form of disease.

Dr Jackson thinks the reeling is due to a paresis of the muscles of the spine, and the swaying movement is due not so much to the legs being at fault as their continually *running after* the trunk, which they are endeavouring to prop up. He thinks the cerebellum is the organ where the most special and complex movements are represented.

I might add that although Dr Jackson may with special acumen make a correct diagnosis from such symptoms, yet I believe most practitioners would be guided by the tendency to amaurosis, since I have now seen and heard of several cases where rigidity of the limbs suggested a lateral sclerosis of the cord.

Scrofulous Tumour of Cerebellum

CASE.—Boy, æt. 4, of whom the mother gave the following account:—That fifteen months before the time he was first seen he had an attack of measles, and that soon afterwards the abdomen swelled. In six months' time the abdomen decreased in size, and then the head became affected; it grew large, and there was an alteration in the boy's manner; he was slow, and hesitated in answering; after this he began to lose power in his left side. When first seen he was scarcely in a sensible condition; he lay in bed, unable to lift up his head, which was very large, aud he often applied his right hand to it; pupils dilated. At the end of the month his state was much the same, but the left side was completely paralysed, the pupils were dilated, and the child, judging from his vacant stare, appeared quite blind. In the night he often screamed and started. Afterwards a watery discharge was observed flowing from the ear. Subsequently the other side of the body became paralysed, as well as the rectum and bladder. The child often had violent fits of screaming, but never any convulsions. He lived six months after he was first seen, and nearly two years from date of the first illness.

Post-mortem examination.—There was a bed-sore on the sacrum; the head was as large as that of a child of ten years, and from the occiput the hair was rubbed off, and an ulcer existed. The fontanelles were not closed; the surface of brain healthy, but hemispheres burst open from the weight of the fluid within. This could not all be collected, but was reckoned to amount to a pint; it was clear, like water. The ventricles were thus of enormous size; the septum lucidum was entire, but like a piece of tissue-paper, and the corpus callosum

much resembled it. The ependyma was not softened, as in the white softening of acute disease. On attempting to remove the brain, the cerebellum was found adherent to the dura mater, owing to the presence of two scrofulous tubercles in the cerebellum; one was very large, the size of a small egg, and to this was attached a smaller one; the larger one was two inches long and one inch broad; the right lobe of cerebellum was thus destroyed, and neighbouring parts pressed upon. The mesenteric and other lymphatic glands contained tuberculous deposit; also lungs, liver, kidney, and spleen.

The following case of cyst in the cerebellum has just been published in the Guy's 'Gazette.'

"A young woman, æt. 21. About four weeks before her death she began to vomit every morning on rising, and it was observed that her manner was altered, being excitable and hysterical. She was obliged to leave her situation, and go home, where she remained in a very listless and irritable condition, the vomiting continuing, and the food being regurgitated as soon as swallowed.

"On admission, had listless vacant expression, complained of constant headache referred to left temple, occiput, and back of neck, and sight was double. She felt better sitting up than lying down. Answers all questions intelligibly. Slight amount of optic neuritis in left eye.

"On next day she was found sitting up, and on asking her to walk she rose deliberately from the chair, then seemed to wait to steady herself, and placing her hand over the left eye, started off, holding out the right hand to grasp any object should she fall. Her gait was unsteady and shuffling, especially with right leg, and she looked whilst walking as if every moment she were about to fall. Sickness continued.

"On following day headache so bad that she could not get up, and she turned about the bed with pain. Then came on a fit of screaming, and she fell into an unconscious state and died, respiration ceasing five minutes before the heart. No convulsions.

"A cyst was found occupying the left cerebellar lobe, outside the corpus dentatum, and nearer upper than lower surface of cerebellum."

Hydatid in the Brain

Eliza S., æt. 9, admitted in January into Clinical ward, and died two months afterwards. About six months before she began to complain of pain in the head, until this became constant; she lost her appetite, and was often sick. After a little while she became somewhat better, and was able to leave her bed, but it was then observed that her left side was weak; her appetite returned, and sometimes she was actually ravenous. A month before admission she completely lost her eyesight. On admission she was quite blind, with pupils widely dilated; she seemed quite intelligible, understanding all that was said to her. She was very fretful and irritable, constantly asking to be moved or crying out for food. She only occasionally complained of headache, and if so, this was situated in the forehead. The motions were passed involuntarily. Both legs were weak, but the left more so; the left arm was contracted and rigid. The right arm she could move, though imperfectly; neither sensation nor excito-motility were impaired. When moved she called out as if it gave her pain, and the muscles became more rigid. Mr Bader examined the eyes and found nothing very

noticeable; nothing, indeed, to suggest a cerebral tumour. When she was asleep the pupils became contracted as in health.

The child gradually grew worse, was very fretful, very sharp in her answers, and continually crying out for the nurse. The left leg became flexed like the arm, whilst the right remained extended, but powerless. The right arm appeared disposed to be rigid. Respiration irregular. Death took place quietly.

Post-mortem examination.—When the calvaria was removed the convolutions were found flattened, and on cutting through the brain a large hydatid cyst was seen situated in the right hemisphere. It was large enough to hold half a pint of fluid, occupying the middle and posterior lobes of the cerebrum, within three lines of the surface, and separated from the ventricle by a very thin membrane. There was a small hydatid cyst in the liver.

Tumour in Medulla Oblongata

CASE.—A girl came in complaining of pain at the back of the head which had existed only a few days, and having no other symptom; the house physician thought it was functional, and her condition due to hysteria. She had only been in the hospital two days, when he was called to her to find her dying, and very shortly she ceased to breathe. He kept up artificial respiration as long as the heart beat, and this continued for eight hours! There was no attempt at spontaneous breathing, and the body was cooling down all this time. At the end of this period the artificial respiration was stopped, and then, most remarkably, the heart continued to beat for another twenty-five minutes.

The post-mortem examination showed a glioma in the medulla oblongata infiltrating and encroaching on all the important centres, including the fourth ventricle. It was dilated with fluid and the surface granular.

The following case of Dr Goodhart was very interesting as being apparently one of tumour which had been dispersed or shrunken; and I have seen other cases where a tumour has been diagnosed and the patient has recovered.

Tumour cured

CASE.—Ada P. was attacked with severe headache and vomiting on Dec. 20th; this had existed some days, when Dr Goodhart saw her. The headache and vomiting continued, and her sight was impaired. The optic discs were hazy grey, and swollen; the pulse 52. She was ordered bromide and other remedies with temporary relief, when the headache again returned in a most agonising form, and if anything was given her she immediately began to retch. Sight very dim. Pulse 48. During next few days she looked very ill, a little delirious at night, and pain down right side of head. She subsequently became unable to distinguish forms, and could see only a glimmer of light. Pupils dilated, and external recti paralysed. Mr Higgens then saw the patient and found double optic neuritis, disc swollen, edges blurred, &c. On following day she was worse, only half understanding what was said to her, but crying out with pain in the head, and she appeared to have some weakness of the left side. She was ordered bromide and iodide together. She thus continued until a month after the time when Dr Goodhart first saw her, and then she began to improve; all the urgent symptoms passed off, and the sight began to return. A careful examination of

the eyes was continually made, and changes were seen. In March she was able to get out of bed and walk with assistance, and in May she was fairly well, with exception of dimness of vision. When Dr Goodhart reported the case a year and a half after this date, she was well with exception of imperfect sight and occasional sickness.

Aneurysm of the Brain.—Aneurysms of the larger vessels on the exterior of the brain have always been recognised, occasionally even in the substance of the organ itself, and, as I said when speaking of apoplexy, they have of late years, especially by French observers, been found to be far from uncommon. When very small and numerous they have been styled miliary aneurysms. As regards those of the larger vessels, there may have been no symptoms indicating their presence until they have ruptured, the brain becoming flooded with blood, and the patient falling into an apoplectic state. As an aneurysm is as likely to occur in a young person as in those of more advanced years, it should always be suspected when any one of tender age dies with the symptoms of apoplexy, and its presence may be almost regarded as certain if, after death, on removal of the membranes, the brain is found covered with blood. A specimen of ruptured aneurysm was lately sent me by Dr Cossham, of Cirencester. It came from a little girl aged eight years, who was suddenly seized with all the symptoms of apoplexy and died in a few hours. In some cases there may be symptoms of long standing, which create a suspicion of a local growth, if not of aneurysm; as, for example, those which would be due to pressure on some important region of the brain, by which particular nerves are involved. Several cases of the kind, published in the 'Reports,' were collected by Sir William Gull, and the specimens may be seen on the shelves of our museum. In some of these the aneurysms were situated on the vessels constituting the circle of Willis and its branches, and no symptoms of their presence existed. In other cases of aneurysm of the basilar artery pressure was exerted on the pons Varolii, and the patient had a gradually increasing paralysis of the limbs, followed, after a time, by weakness of the muscles of the face and of speech, and deficiency of hearing.

In a case, of which we have the specimen, where an aneurysm the size of a grain of wheat broke into the substance of the pons, the principal symptom had been a constant pain in the back of the head and down the neck, with an inability to bend the head forwards. Next to aneurysms of the basilar I think the most frequent are those of the middle cerebral artery. In aneurysms of other vessels the symptoms vary with the locality and the parts which are pressed upon; thus, in a fatal case of aneurysm of the posterior communicating artery described by Mr France in the 'Reports,' the patient

had for some time been an inmate of the eye ward for paralysis of the third nerve.

In this case and in another, where an aneurysm existed in the middle cerebral artery, the patients were young, they had suffered from rheumatic endocarditis, and after death embolic infarctions were found in their spleen and kidneys. The combination of these conditions has been found so often that no doubt can be left that aneurysms in young persons have had their origin in embolism.

Such an origin for aneurysm is not yet described in the systematic works on medicine, but the cases taken to the Pathological Society and described occasionally in the medical journals can leave no doubt as to its correctness. An embolic mass of fibrin sticks in a vessel, becomes adherent to it, undergoes a softening process, and carrying the coats of the artery with it at last produces an aneurysmal dilatation or pouch.

Many years ago I exhibited a case of aneurysm of the axillary artery in a little girl, in whom there was endocarditis, and one of the mesenteric artery in a young man, who also had a similar affection of the heart; and some other instances. Only just now we have seen an aneurysm of the thigh at the division of the femoral and profunda, exactly at the place where an embolus would lodge; and in this case there was extensive disease of the aortic valves. I have had also two cases of embolic infarction of the brain where the aneurysms may be seen in process of formation.

Since these lectures were first given I have seen several other instances proving clearly the origin of aneurysm from embolism. A recent very striking case was that of a lad, æt. 18, who was under my care for mitral disease; he also had some special muscular weakness and difficulty of speech. Subsequently the pulse at the wrist suddenly stopped. The brain showed an aneurysmal dilatation of the Sylvian artery with a softening clot, and the brachial artery contained an embolus.[1]

Case.—A gentleman, æt. 42, fell from his horse whilst hunting, and when on the ground appeared to be convulsed. He was taken home, and remained tolerably well except a headache. Four days afterwards he was seized with an intense pain in the head, followed by a severe epileptic fit. He soon recovered, and when I saw him he had not a single cerebral symptom except a general headache. On the following morning he had a similar attack followed by coma, and after lying unconscious for some hours he died. Whilst in this state his pupils were contracted, the pulse slow and irregular, but no specially marked paralysis. It appeared that he had suffered from headache for eighteen months. Post mortem I found the base of brain and ventricles flooded with blood which had proceeded from a rupture in the brain anterior to the corpus striatum. On

[1] See details of this case and others by Dr Goodhart, 'Path Trans.,' 1877.

examining further into the anterior lobe I found an aneurysm on the anterior branch of the middle cerebral artery. It was the size of a bean, and had a longitudinal rent in it.

Chronic Meningo-cerebritis and General Atrophy.—I have spoken of acute general cerebritis with softening, as well as a meningo-cerebritis of a subacute character, where the main symptoms are evidently due to a progressive morbid change in the brain; now, besides these more evident forms, there is a slow degenerative disease, not marked by any distinctive features, but only apparent, after a lapse of time, by the failure of brain power. Just as there is a phthisis which may be compared to pneumonia, and a cirrhosis of the liver or granular kidney which may be compared to acute hepatitis or nephritis, so there is a degenerative disease of the brain which is a counterpart of these other chronic affections. In cirrhosis, or Bright's disease, the great fact which comes before us is a spoiled or degenerated organ, whose commencement is obscure; the pathological question whether either of these diseases is due to a simple atrophy or to a change of a chronic inflammatory nature being still an open one. So likewise in the case of the brain, where we find a wasted organ with thickening of the membranes, the mode of production may be equally obscure, and therefore altogether comparable to that of the granular kidney. In nearly all these diseases the change in the organs is only a part of a more general one, existing throughout the body, there being some common cause productive of the universal tissue alteration.

Under many and varied conditions we find the brain shrunken as a whole, the convolutions gaping, leaving spaces occupied by fluid, the arachnoid everywhere thickened and sometimes adherent to the surface, the pia mater vessels also diseased, the ventricles distended with fluid, sometimes granular on the surface, the central ganglia having lost their roundness, and the structure of the brain, when examined by the microscope, often having undergone degenerative changes, especially in the grey cells. With this state of brain it can be imagined that there will have been observable during life failure of the powers both of the body and mind. In old age such a condition is often met with when the patient has become childish and garrulous, totters in his walk, writes with a trembling hand, and everything betrays an increasing decay of muscular and nervous power. Now a very similar condition may be met with in earlier age in imbeciles and the demented. It may also arise from injury and shock to the nervous system, and is most markedly seen in alcoholism. The inveterate drunkard, is in fact, prematurely old, and has literally been living too fast. Then also from various unknown causes of a moral kind a degenerative change

may arise in the brain, as is found in the general paralysis of the insane. From whatever cause it results such a brain must imply the existence of a *dementia paralytica*, although, according to the mode in which the change has come about, so would the symptoms which lead up to the final issue differ. We can see how this would be from taking the analogous case of the diseased kidney, and considering that, when this organ has undergone a structural change, certain symptoms, such as uræmia, would necessarily ensue; but according to the mode in which this change had occurred so would the whole history of the case be peculiar, varying in acute nephritis, granular kidney, or in suppuration. In like manner, probably, according to the character of the morbid process going on in the brain, would the symptoms during its progress be of a special kind, although they would be all leading up to the final catastrophe, the destruction of the organ, when they would all become as one.

GENERAL PARALYSIS OF THE INSANE

It may appear to some of you that passing from inflammation of the brain to insanity was a long stride, and that I am going now out of the wards of the hospital to the madhouse; but, in fact, I am following the natural order of disease, for the forcible separation of many cases found in lunatic asylums from those which we have to treat here is artificial. For not only pathology but clinical facts unite them; over and over again have I seen a patient sent here, and it has been a question whether he has softening of the brain, whether he be suffering from the effects of intemperance, or whether he have dementia. Not long ago I had a man in my ward who was labouring under cerebral symptoms in consequence of an injury, and one of my clerks, who saw him first, finding his articulation defective, believed it was a case of disease of the medulla oblongata, but after going over all the man's symptoms I concluded it was a case of general paralysis of the insane. Thus you see in actual practice there is not that line of demarcation between cases which you think ought strictly to be found in lunatic asylums and those which we have to treat here in a general hospital.

You might very fairly argue that this doctrine would apply to all cases of mental disease, for all have their foundation in an alteration of the brain. But this is not really so. Insanity is not a pathological condition, as we understand the term in our post-mortem room. I believe all mental peculiarities are associated with a certain organisation, but that peculiar organisation is not of a kind which can be appreciated by our eye. We know that cere-

bral development is intimately connected with mental power, and that no doubt a peculiar formation exists with eccentricity of character. But if this eccentricity reaches that height to which we give the name of insanity, we should not expect to find any structural change in the brain, even if there were a visible peculiarity in its conformation. I would have you here remember, once for all, that the changes which our eyes or microscopes discern are either of a degenerative or destructive nature or of that formative kind which encroaches on the healthy structure, and therefore, under both these circumstances, there is a loss of good substance, with a corresponding failure of function. We know nothing of those alterations which are associated with a change of function or exalted function, if there be such a thing.[1] If, then, a person be not born fatuous, but, having possessed the ordinary mental faculties of man, should lose any of these, and at the same time his bodily powers, we should expect some degeneration of the structure of the brain. If a patient becomes feeble or paralysed in any part, we ought to be able to discover the cause in his nervous system, or if he become demented a lesion should be made manifest; but such a case is clearly separable from one where the patient has spent the whole of his life in an asylum.

I believe it is true that alienists are now making this distinction, and if imbeciles and old people are excluded, they are able to divide all cases into the functional and curable diseases such as mania and melancholia on the one hand, and into the organic and fatal on the other, which in an asylum seem to be called general paralysis of the insane.

In speaking, therefore, of chronic inflammatory processes in the brain we of necessity touch upon the subject of mental disease, and in this form of malady to which I now allude, and which may be compared to the atrophic form of Bright's kidney, the cerebro-spinal centres become wasted. You would expect, of course, a paralysis of body and mind—a "dementia paralytica." This is what you have, and is, in fact, the name of the disease. It is a disease in which the patient finally possesses little more than vegetative life. He sits in a chair or lies in bed perfectly helpless, with the mind gone. Now, as you might suppose, this disease progresses slowly, and thus there is a gradual decay both of mental and physical power; which of these begins to fail first is a disputed

[1] This is what we mean when we speak of functional and organic disorders; not that the functional are not dependent upon physical conditions, but that they take place within the range of known physiological action in a structurally healthy organ; whereas the latter are altogether outside the range, and are associated with tangible organic changes.

question among alienists. Inasmuch as the membranes are often affected as well as the adjacent cortical structure, you might infer (from what has been already taught) that convulsive movements might be present; and so they are, epileptiform attacks being very frequent. As also the change is not simply a degenerative one, as seen in old age, but is a destruction due to a more active process, you might suppose that the dementia was ushered in by peculiar mental phenomena. This is so. The mental peculiarities are almost characteristic of the disease. The patient's mind is excited to the formation of the most extravagant ideas; he believes himself to be some exalted personage, to be inhabiting a palace, and to be possessed of enormous wealth. Thus it is that this disease is styled by the French "paralysie ambitieuse," or "folie ambitieuse."

Here, then, is a chronic disease of the cerebro-spinal centres having the same relation to acute inflammation as phthisis has to pneumonia, or a chronic rheumatic arthritis to an acute synovitis, or, more appropriately, a chronic Bright's disease to an acute nephritis. The disease has a duration of about two or three years, and then terminates fatally. After death in many cases there is no change evident to the eye; in others there are microscopic changes; and in others, as Calmeil described, a very evident meningo-cerebritis, aud with this a marked degeneration or destruction of the most important parts of the brain, the grey substance more especially; but no portion of the whole cerebrum is excluded from the process. The membranes —that is, the visceral arachnoid and pia mater—may be found thickened and closely adherent to the surface, so that on an attempt to remove them the cineritious structure is torn. In this grey substance the ganglionic cells would be found to have completely degenerated and altered in form and colour. Associated with them are amylaceous bodies and a quantity of new connective tissue, which binds the whole together and hardens it. Sometimes numerous blood-vessels are seen, and small extravasations of blood; also considerable extravasations are often seen to have occurred on the surface, and to have become organised into membranes.

Luys regards general paralysis as a diffuse interstitial sclerosis of the neuroglia of the nervous centres. In the different layers of the cortex he had found an increase of connective tissue, which by its pressure destroys the true nerve elements—a condition at last being produced similar to a cirrhosis of the liver.

Dr Mickle, by a careful study of numerous cases in asylums, has been able to make a further analysis dependent upon special symptoms and corresponding degenerative changes in the brain. He has found portions of the brain affected more than others, both by degeneration and adhesions; also varying amounts of con-

sistency and vascular changes. With these there have been different mental states, shown by depression, violence, fits, &c.

In some cases one of the most striking alterations is to be found in the blood-vessels; thus, in one specimen in the museum, when a section was made, the vessels stood out like so many bristles. They could be pulled out of the brain to the length of several inches, and had undergone a most remarkable calcareous change. The patient was comparatively young, and such an alteration I have never met with in older persons with diseased cerebral vessels. This was an evident and marked change, but besides this it is said that the microscope is able to exhibit even more distinct alterations in the vessels. Dr Sankey thought that the vessels became tortuous, and put on a varicose appearance from protuberances on their surface, owing to a thickening of the walls; and regarded the disease in a pathological point of view as a case where there was hypertrophy of the connective tissue in the small arteries and veins of the pia mater of the cortical portion of the brain. At the time these observations were made the anatomy of the blood-vessels of the brain was not so well known as it has been of late, and therefore it would be necessary to compare these diseased vessels with those which may be regarded as normal, as delineated by Professors His and Bastian. These gentlemen have shown that the blood-vessels of the brain are normally surrounded with a case, or rather they are contained in sheaths styled perivascular canals, and which some have regarded as lymphatics. With this new light our specimens must be studied afresh. As you might suppose, the disease does not end here, but affects the brain as a whole, and at the same time the spinal cord. Several cases have been recorded where the medullary matter was so hardened by the chronic inflammatory process and the production of adventitious matter that the grey matter could be scraped off, leaving the form of the convolutions in the white matter beneath. The spinal cord is also atrophied. In a spinal cord sent to me from an asylum I found grey degeneration of the posterior columns with abundance of amylaceous bodies; but the history was not very good. Dr Ringrose Atkins has carefully examined the spinal cords in several old cases of insanity, and found that they have undergone marked atrophy and degeneration. He has found the vessels dilated and thickened, an overgrowth of connective tissue, nerve-fibres deprived of axis-cylinders, and ganglionic cells withered and pigmented, besides distinct portions of cord which had undergone a more marked degeneration. Theoretically there may be no necessity for supposing that the cord shares in the disease, for, besides those in the central ganglia, the changes in the cortex might be considered sufficient to account for the sym-

ptoms, now that the motor properties of this region are better known; more than this, it has been suggested that the peculiar movements of the patient may indicate the exact convolutions which are affected.

In the cases where there are no very evident changes to the naked eye in the form of inflammatory adhesions and wasting, the microscope may display profound alterations in the shape and conditions of the ganglionic cells. The ventricles may also show atrophied patches on their walls, and the latter may be granular. From such cases it can be seen that the marked alteration in the blood-vessels sometimes found cannot be regarded as the essential pathological condition, since they are not always present. A theory, therefore, exists which converts the degeneration into a malnutrition due to a prior derangement of the vaso-motor or trophic nerves. I believe I heard this theory first propounded by Dr Davey. It has since been advocated by Dr Bonnet, who after some very careful investigations comes to the conclusion that the origin of the disease is to be found in the sympathetic system; he declares that visible changes are met with in the whole chain of ganglia, but more especially in those of the cervical region. In these glands he found the nerve cells atrophied and destroyed, and their place taken by cellular and adipose tissue. In the ganglia of the spinal nerves, and even in the cranial, there was pigmentary degeneration of the grey cells. To these alterations he attributes the changes of nutrition in the cerebro-spinal centres. In the brain and cord he does not find actual disease of the blood-vessels, although there may be some thickening of the external coat. The radical change is the deformation and fatty degeneration of the grey cells of the ganglia; these are found containing granular and pigmentary matter, diminished in size or destroyed, or their place occupied by adipose tissue; there may also be an increase of connective tissue. According to these views the primary disease is in the sympathetic system, and the original cause of the malady is not in the encephalic centres, which are only secondarily affected. I give this as the last new theory, but I confess to a prejudice against it, as the vaso-motor pathology is now the one in fashion.

We have, then, this disease styled "dementia paralytica," or the "general paralysis of the insane;" by the French "folie paralytique," or "paralysie ambitieuse." Pathologically it is a degeneration, and by those who insist on its inflammatory origin would be styled "meningo-cerebritis chronica" or "peri-encephalo-meningitis." It is a case of paralysis of body and mind, commencing with a physical weakness or some alteration in the manners or character of the patient. It is a question which takes the lead, the psychical or

physical derangement. Those who have recorded most cases agree that the mental aberration is the first change discernible. I think it is Dr Blandford who has insisted on the mental alienation being the first and most important symptom, and that even the defect of speech does not at that time prove a necessary motor lesion, since by a strong effort of the will the stammering may be overcome. As regards the bodily symptoms, they are those of gradual progressing paralysis; there is a tottering in the gait, a want of power in articulation, and an evident paralysis of the muscles of the face. The commencing paralysis of the muscles of the face produces a vacant expression, which is at once recognised by the experienced medical man, and as soon as the patient talks his mode of articulation at once characterises the disease; he speaks thickly, and clips his words like a drunken man. There is no necessary connection between paralysis of the face and insanity, but still, in a case where the brain is approaching decay, it might be the first symptom recognisable. Thus, from the earliest ages, a madman was characterised by an altered mode of speech and by an inability to hold his saliva. In this disease there is a vacant expression, the articulation is indistinct, and the tongue is protruded with difficulty or wavers. Afterwards the paralysis extends to all parts; there is a weakness of the limbs, and the patient walks unsteadily, like a drunken man. When it is said that the paralysis begins above and then affects the body, this is often only apparent, and because a change in the muscles of the face is more easily distinguishable. Thus, in a man who was in the hospital some time ago, there was the tremor of lips and tongue, as well as hesitating speech; but the man could grasp with his hands most powerfully, and when asked to walk would step out with vigour, and said he could continue for miles. It might thus have been inferred that he had perfect control over his limbs; but I caused him to write, and the tremor of the hand was evident, as you will see by this specimen, where every letter is formed by a dozen or twenty different strokes; and when he walked his gait was seen to be unsteady, although we had no opportunity of testing the amount of control over his limbs. If ever you go to a lunatic asylum, you may observe persons with this disease playing at cricket, and then you will perceive that, although they run and hit the ball, they do it in so awkward and grotesque a manner that it looks like a burlesque of the game. The appearance of a drunken man will give you some idea of a patient thus affected—in fact, a drunken man might be said to have an acute general paralysis of the insane. I should have mentioned also a fact which is very common in many brain-diseases—that the pupils are, as a rule, unequal in size, and both contracted more than natural.

I had lately an opportunity of proving the importance of this symptom. A gentleman died, of what was evidently general paralysis, about two years after his life was insured, when of course some investigation was made as to the condition of his health at the time the assurance was effected. It was then known that he was suffering from general nervous debility, attributed to over-study at college, and it was also known that one pupil was larger than the other. The two facts were not associated by the medical adviser; but the proposer of the assurance was sent to an ophthalmic surgeon who declared that there was no organic disease of the eye. His life was then accepted.

As regards the mental symptoms, these may show themselves by a mere failure of power, or inability to attend to business or the ordinary affairs of life, or are perhaps exhibited in a more striking manner, by strange behaviour towards those with whom he associates, and by certain likes and dislikes in his own family. The tendency is towards dementia, seen in the memory failing and the mistakes which are made in the transactions of business. Then he will have delusions, and his mind becomes wholly deranged; but instead of growing melancholy, he becomes elated, or is, as the French say, "gay"—he has exalted ideas. These are not necessarily of the kind before mentioned, but, in cases I have seen, are rather extravagant ideas. The greatness of the man has been not merely exhibited by his boast of immense wealth, but everything around him appears to him on a larger scale; a patient for instance informed me that his house was a mile high, and that he had a hundred ribs, and that he could kill a thousand pigeons at a shot. They are often rather extravagant than ambitious ideas. I used, amongst my out-patients, to have a postman led in by his wife, as he could scarcely stand. When asked how he was, he smiled, said he was very well, was about to resume his occupation, and that he could walk for miles. A medical friend of my own, whom I was asked to see, told me of an operation for hernia which he had performed, and it was the quickest known—being done in half a second. A literary friend began to be extravagant in purchasing books; he then began to talk about his intended travels over the world and informed his friends he could speak 100 languages. These were the first notable symptoms of his complaint. Strange that the patient, not feeling ill, will deceive others. Thus, not long ago, a patient staggered into my room, accompanied by his wife, and having all the well marked symptoms of dementia paralytica; but both of them for some time warded off my questions regarding his brain or the state of his mind, since, as they said, they had come to consult me about the sudden "bilious attacks"

to which he was liable. These persons, I may mention, are often subject to these so-called affections of the liver.

I not long ago went a few miles into the country to see a young man who I was told had had a sudden attack of illness, and had had several before. I found him in bed in a not completely conscious state after having had a severe fit of vomiting. The doctor told me he had been called before to him in such attacks, and believed it was the liver. After a few days, when he had recovered, he came to my house; it proved to be a clear case of the disease I am describing. I then learned about his altered manner for some months previously. He is now in an asylum. It is very likely that the attacks are of an epileptiform nature, of which the vomiting is a symptom, for these patients, you ought to know, very frequently have fits of what is called cerebral congestion, or epilepsy. It has been thought that these attacks are caused by blood effusions, as the remnants of them are often found after death.

A gentleman belonging to a family with whom I am acquainted was sent to me on account of a severe shock which he had received owing to domestic troubles and separation from his wife. He held a responsible position in a Government office, and I was prepared to endeavour to assist him by advice and by my condolence. I expected to find him looking ill and depressed in spirits. I soon discovered, however, that he was morbidly exhilarated. On speaking of rest from business, he said he was better than any clerk in the office, he could run up rows in a ledger without looking at them, and could undertake the most complicated work. He spoke coherently but extravagantly. On alluding to his state of mind, he said he thought a great deal and had most noble thoughts, for he had always associated with the "upper ten;" in fact, he could no longer mix with the low people of the office, and that was the reason why he was away at present. Indeed, his mother was connected with noble families, and even with the Queen. He was very garrulous, his speech slighty hesitating, and his handwriting shaky. At this time he was going about at large, and his family had not thought of him as insane. His bodily and mental weakness, however, rapidly increased, he was constantly talking of lords and dukes and the lovely places he was going to, and he died a year after I saw him. It appeared that for two or three years he had gone through the most tremendous mental struggle, and at that time depression was his constant condition; the shock had completely shattered his nerves, and when I saw him the natural effect was past. It is quite true, as Dr Savage says, that the hilarious state of mind is a much lower one than the sad or melancholy. The latter necessitates some remnant of care, responsibility, or affec-

tion, whilst the simple gaiety or merriment exhibits a frame of mind when these higher faculties are gone.

Dr Tuke, who has written on this subject, says you may divide the disease into three stages—first, where the quivering of the lips and thick articulation are observable, together with contraction of the pupils; secondly, where there is decided want of power, shown in the unsteady gait and weakness of the arms; and, thirdly, where all power of motion is gone, and the epileptiform attacks occur. This division would have reference to the bodily symptoms, but as for the mental there would be first loss of self-control, of reasoning power, and perhaps excitement; secondly, the patient might have absolute delusions; and, thirdly, complete insensibility. Some have said that the patient passes through the three stages of alienation, dementia, and amentia.

Causes.—It would appear that in this form of insanity there is not found the same strong hereditary disposition to it as in other forms of the disease; and this quite accords with our knowledge that it may be set up by accidental causes. No doubt overwork, or wear and tear on the nervous system in a person of excitable temperament, might develop the disease; but at the same time it does seem capable of being produced by altogether accidental circumstances. There is the case of that man who lately left us. He came in saying that he had not been well since he fell off a scaffold two years before, and was brought to the hospital suffering from injury to the head. His wife said that he had not been right since, and that his capacity for business had altogether failed. He had a vacant expression, or rather a scared look, showing at once that we had before us a cerebral case; we noticed that one pupil was larger than the other; both contracted, however, on the stimulus of light. When spoken to he answered quickly, but rather indistinctly, all his words being as it were thrown together—that is, he spoke thickly, with no clear articulation. His lips trembled when he attempted to utter a word, and his tongue when he protruded it. When asked to walk he set off with great determination, but his gait was very awkward. He could grasp you tightly, and there appeared to be no tremor of the hand; but, when asked to write, his hand was very tremulous, as you will see by this specimen. As regards his mind, we could not say that he had very exalted ideas; but, on the other hand, he had no approach to melancholy; he always spoke cheerfully, said he could walk, or write, or read. He often had a book before him, but I question if he understood it. Now, if this man had had exalted ambitious ideas, not a single symptom would have been wanting to make it a case of the general paralysis of the insane; but in spite of this absence I regard it as an example of the disease,

for in some exceptional cases this exhilaration is wanting. The great point of interest is that it resulted from an injury. When you remember that you find in this disease thickening of the membranes, which are adherent to the brain, besides false membranes, which have probably arisen from extravasations of blood, the conditions are just those which might arise from severe concussion, accompanied by some injury to the cineritious structure, with perhaps effusion of blood on the suface.

A man, three years before I saw him, met with a severe railway injury; his nervous system received a great shock, his mind became affected, he had delusions of a grandiose kind, was restless and excited, and had tremulous tongue and tottering gait.

The moral causes have been due, in persons whom I have known, to disastrous money speculations or domestic affliction, combined in some cases with rather fast living.

As regards diagnosis, we must be led by a number of circumstances before we form a conclusion. In most cases there is a general paralysis, with the peculiar mental defect before mentioned, and a certain morbid condition found after death. Take these together, they characterise a disease deserving of a special name, but it does not follow that some one symptom may not be absent; and thus we must not style every case where there is bodily and mental weakness a case of "dementia paralytica," which has at the present day a very definite signification. For instance, a bodily and mental paralysis exists in mere atrophy of the brain, arising from many causes—as excessive spirit drinking or mere old age—but in the disease of which I speak the destruction of brain has come about in a peculiar way, and the symptoms are necessarily almost characteristic. The handwriting, for example, of very old infirm people is exactly like that of the general paralytic; the best authorities have failed to distinguish between them. There are also cases of disease commencing in the spine, and subsequently creeping up to the head, and which, strictly speaking, are cases of general paralysis. Some of the most remarkable instances of this kind have been those where an injury has been received, causing in the first instance symptoms of paraplegia, and subsequently of cerebral palsy. I believe it is now generally admitted that patients who have had symptoms in the first place only of locomotor ataxy have ended with general paralysis of the insane. I have moreover in remembrance some knowledge of a case which terminated with all the symptoms of the general paralysis of the insane, and which resulted from a severe injury to the spine. An alienist physician could not allow, however, that the condition was the same, for it would contradict his strict rule that the brain, or at least the mind,

is first affected. The distinction is one of immense importance in a legal point of view, for although we may meet with numerous cases which, being strictly interpreted, would demand the appellation general paralysis, yet it is best to withhold the term, for I believe I am right in saying that in a court of justice an expert who used this expression would necessarily imply that the patient was mentally incapable at the very first moment that any symptoms of general paralysis manifested themselves.

Many years ago I had the advantage of attending a course of lectures delivered by Dr Conolly at Hanwell, and I remember that he made the following statement, which I believe is quite correct—that general paralysis of the insane occurs mostly amongst the lower orders, and thus is seen much more frequently in public than private asylums; also that it occurs much less frequently in women, and I think he went so far as to say that he had never seen an example of the disease in a lady of the upper classes of society. I cannot but think that these facts tend to corroborate the idea that the disease is often induced by accidental causes, such as direct injuries to the head. I am told that at the present time it is more frequent in women, and one reason suggested is intemperance. It is a disease said to be rarely seen in Ireland.

I believe I am right in saying that there are some in the profession who deny the broad statement that the disease is incurable and necessarily fatal in a given period. I can venture no opinion on the subject, but there appears no *à priori* objection to the disease being recovered from in its earliest stages. I have never seen a case get well, and recovery must be extremely rare. On the contrary, the most remarkable fact in this affection is that as soon as it is diagnosed by the most trifling peculiarities the patient may be regarded as having a mortal disease upon him.

Of course this implies that the disease is organic; but probably similar symptoms might be temporary or arise from special causes. A gentleman who had been in the tropics suffered much from dysentery and malaria. On his recovery he went on the Continent, and was there taken ill, and went mad. He was confined for some time in a large German asylum. The report of the case is one of general paralysis of the insane. After some months he got better, and is now quite well.

The mental state renders the nature of the disease remarkable, seeing that we have no means of knowing why this fatal degeneration of the brain should be attended by such characteristic mental phenomena. If, for example, a patient becomes melancholic, we know of no reason why he should not recover his mental vigour; but let him be the subject of extravagant delusions, we know that

an organic change has probably commenced which before long will prove fatal.

We must conclude therefore, that this disease of the brain is of a peculiar kind, seeing that there are other degenerative changes which lead to bodily and mental infirmity or dementia paralytica. It is, therefore, wrong to use a term of this general signification for a special form of the disease. No doubt the only form seen in an asylum is of the nature described, but in a general hospital like ours, we see instances of dementia paralytica resulting from disease of the cerebro-spinal centres of other kinds. The French term, "paralysie ambitieuse," is more defined, or better still, "folie ambitieuse." I prefer it also for another reason; on signing a certificate, or acquainting the friends with the nature of the illness of the patient, who is raving mad and who still possesses all his ordinary strength, the use of the term paralysis appears absurd, and its justification only made explicable by the remarkable reason that he will some day become the subject of it.

My complaint, therefore, against the alienists is that they employ a term of general signification to designate one form of the disease. They should define exactly what they mean by the expression, either in a clinical or pathological sense, and thus assist us in our diagnosis.

Other forms of General Paralysis.—You will understand that degeneration of the cerebro-spinal centres implies a paralysis of body and mind. Now, in all probability, this degeneration may occur in different modes or may involve special structures, so that the symptoms in each form would differ.

General Paralysis from Injury

CASE.—Thomas M—, æt. 41, a slater by trade, is totally unfit to give any account of himself, and thus the following history has been obtained from his wife. As long as she can remember he has been a very healthy man, never having an illness of any kind until eighteen months ago, at which time he was at work at the roof of a house, standing on a scaffold, when he fell backwards six or seven feet, striking his back across a beam. He got up, however, and continued his work until the evening, apparently little the worse for his accident, only complaining of pain running up his back on stooping to pick up anything. Five months after this, after working all day in the sun, he was seized with headache and vomiting, which became so bad that he had to leave off work and go home. In the night he raved so much that she sent for a medical man, who gave him some pills, which kept him in a comatose condition for three days. He recovered and was able to do some work for a few months, but was never thoroughly well again; he had pain in the head and was giddy, so that he never could again ascend a ladder. About five months before admission he became much worse, as one evening he found his right arm completely numbed and feeble, and after some hours he experienced much pain in it. Subsequently he had several such attacks, at which time he clutched hold of his right arm, saying hat he felt something hard and heavy in the palm. During this time he has

complained of pain at the back of the head, and has been losing his memory and had difficulty in speaking. Latterly, he has not been allowed to go out alone, as he cannot remember where he lives, and loses his way; for although he has his name and address in full in his pocket-book, he has not the sense to show it to anybody. Lately, also, he has had a very ravenous appetite, sometimes asking for dinner immediately after finishing it, apparently forgetting that he has just eaten it.

On admission, the report says, he is a fine well-developed man, having a wild and excited look. He talks to himself, has a difficulty in pronouncing some of his words, and often, being unable to answer, will start off on an entirely different subject. When asked to repeat numbers he will do so and in any order, not apparently knowing what he is saying. When asked to write his name he assents, but the letters are shaky, and in a kind of mechanical way he places dots over the Christian and surname. Sometimes he will laugh when spoken to, but generally the state of the mind displays no characteristic peculiarities; in fact, he is rather demented. When his wife and friends call he often fails to recognise them.

He remained in hospital a short time and was then removed.

CASE.—Cornelius S—, æt. 32. He was a carman on the South Eastern Railway. Six months ago he fell off his van, a distance of nine feet, striking his back and head. He was picked up insensible and taken to the Middlesex Hospital, where he remained unconscious six hours. He left at the end of a fortnight, very weak in all his limbs. He has never recovered but suffered from headache and giddiness; twice he has fallen out of his chair.

On admission, he seemed a well nourished man and showed no mental peculiarities, but he walked feebly and his arms were also weak. His tongue trembled when protruded, his speech was slow and thick, and his hand-writing very shaky. As regards his physical condition it resembled closely what is observed in the general paralysis of the insane.

General Paralysis with Dementia

CASE.—George B—, æt. 30. Was quite well until four months ago, when, without any assignable cause, he went out of his mind and was very violent. After three weeks the attack passed off and he resumed his work. Shortly, however, the symptoms returned, and his mind became quite lost. He would sit all day taking no notice of any one and not speaking, but he had not, as far as could be told, been the subject of any delusions.

There is no marked paralysis of any part, but there is a failure of expression, and there is general feebleness of the whole body. His gait is tottering, and his hands shake when he raises his arms. He is quiet when lying in bed, but as soon as he moves a tremulousness comes over him. When asked to write he makes the attempt, and the strokes are made by a sudden jerk of the pen. During some days he sat quiet in his chair, and beyond saying "yes" and "no" did not speak. He then had a fit in which the face became livid, the left side drawn up, and there were spasmodic twitchings of the limbs. After this he was delirious, especially at night, calling out, getting out of bed, so that the nurse was obliged to fasten him down. After a few days the attack passed off, and he was able to get up; he soon after left. His bodily condition was one of universal failure of power, observed in his tottering gait, tremor of limb, and hesitation in speech; as regards his mind, it was simply in a state of vacuity.

General Paralysis of the Insane with no exalted ideas

CASE.—George K—, æt. 44, a baker. Was well until a year ago, when he began to get weak, and it was noticed that his voice trembled when he spoke, and that his memory was defective. He was better for a little while, but again got worse and quite incapacitated for any kind of work for four months. During this time he has been silent, has taken very little notice of anything, has never been at all violent, but was troublesome owing to the difficulty in keeping him in bed. He could walk for a short distance when supported, but if left alone he fell backwards. On one occasion when in bed his eyes became fixed and staring, and he trembled violently for about a quarter of an hour, but was not unconscious. A temperate man; had no exalted ideas during his illness.

A tall, well-made man, with vacant expression of countenance; when asked a question he appears puzzled and seems to be trying to collect his thoughts; never speaks unless spoken to; and generally answers in monosyllables. He remains in bed nearly all day, taking no heed of anything passing around, but occasionally attempts to get out of bed and cannot be kept quiet, unless his legs are tied down. When assisted he can walk for a short distance, and then in a shuffling manner on his heels. Passes his motions in bed simply from want of mental effort. The left pupil is smaller than the right. He could at one time write very fairly, but now grasps the pen feebly, and the letters he attempts to form are very shaky (specimen in report). As he was very dirty, and began to eat his fæces, he was sent away.

DELIRIUM TREMENS

Now, after speaking to you of the slow destruction of the brain-tissue by a chronic inflammatory process, let us look at the case of a more simple atrophy. In the disease we have just left—the general paralysis of the insane—there is not only loss of bodily and mental power, but the manifestations of the latter are peculiar. In simple wasting of the brain, however, there appears to be only a gradual failing of the physical and intellectual functions. See a man, for example, tottering along scarcely able to support himself, or "all of a tremble," and his mind at the same time impaired—that man, if the symptoms have existed for any period, has an atrophic brain. This may have been the result of age, and he may be approaching a second childishness or mere oblivion; but if he be a young man, it arises from disease, and, in all probability, from intemperance. Certainly one of the causes most frequently instrumental in the production of an atrophy of the brain is drunkenness, or the excessive use of alcoholic drinks. Alcohol, as you know, causes a degeneration of all the tissues of the body. By its direct effect on particular organs, you may find an increase of the connective or fibrous tissues, and then a cirrhosis of the liver, a Bright's kidney, or a so-called chronic pneumonia may arise; in other instances a fatty degeneration of the tissues occurs, and thus death by diseased

heart is very frequent in the drunkard. These two morbid processes are, however, often combined; but, whatever may be the exact pathological change, the result is a decay of all the tissues and organs of the body. It is remarkable how many morbid processes resemble those which naturally take place in advancing age, and how a disease will thus, by its effects, add so many years to a person's life. A drunken man is literally living too fast.

There are, of course, other circumstances which tend to this general and nervous decay; but I think in most instances, as you have often heard me say, if you see a man come staggering in amongst our out-patients, the probability is that he has been taking too many so-called "strengthening things" all his life. If you find this so, and he is bodily and mentally incapacitated, that man has assuredly an atrophied brain. If you examine the body of a man who has died of delirium tremens, you find the effects of the long-continued narcotic on his organs; and, as regards his brain, there is a very striking appearance—the membranes are thickened, and the convolutions are much shrunken, so that there are deep sulci on the surface, and in these a quantity of fluid. Sometimes there or four ounces of serum are seen, taking the place of so much good brain which has disappeared. The figurative expression which Cassio makes use of when speaking to Iago contains a solid and substantial fact—"O God! that men should put an enemy in their mouths to steal away their brains!" The brain, then, of a confirmed drunkard is an organ which is shrunken, and weighs so many ounces less than it did when healthy. All its functions, also, are becoming enfeebled, and those qualities which should have preserved to its owner the name of lord of the creation have disappeared, and he has become, in common parlance, a good-natured fool. Call such a man a brainless sot, and you have his exact condition—the sot implying a man stupid with drink, and the "brainless" imparting to the term his true pathological state. It is such a brain as I have mentioned that you find in those who have died of delirium tremens. The earlier attacks of the drunkard are recovered from; but there comes a time when the last and fatal one arises. But then his death is really due to the degeneration of tissues which long-continued habits of intemperance have entailed. The last case I saw on our post-mortem table is an illustration of what I have witnessed a score of times—a man, æt. 50, comes in with a fractured leg. He dies in four days from delirium tremens. The brain is wasted, the ventricles distended with fluid, and ependyma granular.

An illustration of intemperance is not far to find, for the newspapers of to-day contain the sad history of a gentleman whose will is in dispute in the Probate Court. Sir E. had been in

the Government employ, and had been a refined, graceful, and accomplished gentleman, until he began a course of dissipation. "He then sank into a state of debasement, in which his whole nature seemed changed; he was held hardly responsible for his conduct, and imbecility seemed imminent. The graceful gentleman became a paralytic of wretched aspect and filthy habits; the gay attaché degenerated into a brainless sot, an indecent talker, a petty pilferer; the trained and accomplished man of the world became an object of scorn or compassion. Shunned by his equals, expelled from clubs, unfit for active or social life, Sir E., after fifty, was a mere decaying wreck, his body a mass of weakness and disease, his mind, with some remains of intelligence, declining into premature decrepitude."

Take a man who, from his addiction to alcoholic drinks, has the weakened brain that I have described, and let any unusual stimulus act upon it, he loses his balance, and he is thrown into the state known as *delirium tremens*. This is my idea of the disease. I believe some medical books state that delirium tremens is a train of morbid phenomena produced by the slow and cumulative action of alcohol. This, however, I cannot admit without some modification, for it might imply that delirium tremens was due directly to stimulation of the brain. There is, no doubt, a morbid condition set up by alcohol, but this would be *delirium e potu*. The patient would be simply intoxicated, or poisoned by spirit, which has "made havoc amongst those tender cells, and checked his power to shape." I believe, however, that such an opinion as I have mentioned does largely prevail, *i. e.* that the brain is over-stimulated by the artificial excitement, and that a sudden deprivation of this starts the disease into life. My own strong conviction is, that such an opinion is highly erroneous, as well as the treatment which it necessarily involves, viz. that the stimulus must be restored, and the excitement abated by opium. I believe firmly that such an opinion and the conclusions which flow from it are erroneous and mischievous.

My own idea is that the brain has been previously brought into an impoverished state by the continued debauchery, and that, thus weakened, it is ready to be further disturbed by any fresh excitant, whether this be a mental trouble, an accident, or, more probably, an extra amount of the alcoholic stimulus. I am led to this opinion because, in the interval of the attacks of delirium tremens the patient presents the symptoms I have before mentioned—a mental and physical weakness—as a result of the chronic and pernicious effects which are being produced on the brain, and also because I observe the circumstances which excite the attack. The cause may

be an accident or an acute disease, suddenly set up, but more generally we find that the patient has been out with his friends drinking for two or three days in succession, and if he has had any trouble in business this would be a still further exciting cause. On the other hand, I never hear of a man suffering from delirium tremens from having got drunk only once, nor do I hear of it in the habitual drunkard from his having left off the accustomed stimulus. I have never witnessed such a case myself, and I have taken the trouble of inquiring of those who have had an opportunity of seeing persons habitually intemperate who have been placed on a bread-and-water diet; and I am informed that such persons do not have delirium tremens. I have myself on several occasions recommended or insisted upon the withdrawal of ale, wine, and spirits from those who have been endeavouring to live upon these stimulants, but never witnessed anything like delirium tremens result. Why I insist more especially upon the importance of having a true conception of the disease is that an erroneous opinion carries with it a very harmful treatment. For whilst one theory suggests a continuance of the accustomed stimulus, the other demands its withdrawal, and insists upon repose for the excited and wearied brain. Delirium tremens is not so simple a disorder as you may imagine; each case requires study, and its appropriate remedies.

Having given you a clue to its pathology and treatment, I have said all that is important. As regards the symptoms, several very graphic accounts have been written, and some by those who have suffered all its horrors, as in the following example. Of course, in a description of this kind, as in the analogous one of the effects of opium eating, the account is written in calm moments, and therefore can only be a feeble representation of the sensations experienced during delirium.

"For three days I endured more agony than pen can describe, even were it guided by the hand of a Dante. Who can tell the horrors of that horrible malady, aggravated as it is by the almost ever-abiding consciousness that it is self-sought? Hideous faces appeared on the walls and on the ceiling and on the floors; foul things crept along the bed-clothes, and glaring eyes peered into mine. I was at one time surrounded by millions of monstrous spiders, who crawled slowly, slowly over every limb; whilst beaded drops of perspiration would start to my brow, and my limbs would shiver until the bed rattled again. Strange lights would dance before my eyes, and then suddenly the very blackness of darkness would appal me by its dense gloom. All at once, whilst gazing at a frightful creation of my distempered mind, I seemed struck with sudden blindness. I knew a candle was burning in my room, but

I could not see it, all was so pitchy dark. I lost the sense of feeling, too, for I endeavoured to grasp my arm in one hand, but consciousness was gone. I put my hand to my side, my head, but felt nothing, and still I knew my limbs and frame *were* there. And then the scene would change. I was falling, falling swiftly as an arrow far down into some terrible abyss; and so like reality was it that as I fell I could see the rocky sides of the horrible shaft where mocking, gibing, mowing, fiend-like forms were perched, and I could feel the air rushing past me, making my hair stream out by the force of the unwholesome blast. Then the paroxysms sometimes ceased for a few moments, and I would sink back on my pallet drenched with perspiration, utterly exhausted, and feeling a dreadful certainty of the renewal of my torments."

A man suffering from delirium tremens has generally already shown symptoms of a weakened brain by his tremor and want of mental vigour. When you are called to see him in the attack, you usually recognise at once the nature of the case; he is probably up and dressed; he may, indeed, be attempting to conduct his usual business; in fact, he generally has a great desire to be about his accustomed avocations; he is constantly moving and wanting to go somewhere or do something, which his friends are as constantly desirous of preventing. As you speak to him he is sufficiently intelligent to know you, and sit down for a moment and converse, but it is only for a moment; his restlessness prevents him remaining quiet, and his mind then rambles on all kinds of subjects. If you place him in bed he constantly jumps up, and is suspicious of those around him, or fancies that he sees objects in the corners of the room; if the bed be surrounded by a screen then he perceives imaginary cats and dogs on the bed-clothes, and will attempt to stroke them, or sees creeping things like spiders; or he stretches out of bed to look beneath it, fearing there are persons hidden there. All this time he is constantly fidgetting his hands, and perpetually jumping up and lying down again; his pulse is quick, his tongue is furred, and he is bathed in perspiraton; but the temperature is not raised.

When I say such a case is easily recognised, I mean with care, for I have constantly seen mistakes made with reference to diagnosis. I have seen general paralysis of the insane styled delirium tremens by the same physician on two different occasions. In the surgical ward of a hospital cases of injury to the head, followed by arachnitis, or effusion of blood on the surface of the brain, are extremely likely to be called by this name. Acute disease, as pneumonia, occurring in a person of intemperate habits, is sometimes masked by the delirium, and may, therefore, be mistaken. Typhus fever

I have seen styled delirium tremens, and there is one form of complaint I have seen on three several occasions confounded with it; I allude to the so-called cerebral rheumatism, where the arthritic symptoms suddenly abate with the appearance of delirium. This may occur, as is usually the case, with a sudden onset of high temperature, and more rarely in connection with a pericarditis or other complication. The physical signs or history of the case ought to render it clear, although the delirium, the restlessness, and the perspiration, form a picture which is often the facsimile of delirium tremens. Authors have dwelt upon its liability to be confounded with arachnitis; such a confusion, however, could only arise from a theoretical view of what the symptoms of arachnitis ought to be. If you suppose they are like those of delirium tremens you might be apt to call the disease by the wrong name; but if you have any real knowledge of the symptoms depending on inflammation of the brain you could not possibly make any such mistake. I never, for example, saw a patient jumping about in bed with meningitis, much less have a low temperature, and be bathed in perspiration. The tendency in all forms of inflammation of the brain is towards lethargy rather than excitement.

It is important also to know what is the condition of the patient generally who suffers from delirium tremens, for on the state of the organs the prognosis mainly depends. He may have cirrhosis of the liver, or, what is not uncommon, Bright's disease of the kidney. If the patient have convulsions, you may find that the urine is albuminous, and this of course must endanger the case. Convulsions, or spasms, I might say, however, often occur independently: they may be due to the wasted brain, or irritation connected with the arachnitis or general thickening of the membranes, or be temporary and due to the recent debauch.

Now, as regards *treatment*, the most important instruction I can give you is what *not* to do. Do not, in the first place, regard delirium tremens as a disease due to the sudden withdrawal of an accustomed stimulus, and therefore commence the treatment with the administration of wine or spirits—you will by so doing add fuel to the fire—but look upon the attack as due to excitement acting on a previously weakened brain. Then your mode of treatment is obvious and rational. In one word, get your patient *repose*. Now, I do not mean by this that your remedy is simply opium to procure sleep, but I use repose in a much larger sense. I have frequently seen a patient, probably a publican, sitting in a large room surrounded by a dozen friends, male and female, who are talking to him or holding him in restraint. He is bathed in perspiration, his pulse is very quick and feeble; the doctor says he has

not slept for two or three nights, and he dare not give any more opium, as the pupils are already contracted. His fears that the man will die seem not ill-grounded, since it is impossible to suppose that any mortal man could go to sleep under such circumstances. I have ordered such a patient to be removed to a small room, put to bed, and he has gone to sleep in half an hour. Therefore I say that the most judicious treatment is required for delirium tremens. Do not go away with the notion that all you have to do is to give opium to procure sleep. I have many times seen the last sleep produced by it. And do not, as I before said, continually give stimulants to "keep up" the patient, for I have constantly seen the complaint aggravated by these means. I do not wish to reflect on the opinion of others when I state strongly my impression that the disease is not to be cured off-hand by medicine, and that in a bad example of the complaint the symptoms will continue without abatement for three days at least. I see a great deal of this disease, and the time which I am called in is about the third day, when, all means having been found unavailing in checking the complaint, another opinion is sought; after this time the patient usually sleeps and does well. I think, then, except in very slight cases, where a single dose of opium procures rest, that a certain interval must elapse before the commotion subsides; this is my experience under all modes of treatment. I have no objection to opium, but it should be administered judiciously; if you act on the principle that sleep must be procured at all hazards and as soon as possible, you will without doubt kill many of your patients. In the first instance you should place your patient in a small quiet room, and get rid of a number of officious friends.

As regards medicines, you must be guided by circumstances. I have often prescribed with advantage the well-known mixture of twenty drops of antimony wine and tincture of opium every four hours, keeping up the patient's strength by beef tea. If you can give a glass of wine or beer in the form of nourishment without its producing any injurious stimulating effects I have no objection; but, as a rule, I advocate the plan of giving none. Instead of administering antimony you might give the laudanum, or small doses of morphia with ether or ammonia, and, at the same time, support the strength of the patient. By judicious management of this kind you will find your patient recover in three or four days, unless, indeed, he be extremely diseased in consequence of his former dissipation. As regards restraint, I have often heard objections made to it, but I believe it is often necessary, and its adoption is a real kindness to the patient. He may wander about his house until he drops dead from exhaustion, when a forcible restraint in bed by a sheet

across the chest might procure rest for the body, and often for the brain. Remember, then, your patient wants repose; do not be content with administering opium, and neglecting every measure which common sense would say was necessary to give any man a night's rest. As regards chloroform, you may quiet the patient by it for a time, but you do not in any way influence the disease. Lately, since, the invention of chloral, this drug has been largely administered in delirium tremens. In mild cases it often acts admirably, and I should advise you always to use it in the first instance. Other remedies are advocated. When digitalis was first proposed I gave it to a man in large doses, and as he unfortunately died I have never felt myself justified in administering it again. I have seen enough of the sedative effects of the wet sheet to fully believe the statements which have been made as to its efficacy; you strip the patient naked, roll around him a wet sheet until he looks like a mummy, and then a blanket around this again. In many cases of delirious excitement you will find that as soon as a hot vapour surrounds the patient he sinks into a quiet sleep.

PART II—THE SPINAL CORD

ANATOMY AND PHYSIOLOGY OF THE SPINAL CORD

A TRANSVERSE section of the spinal cord shows a tendency to divide into two halves by a wide and distinct fissure in front, and by a less distinct though deeper fissure behind. On each side of it are the roots of the nerves, the anterior being the efferent or motor and the posterior the afferent or sensory; at the origin of the latter there is a distinct groove, which is not the case with the former, so that the cord is naturally divided on each side into an antero-lateral and posterior portion. The posterior column is again divided by a slight indentation into two parts, external and internal, styled respectively the *funiculus cuneatus* and *funiculus gracilis*. The former is also called the posterior root zone or column of Burdach, and the latter the column of Goll. These columns are probably physiologically distinct, as they are affected in a separate manner by pathological processes, as, for example, the inner one in the ascending degenerative process, and the outer one in ataxia. Pathological facts would seem also to warrant a further division of the antero-lateral columns into special strands, since we find degenerative processes running exclusively along particular portions, as well as along the anterior and posterior edges; several instances having been shown of an ascending degeneration affecting a thin layer of the cord on the periphery of the posterior part of the lateral columns.

The grey matter of the cord displayed in the centre of the section is composed of two crescentic portions joined by a commissural band. The two crescents terminate in anterior and posterior cornua, which are connected with the corresponding nerves. The posterior horns come near the surface and end close to the origin of the posterior roots of the nerves, whilst the anterior cornua are shorter, rounder, and more distant from the surface. The posterior roots, therefore, make a natural division into posterior and lateral columns. The posterior cornua are covered with a substance somewhat different in character from the grey matter, and called the

gelatinous substance. Between the anterior and posterior cornua is a projecting portion of grey matter called the *tractus intermedio-lateralis*.

Running through the transverse or commissural portion is the central canal. This opens above into the fourth ventricle, where the grey matter undergoes expansion, so that the posterior cornua are turned towards its edges, whilst the anterior remain in the median line. The mode by which the nerves are connected with the spinal cord is only in part known. There are clearly transverse and longitudinal fibres, the former passing across from front to back, and *vice versâ*, through the grey substance, and these vary much in size. The anterior roots may be seen entering the cord and spreading out, some entering the grey substance, whilst others pass upwards and downwards. The posterior roots in like manner pass into the posterior cornua and some into the posterior columns. The course and function of the different strands have been worked out by dissection, by experiments on animals, and by the methods of Bouchard and Waller. That of the latter consisted in tracing the course of the degeneration of nerve-fibres after they had been purposely injured. The same process has now frequently been observed in the human subject after disease or injury, so that we recognise ascending and descending degenerations attacking the posterior median column and lateral column respectively, according to the physiological course of the tracts.

The experiments of Brown-Séquard seemed to show that division of the posterior columns did not destroy sensation; he further proved that sensation was lost by a destruction of the central grey matter, showing that this important part of the cord, besides possessing its own true and independent function transmitted sensory impressions upwards. He demonstrated also that the sensory fibres crossed immediately from one side to the other, differing herein from the motor fibres which decussate in one mass at the pyramids.

He found, therefore, by severing one lateral half of the cord, that he produced perfect paralysis of motion on that side and loss of sensation on the other, sensation remaining perfect on the paralysed side. There have now been a sufficient number of experiments made for us on the human subject by disease and injuries to confirm to a certain extent the truth of this physiologist's investigations. If he be right we cannot say that the function of the grey matter is wholly dynamic or force-producing, whilst the medullary portion is for conduction only. Schiff, however, declares that division of the posterior columns does destroy tactile sensation, and that it is the sense of "pain" which is conducted

by the grey matter. But later experiments throw much doubt on these statements.

The motor tract is undoubtedly contained in the antero-lateral columns and more especially in the lateral. Its fibres are intimately connected with the anterior cornu of the grey matter. Proceeding downwards from the region of the corpora striata, the motor tracts run along the crusta and lower portion of the pons, and then entering the medulla appear as the pyramids, where they decussate and pass into the lateral column of the opposite side. These pyramidal fibres occupy mostly the posterior half, almost touching the posterior cornua. Some of the fibres of the motor tract, however, after leaving the medulla pass down in the anterior column of the same side, and the strand they form close to the anterior fissure is known as the column of Türck.

Proceeding both from the corpora striata and thalami optici are the radiating fibres which terminate in the convolutions. According to physiological necessity it is supposed that those connected with the corpora striata proceed from the anterior lobes of the brain and are therefore associated with motor functions, whilst those connected with the thalami proceed outwards towards the posterior lobes, and consequently have to do with the sensory or perceptive functions.

In describing the anatomy of the brain it has been stated how pathological facts have given a more precise limit to these motor and sensory tracts. I have spoken of the two nuclei of the corpus striatum, and of the white band of fibres lying between them which is called the internal capsule. Now, in tracing the motor or pyramidal tract upwards through the crustum and peduncle, we find that it joins the internal capsule, and again spreads out into the corona radiata which passes to the motor region of the brain. Any confirmation of Ferrier's views would tend to show that the originating source of the motor tract is in the convolutions, and that this tract then proceeds downwards in the way indicated. The nuclei of the corpus striatum would then be regarded as recording or reinforcing ganglia.

The fibres of the internal capsule run, in the anterior two-thirds of their course, between the lenticular and caudate ganglia of the corpus striatum, and thus constitute its motor portion; the capsule then gives a bend, the angle being called *the knee*. The remaining or posterior part is sensory and intimately associated with the fibres passing up from the tegmentum. The tendency of opinion at present is to associate paralysis of motion with lesions of the anterior part of the capsule and paralysis of sensation with lesions of the posterior part.

The posterior columns of the cord, which do not appear, as was once thought, to be for the conveyance of sensory impressions, are intimately connected above with the restiform bodies and the cerebellum. From experiments on animals, as well as those made for us in the human subject in consequence of grey degeneration of the posterior columns, it is believed that their function is devoted mainly to co-ordinate movements of the body, by uniting together the various centres of the grey matter from which motor impulses proceed. This is accomplished by an arrangement of short fibres, which are found continually passing from one grey centre to those above and below; by this means all parts of the cord can act in unison. From pathological facts it would seem that it is the outer column or that immediately connected with the posterior roots, wherein lies the co-ordinating power. This function seems intimately associated with that of the cerebellum, which stands between the cerebral and spinal systems, and whose influence is supposed to spread over the whole body, so as to keep it in perfect equilibrium. The upper part of the cord, the medulla oblongata, is much more complex than the remainder of the organ below, and no doubt has very important and special functions, especially those employed in respiration, speech, and various complex movements of the mouth and chest; the grey centres ruling over these being seen in the olivary and restiform bodies, &c. The anterior pyramids are mainly associated with the antero-lateral columns; the corpus olivare also joins with them below, and its fibres pass up to the corpora quadrigemina; its grey centre, the corpus dentatum, appears to be continuous with the anterior cornu of the cord. The restiform bodies connected with the posterior columns and the crura cerebelli, and some of the strands, designated by the name of posterior pyramids, carry up the sensory fibres of the cord to the crus cerebri and brain. There is a form of degeneration of the cord in which the outer edge of the posterior column is affected in connection with the cerebellum, and called the direct cerebellar tract. A part of the lateral column separates or opens out to form the fourth ventricle. A section of the cord will, therefore, show us the following functional division, as far as we at present can make use of it for clinical purposes. If the central grey matter be seriously injured the true function of the spine and excito-motor acts would be abolished, and if lesser changes in this part occur there would be an interference with the transmission of ordinary sensation. If there were an injury to the antero-lateral columns a paralysis of motion would ensue, and if there were lesser changes throughout its substance, a disturbance of movements as seen in tremor or spasm; also if an injury or disease of the cord

should involve the anterior cornu the motor root would be implicated, which would produce not only a loss of function of the nerve, but an actual degeneration of its fibres along its whole course, together with a corresponding atrophy of the muscles to which the nerve was distributed. Again, if the posterior columns were diseased the function of co-ordination would be seriously interfered with. We may, therefore, associate disease of the posterior columns with *ataxia*, of the centres with *anæsthesia*, and of the antero-lateral columns with *akinesia*.

The first knowledge of disease of the cord made it manifest that the cord was something more than a collection of nerves proceeding from all parts of the body, and had a function of its own. This is seen, for example, when both arms are paralysed and the body below unaffected, as in infantile paralysis; or in a case related by Sir W. Gull, where a child had a tubercle in the midst of the cervical enlargement, causing paralysis and atrophy of both arms, though power remained in the legs.

Spurzheim, many years ago, clearly saw that the spinal cord had an independent function of its own. "I do not believe that the only office of the spinal cord with its nervous roots is to establish a connection between the brain and the instruments of motion, the muscles. To me it seems probable that a very small part of the spinal cord suffices for these purposes; the particular portion or organ, however, cannot in the present state of our knowledge be specified. I rather conceive that they (the spinal cord and nerves) aid in maintaining the powers of those parts to which they are distributed; for example, that the muscles or instruments of motion acquire their power in part through the influence of their nerves, whilst the will to make the muscles act resides in the brain."

I have spoken merely of ordinary sensation and the columns which convey it, as well as of motion and the columns appropriated for the transmission of motor influences; but on analysing the various kinds of sensation, as well as the functions of the nerves, it may be well surmised that a nerve is a very complex structure, and may possibly have to transmit many other kinds of influences than those of common sensation and motion. A moment's consideration will show you that it is not an easy problem to solve, whether the impressions conveyed from the surface are but modifications of one another, or whether they are altogether different in kind. Take, for instance, the case of the hand being held to the fire, and a pleasant sense of warmth experienced, and then the actual pain produced if it be approached too near, and ask if the sense of pain is merely an excess of the stimulus which was just before producing

pleasure. It seems so, and yet we know that pain may exist when ordinary sensation is wanting; also that the sensation of warmth and touch may be quite dissociated, as witnessed in various forms of paralysis. The latter fact was known to the elder Darwin nearly a century ago, who quotes in his 'Zoonomia' a letter from Dr K. W. Darwin, of Shrewsbury, who was studying at Edinburgh. to the following effect:—"I made an experiment yesterday in our hospital which much favours your opinion, that the sensation of heat and touch depend on different sets of nerves. A man who had lately recovered from a fever, and who was still weak, was seized with violent cramps in his legs and feet, which were removed by opiates, except that one of his feet remained insensible. Mr Ewart pricked him with a pin in five or six places, and the patient declared he did not feel it in the least, nor was he sensible of a very smart pinch. I then held a red-hot poker at some distance, and brought it gradually nearer till it came within three inches, when he asserted that he felt it quite distinctly. I suppose some violent irritation on the nerves of touch had caused the cramp, and had left them paralytic, while the nerves of heat having suffered no increased stimulus retained their irritability." We are constantly verifying the truth of this in the wards, where, in cases of paraplegia, ordinary sensation may be lost, and yet the patients still appreciate the difference between heat and cold. This, of course, only occurs in modified forms of paralysis. It is a question, therefore, whether one distinct nerve is not required to transmit common sensibility, another pain, and another heat. To these Brown-Séquard would add a fourth for the sensation produced by tickling, and other physiologists a fifth for the cognizance of a muscular contraction during the passages of the electric current. You will see that the question is much of the same kind as is asked with respect to the various effects of light on the optic nerve, or of sound on the auditory, in the production of colour and musical notes—whether there are distinct perceptive centres and corresponding nerves for their relative appreciation, or whether the different effects on the organs of sense are not due to modification of the same stimulus acting in various forms and degrees? It is a question, therefore, whether there are distinct nerves for sensation, pain, heat, &c., or whether these, being but modifications of the same sense, are transmitted only by one, although it is possible there might be different modes of termination of the nerve plates. If a sensory nerve is really compound, we must speak of it as made up of different fibres, as some physiologists do—namely, one for tactile sensibility, another for painful sensibility, a third for thermic sensibility, and perhaps a fourth for electric sensibility. Those who

take this view would have no difficulty in adding a fibre for a muscular sense, and even go to the extent of believing that there are distinct nerves for the reflex acts. In this way each afferent nerve would have a part ending in the grey centre of the cord, and another proceeding to the brain, and in like manner each efferent nerve would consist of a fibre descending from the brain, and another which had its origin in the cord. There is no proof of any complexity of this kind, nor is it theoretically required, for in all probability the fibres descending from the brain above end in the grey matter, or at all events there is no proof of any direct connection between our skin or muscles and the brain above, except through the grey matter of the cord. You must remember also what you are taught as to the different degrees of susceptibility of the skin in the various parts of the body, sensation being most perfect at the tip of the tongue and fingers. Temperature is best appreciated in the lips, cheeks, and backs of the hands. The compound character of a nerve is not thought to end here, for since the nerves appear to regulate the size of blood-vessels and affect nutrition, so there are vaso-motor, if not distinct trophic nerves; and again, as there are nerves to secreting organs, many trunks must contain a nerve with a glandular function. It is thus clearly explicable how eleven or twelve nerves with different offices are supposed by some physiologists to enter into the composition of an ordinary trunk. The functions of a nerve are best observed when the trunk itself is affected; and what we want to discover is in what portions of the nerves do they reside, and whence these functions come. The trophic effects due to the nerves I shall speak of when I come to treat of nerves. That there are influences conveyed by nerves, besides their power of regulating the supply of blood, can scarcely be doubted when we see a neuritis of a sensory nerve followed by changes in the skin, and of a motor nerve by wasting in the muscle. If the motor nerves be cut at their roots, the anterior portion wastes towards its periphery, but not that portion which is still attached to the cord; and not only does the trunk waste, but the muscle itself to which the nerves are attached participates in the atrophy. This shows that the motor nerve receives its nutritive influence from the anterior cornu of the grey matter from which it arises. If the sensory nerve, on the other hand, be cut it retains its bulk in the part beyond the ganglia, showing its nutritive influence is derived from them. If any compound nerve be divided the peripheral part wastes, but not the portion attached to the centres, showing whence it derives the power which prevents its elements undergoing disorganisation. This propagation of degenerative changes along the nerves in special directions may account for many remarkable conditions

hitherto unexplained. In the cord itself the nutritive influence appears to run in the direction of the functional activity of its fibres.

Special centres in the cord.—There can be no doubt that distinct portions of grey matter rule over certain functions through the nervous supply to those muscles which perform definite acts. For example, there is a centre for breathing, another for talking, &c. Besides these more obvious centres it is believed that there are others having their own specific objects, as *trophic centres* and *heat-regulating centres.* Such an opinion has arisen from finding various nutritive changes taking place in the tissues after division of special parts of the spinal cord, but it is not at all clear that these changes may not have been caused by the influence of the sympathetic or vaso-motor nerves on the blood-vessels. These nerves pursue their course along with the ordinary sensori-motor nerves, and therefore it it is difficult to ascertain how far changes in the tissues after injury of the cord or nerves may be due to alterations in them.

The belief in a heat-regulating centre has arisen from the contemplation of various physiological and pathological facts. For example, it has long been observed that very remarkable alterations in temperature take place in injury to the lower cervical region—sometimes a very rapid elevation of temperature, and at other times as rapid a diminution. The reason seemed inexplicable until experiments were made on animals. If a dog had the cord severed at the seventh cervical vertebra, and artificial respiration kept up, the body soon cooled down, as Sir B. Brodie had already shown; from this he concluded that the source of heat was not altogether chemical but was in part derived from the brain. The conclusion, however, was erroneous, for it has since been shown that if the body be clothed so as to prevent the escape of heat, it will become much hotter than natural. From this it would appear that the injury to the cord destroys the creature's power of regulating or adjusting heat; and if you think for a moment, it seems almost necessary to believe that such a power must exist in the nervous system. Call to mind that on one day we may be taking much exercise, on another day seeking repose; on one day eating much and on another but little; and all this time the season is changing from summer to winter, and the converse. Therefore, as we are sometimes converting tissue largely and at another time sparingly, the amount of heat we are producing and giving off must be constantly altering. Yet, under all these changing circumstances, the temperature is the same in all of us even to the fraction of a degree. This normal temperature is the balance

struck between heat produced and heat given off by the skin and blood-vessels, and that this should happen without some such regugulating power can scarcely be believed. Now, these experiments on animals, made purposely, and those in the human subject, made accidentally, seem to show that this regulating force resides in a particular portion of the spinal cord; so that when this is injured, the temperature will be constantly oscillating according to surrounding circumstances. Probably, in disease of the cord, the results of the disturbance may be seen in a modified degree, as well as in the sweating which constantly occurs.

When I say there is a necessity for the belief in a heat-regulating power it does not follow that this must be evolved in a distinct centre in the cord, for it is equally rational to believe in a reflex or automatic process, whereby the heat given off by the skin may so affect the cutaneous nerves as to react at once on the blood-vessels, and so increase or diminish the evaporation.

Since there are nerves proceeding from the cord to the viscera, it has been thought that there may be also distinct centres for the regulation of all the functions, and thus some physiologists speak of a digestive centre or tract. There is no evidence, however, to show that the nerves which proceed to the several viscera carry with them any special influence, but it appears rather that they are identical in function. If this were not so it might with equal reason be argued that the ganglia distributed over the different organs have each their own special office; one, for example, having a renal function, and another an hepatic function. It is more probable that the specialisation lies in the structure of the organs themselves, and that the influence conveyed to them through the nerves is similar in all. This may indeed be nothing more than a regulating blood distribution.

Relation of Nerve to Muscle.—Another point of interest, and one respecting which there is much difference of opinion, is the influence exerted over muscle by the nervous system. When the connection is severed between the brain and the muscular apparatus, any attempt to move the limbs is ineffectual, and the contrast between the healthy and affected side becomes apparent. But it is not only when the will is in operation that the loss of influence is seen; for at all times, and as soon as the paralysis has occurred, not only is the line of conduction broken, but also a certain tonic effect has disappeared. This is well seen in the case of facial paralysis affecting one side, when the face falls and the opposite side is drawn up. This appearance is increased when any voluntary movement is attempted, but even at rest and in sleep the tonic contraction of the healthy side may be well contrasted with the relaxed condition of the other. If

both facial nerves are affected, it is not only when the patient "wills" to move the muscles of the face that the paralysis becomes apparent, but at all times the face assumes a blank expression from the tonicity of the muscles having disappeared. This fact, however, is denied by some, and the appearance explained by the face remaining contracted after the last voluntary action upon it. In a practical lecture it would be out of place to enter fully into the various suppositions and theories propounded to account for this supposed influence, but I may mention that it is one of those questions in nerve and muscle physiology which have by no means been satisfactorily solved. Of course, one's first impression would be that a certain influence, allied, perhaps, to a galvanic force, was constantly passing down the nerve and preserving the tension of the muscle by keeping its elements together. Opposed to such an idea there is the fact of the continuance of the irritability of muscle after the nerves which are distributed to it have been severed; indeed, even more than this; for it has been shown by Brown-Séquard that in a decapitated frog the muscular power has been increased. The spinal cord, however, in this case remains, and Marshall Hall showed that if the spinal cord were destroyed all muscular tone would be lost. In his own words on the decapitated turtle—"The limbs or tail possessed a certain degree of firmness or *tone*, recoiled on being drawn from their position, and moved with energy on the application of a stimulus. On withdrawing the spinal marrow gently out of its canal all these phenomena ceased. The limbs were no longer obedient to stimuli, and became perfectly flaccid, having lost all their resilience. The sphincter lost its circular form and its contracted state, becoming lax, flaccid, and shapeless. The tail was flaccid and unmoved on the application of stimuli." Then, again, arguments have been taken from the independent contraction of muscle which occurs after death to show that the properties of muscle are inherent in itself. It seems strange, however, that a condition of muscle observed after death should be thought to resemble in any way the contractility which is regarded as a sure sign of life. Dr Radcliffe thinks that the active state of muscle is the relaxed one; that during rest it is kept in this condition by electricity in a statical form, and that when the muscle is thrown into action a discharge of electricity takes place. He illustrates this by the case of the torpedo, where an electrical discharge accompanies the contraction of its muscles. The muscle deprived of the force inherent in its molecules contracts, but the contraction does not continue because the electricity is regained. In rigor mortis it is for ever lost. He thinks the longitudinal surface of the muscle is positively electrified and the ends negatively. The muscle

is kept elongated by the opposite electricities and contraction is caused by their discharge.

A knowledge of the true relationship between muscle and nerve ought to be possessed by us before it is possible to afford an explanation of the phenomena of disordered movement, but at present we have not an accurate idea of the nature of the forces which bind these two structures together in health. Physiologists seem to hold the most misty conceptions regarding not only the nature but the seat of the motor force, although there is sufficient distinctness in their views to show that they are most opposed and conflicting. For example, we frequently read of a force generated in the brain which pervades the body by means of the nerves, and becoming altered in various ways as it is transmitted through the organs, or being discharged by the muscles, produces the various movements of the body. Some physicians, as Todd, thus speak of the brain being over-charged with nerve-force in various forms of disease, rendering it liable to discharge itself as would a Leyden jar. Others, again, who would use similar language, would place the source of the nerve-force, which they suppose is in operation during muscular movement, in the central ganglia or spinal system, and if, therefore, anything like convulsion should occur from an irritation of the brain they would consider that it arose not from an emission of force from the brain, acting directly on the muscles, but rather was the result of the spinal system coming into play when let loose from the controlling influence of the brain.

In opposition to these two views are those which place the forces which we see in operation during the movements of the body in the muscles themselves. The holders of the latter opinion would not deny that a force is generated under the influence of the nerve-centres, but would say that we must look rather to the muscles and the nutritive changes which are going on within them for the real sources of power. When we wish, for example, to move a limb, we do not transmit down the nerve the actual force which we see exerted on the muscles, but merely allow them to come into play by removing some restraint, just as would be done in driving a steam-engine on turning a handle and letting the properties of the steam come into action. Many obvious facts appear to confirm the correctness of this view, such as the strength of an animal being proportionate to the amount of its muscle rather than of its brain; also the fact, more lately arrived at, that the electrical apparatus of the torpedo is more allied to muscular than nerve structure; and again, that an animal deprived of consciousness by loss of blood, and whose brain is therefore in abeyance, is thrown into convulsions.

This theory of the seat of motor force has always been most in

unison with my own views, and has probably been confirmed by having been held by all those of my colleagues who have written on the subject. Sir W. Gull, in the Gulstonian lectures, which he delivered in 1849, thus expressed himself:—"The muscle has its own inherent and proper power of contracting in virtue of its organisation, and nerve is the proper excitor of this power in a manner not yet explained. All we yet know being this, that a nerve, when mechanically disturbed or affected with an infinitesimal amount of electricity, brings out the function of the muscle. We can compare the phenomena to nothing so aptly as to a spring set free by the easy motion of its stop." Then, again, my late lamented and talented colleague, Mr Hinton, in his various writings upheld a somewhat similar opinion. He maintained that the forces operating in the animal body were of a mechanical kind, and were held in restraint by an antagonistic one—the vital force, the nature of which he did not endeavour to explain. He held that the animal body, like any other machine, possessed a power which was regulated by another and distinct counter-balancing one, the power in all machines being due to matter being restrained by the fulfilment of its natural tendencies; and that the removal of the restraining force permitting their play produced the action. He says:—Organisation gives capacity for action only by virtue of the resistance it presents to chemical forces, these chemical forces being the true sources of functional activity." The movements of muscle, therefore, would be due to the liberation of the forces within it, and the stimulus conveyed by the nerve is merely unloosening the condition which prevented their previous operation. This view, you see, is opposed to that taught by Liebig and his followers, that muscular force is a conversion of vital or nervous force, "that the nervous force appears convertible into motion through the medium of the muscular apparatus." Hinton's view was that the nerves do not supply a force, but merely overthrow the balance. How the forces are produced is another matter; there are nutritive changes constantly going on, and these, no doubt, produce also the forces which come into play during motility. That the muscular structures are influenced by or receive some actual power from the nerve centres during their nutritive changes is in all probability true. But the influences are slow in operation, and therefore do not support the theory that movement is one of a discharge of nerve force. After the use of a muscle time is required for it to regain its lost power, as is seen in the case of the torpedo after it has given a shock; we observe this every day after the fatigue of carrying a weight in the arm which obliges us to transfer it to the other. Again, in some very interesting experiments of Dr Poore, he showed that an

electric current would help to sustain the power in a limb. After the arm has been held out straight for some time, and the moment has come when it can endure no longer, a galvanic current will remove the feeling of tiredness and allow the limb to remain extended for a considerable time longer. Hinton considered that an epileptic fit was due to an irritation disturbing the equilibrium of the nerve centre, which took off the chemical tension of the muscle and allowed its force to come into play. He says—"Muscular contraction from a stimulus is the analogue of the electrical discharge by means of a metallic contact, in which the restraint is removed; and the spontaneous contraction of the heart is parallel to the spontaneous discharge which ensues when the resistance is weak. In the heart and its ganglia the chemical and vital forces are so balanced that they assume a state of alternating activity." The same line of argument was also maintained by your late teacher, Dr Thompson Dickson, who, in his papers on epilepsy, opposed the view that the phenomena of motion were due to a discharge of nerve force. He was endeavouring to confute the idea of "discharge," the term used so much by Dr Hughlings Jackson and his followers in describing cases of epilepsy and other convulsive diseases. He denied that the brain or any other organ could do more than a certain amount of work, and therefore the term "surcharge" was a misnomer—that, in fact, in these diseases just named, there was every reason to believe that the brain was impoverished or anæmic, and that it was by a loss of its controlling power that the muscles came into action. His theory of epilepsy was founded on a loss of control by one hemisphere or both, which resulted in a hemiconvulsion or complete convulsion. He would have explained Ferrier's experiments of inducing a localised movement by saying that the stimulation excited a discharge and so exhausted the particular convolution acted upon. Somewhat similar views are held with regard to the exhausted state of the cord in tetanus.

We must not, however, forget the clinical fact that want of tonicity of muscle generally implies deficient nervous influence, as seen in the want of expression in the faces of sufferers from general paralysis. It seems as if practically we must regard the muscles in three conditions—one of relaxation, as in paralysis or sleep; one of extreme contraction, as when actively used; and an intermediate state of tension during our waking hours. For example, I contract my sterno-mastoid and my head moves round: I fall asleep and my head drops; but in my waking hours the muscle is in neither of these extreme states, but is keeping my head steady on my shoulders.

SYMPTOMATOLOGY

In coming to the diseases of the spinal cord, we should, according to the principles already laid down, meet with hemiplegia, if one motor tract—that is, half of the organ—were involved. Such an accident, however, rarely occurs; for in actual practice it is much more common to find the cord more or less affected on both sides, or throughout its entire thickness, and thus a paraplegia is a far more likely effect of spine disease than a hemiplegia. But just as there are anatomical and functional divisions in the cord, so we find there are peculiar symptoms associated with its special lesions.

Now let us see if there are any general rules which can guide us as to the seat and nature of the different diseases which we commonly meet with. I have already informed you that clinical observations accord rather with the experiments of Brown-Séquard than with the earlier views respecting the arrangement of the fibres in the spinal cord—that is, that the motor fibres run upwards in the antero-lateral columns and cross at the pyramids, while the sensory fibres of the spinal nerves pass to the grey matter, and then cross to the other side. Thus, when the cord is divided longitudinally, sensation is altogether lost, but a lateral division destroys sensation on the opposite side. Cases of injury to the exterior of the cord, sparing the centre, exhibit a paralysis with sensation unaffected; whilst, on the contrary, all feeling has been lost when the grey matter has been severed. Also in those rare instances where the grey centre has been so shaken by a blow that blood has been effused, sensation has been lost, whilst motor power has remained. Even the crossing of the sensitive fibres, as demonstrated by the physiologist, has been verified by some instances of remarkable accidents; for example, there has been a case reported in one of the foreign journals, where a man received a sabre wound on the upper part of the right side of the neck, which so disabled him that his legs gave way under him, and he immediately fell. It was found, on examination the next day, that his right arm had lost its power of movement, though it still retained sensation. The right leg was a little weakened, but only as regarded motion. It was afterwards discovered that the left side of the body was insensible to touch; pins were inserted into him without his feeling it; and, what was most remarkable, when he was pinched some obscure kind of sensation was felt on the corresponding part of the opposite side of the body.

Dr Gowers described at the Clinical Society the case of a young man who shot himself in the mouth, producing injury or contusion

of the right side of the spinal cord between the second and third cervical vertebræ. The patient lived sixty hours so that very important observations were made of his symptoms. There was complete motor paralysis of the right arm and leg, together with hyperæsthesia; but no loss of sensibility on the opposite side, and the right limbs were warmer than the left. On the following day there was some loss of sensation on the left side, while increased sensitiveness remained on the right, and on this side the reflex action was almost abolished.

A case was reported from Italy of a man who had a wound on the right half of the lower part of the cervical spinal cord. The patient had complete right hemiplegia affecting the thoracic and abdominal muscles, the immobility of the right side being marked. There was hyperalgesia in the right limbs with diminished electric excitability. On the left side there was no loss of motion, but almost total loss of sensation of touch, heat, and pain. After some weeks all the joints on the paralysed side became swollen and painful, and after death they were found filled with blood-clots while the joints on the left side were normal.

In Abercrombie's well-known work, written many years ago, there is to be found the case of the Count de Lordat, who received an injury to the neck from being thrown off a coach. Six months afterwards he had weakness in the left arm and some difficulty in articulation, and subsequently the limb became withered and useless. After this the right arm became numb, and finally the whole body. After death the medulla oblongata and upper part of the cord were found enlarged, and the membranes thickened. Here no doubt the grey matter was involved as well as the motor tracts.

Now, if the motor tracts run towards the outside, and the sensory within, we should expect to find a lesion of motion much more frequent than one of sensation, seeing that the exterior of the cord is more liable to injury as well as disease which so often originates in the bones or the membranes. Therefore it is that when paraplegia has followed disease of the spinal column, it is motion which is first and especially involved, and the same also may be noted in chronic meningitis. In the case just now alluded to, where blood had been effused in the grey matter of the cord, sensation alone was lost. Whenever a softening of the whole of the cord occurs, as in acute inflammation, both sensation and motion would be affected. But, besides these conducting powers, the cord has inherent properties of its own; the grey matter can be excited to action by external stimuli, and therefore, in the case where the cord is simply severed, as in an injury, although voluntary motion and sensation are lost, the portion below still retains its excito-motor power,

and if the limb be touched a movement would result. If the grey matter is destroyed throughout, then of course this power is gone.

We have then a means of testing the integrity of the grey matter by the presence or absence of this reflex action. There may also be conditions of increased excitability of the cord where this action is exaggerated. The symptoms of a reflex kind which may be induced in different circumstances have been made of considerable diagnostic importance by Westphal and Erb. These observers first directed attention to the reflex action produced in the knee and ankle in different kinds of spinal disease. For example, it is well-known that if a person be sitting cross-legged and the tendon of the patella be sharply struck, the leg will suddenly jump up or be extended. Now it has been observed that in *ataxia* this action does not occur. On the other hand, it is equally correctly said that in the so-called *spastic paralysis* the excitability is increased, shown more especially by the whole muscles of the leg undergoing a clonic contraction when the foot is forcibly flexed towards the body. The true interpretation of these phenomena has yet to be shown.

Besides these reflexes of the knee and ankle Dr Gowers has studied those of other parts of the body in order to ascertain the condition of the various regions of the cord. Just as in a case of fractured spine where reflex action of the leg is marked, we say the cord below the injury is healthy, so in like manner the cord may be tested in other parts in its various lesions. If reflex acts are obtained throughout the whole body the whole length of the cord is healthy; if touching the sole of the foot causes reflex movement, then the lumbar enlargement of the cord is entire. Irritation of the skin of the buttock exciting contraction of the muscles beneath shows that the cord is healthy opposite the fourth and fifth lumbar vertebræ. The movement of the testes by touching the inner part of the thigh shows that the cord opposite the first and second lumbar vertebræ is healthy. Contraction of the rectus produced by touching the side of the abdomen from the rib downwards proves the cord to be healthy from the eighth to the twelfth dorsal. Irritation of the side of the chest causing a dimpling of the epigastrium from contraction of the rectus shows that the cord is healthy from the fourth to the seventh dorsal vertebræ; and irritation of the skin of the back over the scapular region will show whether the cord is healthy opposite the lower cervical and upper dorsal.

In a paper by Dr Horrocks it is put clearly how the reflex act is arrested if any part of the loop commencing at the skin and returning to the same spot be affected, whether it be in afferent nerve,

cord, efferent nerve, or muscle. The phenomenon may be tested in the muscles of the elbow by striking the insertion of the triceps, in those of the wrist by striking the muscles of the forearm. He further illustrates the value of the test by quoting the case of a child with paralysis of the arm and leg, which was thought to be hemiplegia of cerebral origin, but by the absent reflexes was shown to be spinal.

Why the reflexes should be increased is not obvious. An instance of this occurs in lateral sclerosis. It may be due to increased irritability of grey matter, or to a removal of cerebral influence over the centres in the cord.

The grey matter also exerts an influence over the nerves which proceed from it of a nutritive kind, and therefore if the anterior cornua are affected a wasting of the motor nerves takes place, as well as of the muscles which they supply.

We may say in general terms that if disease affects the outside of the cord towards the anterior part loss of power results; that if the antero-lateral columns are softened, as in myelitis, there is complete paralysis; but that in the chronic form, where the cord is sclerosed, the paralysis is not complete, but peculiar in its character according to the degree and disposition of the disease, producing a rhythmical paralysis in one case, and a spastic paralysis in another, as we shall hereafter see. If combined with this form of disease there is destruction of the anterior cornua, we may have rigidity and wasting combined. If the centre of the cord be affected at any spot, sensation is lost, but the excito-motor power remains while the grey matter below this spot is entire.

We may note some still further facts; for just as we observed, in speaking of the brain, that an inflammation or irritation of the surface may set up an excited action in the organ within, so we may observe in the cord that an amount of disease on the surface not sufficient to diminish its functions or produce paralysis may yet be perpetually irritating the grey matter beneath it. Consequently, if the action of the cord appear much exalted, we may generally conclude that it is being irritated from without; and an observation of cases has constantly shown that in inflammation of the membranes involving the outer layer of the cord the excito-motor function is painfully active. In acute inflammation you may notice convulsive movements of a tetanic nature; and in chronic meningitis, where a portion of the true cord may be involved with an accompanying paralysis, constant jumping and twitching are amongst the commonest symptoms. Not long ago I had an opportunity of seeing a patient of Mr Birkett's, who, in consequence of an injury to the back, was suffering from an acute arachnitis of the

spinal cord. He had no paralysis, for no portion of the medulla was affected; but he had severe pains all over him, especially in the limbs, his head was drawn back, and he was, in fact, like one suffering from tetanic opisthotonos. In the epidemic cerebro-spinal meningitis, of which you have heard so much of late, these were exactly the symptoms which were noticed. In some other cases of spinal meningitis I have observed not so much convulsion as extreme and constant restlessness. In those instances where there was much pain in the limbs it is probable that there was an implication of the nerves, for there can be no doubt that in many cases of spine disease where much pain exists the roots of the spinal nerves are involved in the inflammatory process. It may be true, indeed, that in the cases of chronic meningitis already alluded to, where an exalted spinal function exists, the immediate cause of the excitability is the implication of the nerve roots, which reacts on the cord.

The correct interpretation, however, of pain in spinal disease is one of the most important matters to understand. In the first place it is undoubtedly true that the spinal cord may be diseased throughout its entire thickness without the patient experiencing any pain, and without, indeed, there being the slightest sign of shrinking when the back is struck. On the other hand, the most intense spinal pains are those which are caused by disease involving the nerves only, as in aneurysms which corrode the spine and leave the cord itself untouched. Again, it has been found that in those cases of meningitis of the cord where pains in the limbs have been a constant symptom the roots of the nerves have been involved in the process. With these facts before us we have some general rules to guide us in the interpretation of pain, although I could not positively teach you that pain necessarily implies an implication of the roots of the nerve external to the cord.

It is highly probable that an implication of the nerve-fibres within the cord, to a certain extent, may produce the same result, but pain is not even then a necessary consequence. We may note also that the irritation of the nerve roots not only produces pain and excites the centres to corresponding movements, but causes tonic spasm or rigidity. Thus, when the membranes are affected in common with the roots of the nerves, a rigidity may often be observed. I have seen a man who, having fractured and dislocated his spine in the upper dorsal region, suffered intense pain and rigidity of the arms; but as soon as the bones were replaced the pain and spasm passed off. In chronic inflammation of the membranes of the cord the surface of the medulla is generally involved, and thus there may be more or less paraplegia; should the disease at

one spot have involved the entire thickness of the cord, then sensation is lost, but the excito-motor function in the part below may be more than usually exalted. In our museum is the spinal cord of a man showing great thickness and ossification of the membranes, closely adherent and bound up with the structure of the cord. In this case the man lay quite paralysed, but his spinal centres were in the highest state of tension, so that it was painful to pass by his bed; the merest touch made his whole body quiver, the act of micturition threw him into convulsions, and, I believe, on one occasion a jar against his bed caused him to spring on to the floor. He was in the condition of a tetanised frog.

Let us see how these observations apply to cases before us, as, for instance, to the case of a boy who was lately lying in Stephen Ward with disease of the dorsal vertebræ. His back projected outwards in consequence of an angular curvature, and thus, no doubt, a quantity of inflammatory or purulent material existed within the canal pressing on the medulla; and what might you think would be the result? You would suspect that he would be lying in bed with his legs stretched out, and quite paralysed as regards motion. The pressure not having reached the centre of the cord you might think that sensation remained; also, as a pressure of this kind on the upper part of the spinal cord would involve the motor tract but leave the sensory entire, and as the medulla would be healthy below, that the true excito-motor function would remain. Thus you would expect that, although he would be perfectly helpless to move in the slightest degree, a tickling of the feet would cause a drawing up of the legs and their flexion on the body. You might also have expected from the membranes being involved, and the consequent existence of an irritation of the cord through the roots of the nerves, that there would have been some convulsive movements of the legs or rigidity. Now all these symptoms were actually present, and considering what, in all probability was the nature of the case, you will see how they accord with all well-observed physiological and pathological facts.

We have already said that inco-ordination is connected with disease of the posterior columns, and that the motor powers are affected in various ways in disease of the anterior and lateral columns.

The state of the cord can also be tested by the action of electricity on the muscles, their excitability varying much in different forms of spinal disease. In health they are readily acted on both by the continuous current and by faradism, both of these forms of electricity acting directly on the muscle and on the nerve which supplies it. One of the most striking alterations observed is where

the nerve supply to a muscle has been interrupted either from disease of the nerve itself or the centre whence it springs. In these circumstances the muscle no longer acts to faradisation, but becomes more irritable to the continuous current. This has been called by Erb the *reaction of degeneration;* not a very good term, but one which has come into general use. The special diagnostic uses of electricity will be referred to under the headings of the different diseases.

There is another point very important to remember in connection with diseases of the cerebro-spinal centres. Some of these are true primary morbid states of the elements of the nervous tissue, whilst others are altogether of a secondary or accidental character. For example, the changes which take place slowly in the brain, as in softening, are altogether different in kind and in pathology from those which would arise from a tumour or from the severe laceration caused by the bursting of a blood-vessel. So, likewise, in the cord, the primary changes, such as we see arising from inflammation and affecting the various strands, are altogether different in kind from the diseases which would occur from its accidental implication, as in caries of the vertebræ, or tumour. You see, then, some diseases are primary, or central, whilst others are secondary, or accidental; and it would follow that each would require its own special treatment. It may be often difficult to diagnose between the two classes of cases, but the following considerations will often materially assist us. In the case of a primary affection of the cord it is most unlikely that the disease should attack one spot alone, or traverse the cord in a plane so as to destroy all its strands on one level, just as a section by a knife would have accomplished. Rather should we see it progress slowly in the course of special fibres and in particular tracts. It follows, therefore, that if a patient should come into hospital with complete paraplegia, that is, with perfect paralysis of motion and sensation below a certain part, and at the same time the excito-motor function be perfect, just as we see in a case of fracture of the spine, we should argue that the cord was affected at one particular spot through all its width. We conclude, therefore, that it has resulted from caries, or that there is a tumour, or that perhaps an aneurysm has eaten its way into the canal. If, on the other hand, paralytic symptoms come on slowly and insidiously, and are of a special kind, showing that the morbid change has been progressing longitudinally in a given tract, the probabilities are in favour of the disease having been primary in the nerve-tissues. I have found these considerations of great assistance in diagnosing cases in the wards. Whatever may be the cause the symptoms vary with the region of the cord affected. In disease of

the lumbar portion there would be paralysis of the legs and the muscles of the abdomen; in that of the dorsal portion paralysis of the intercostal muscles; in the lower cervical, paralysis of the upper extremities; and above this again, where the bulb is involved, the special functions of respiration, of talking and of swallowing would be interfered with. If the upper or cilio-spinal portion be diseased the pupils may be affected: dilatation is due generally to irritation; contraction, to paralysis.

MORBID ANATOMY

The various morbid changes will be considered under each form of disease. I will merely remark now that, as in the brain, we have to deal here also with the nerve-fibres, the nerve-cells of various forms, the neuroglia, as already described, and the blood-vessels.

Changes of the same kind take place in the cord as in the brain, with the remarkable additional instance of that rapidly acute morbid process which occurs in Ascending Paralysis, in which, probably, some subtle nutritive function is destroyed, such as happens when the strands are divided for physiological purposes. Besides this we have acute myelitis and softening, chronic myelitis, with the various forms of sclerosis, or grey degeneration, as it has been called, and spoken of as the diffused and the disseminated. There occur also simple atrophic changes and degenerations in the cord as in the brain. These are often associated with disease of the blood-vessels.

All observations of late years have tended to show the proneness of specialised portions of the spinal cord to undergo morbid processes; that portions of the cord anatomically and physiologically distinct may become perfectly isolated by various degenerative changes, and that consequently the symptoms dependent on these changes are equally distinct and characteristic. Thus, for several nervous disorders a true anatomical change has been found, and were this universally the case a division of diseases of the nervous system founded on a pathological basis might be framed. At present, however, the causes of many diseases are unknown, and therefore we are thrown back on a clinical nomenclature to designate them, the names being usually taken from the most striking symptoms. Were the morbid changes known, even in all cases where a fatal result ensues, it would be obviously wrong to apply names indicative of these changes to other cases where corresponding symptoms existed, but where there might be only functional and recoverable disorders. For these reasons it is better to keep to the clinical name indicative of symptoms only, leaving the question open in individual cases whether certain structural changes have taken place

or not. I shall therefore as far as possible follow a clinical nomenclature.

As, however, there are cases in which well-marked universal morbid changes occur in the cord or its membranes, it may be as well to give a general description of these first, and afterwards describe the separate diseases according to their characteristic symptoms. I shall therefore first speak of inflammation of the substance of the cord and its membranes, or, as they are called, *myelitis* and *meningitis*, and then, before taking the special forms of paralysis, detail the symptoms which belong to the general term *paraplegia*.

INFLAMMATION OF THE SPINAL CORD AND ITS MEMBRANES

Myelitis, or inflammation of the spinal cord, is a general term, formerly made to include many of the affections which we shall presently have to describe under distinct names, according to the region of the cord involved. At the present time the term is employed only when a large portion of the medulla is indiscriminately affected by an inflammatory process.

Myelitis has usually been divided into the *acute* and *chronic* forms, and with both these the term softening was formerly regarded as synonymous. Under the old name *chronic myelitis*, however, must now be included a condition the opposite of that of softening—one of hardening or *sclerosis*. It is an inflammatory process, not beginning, it is generally believed, in the nerve-fibre itself, and leading to its rapid dissolution, but having its origin in the neuroglia or connective tissue, and resulting in a hyperplasia, which destroys the nerve-element and replaces it by a hard mass of fibre. The process is the same as that known as *grey degeneration*. It must be remembered that, although a simple myelitis or softening must be distinguished from sclerosis, yet the two processes may be found together, and a hard mass in the cord be associated with a softening around it.

I should say also that though myelitis produces softening, yet it does not follow any more in the spinal cord than in the brain that softening implies inflammation. The two terms are not coextensive. Softening may occur from mechanical pressure or from the occlusion of an artery by an embolus.

Of late separate terms have come into use according as the white or grey matter is affected; viz. leuco-myelitis and polio-myelitis respectively.

Acute Myelitis may arise from injury, as fracture of the spine, or from pressure of a tumour. It might arise according to Sir W. Gull by an extension of inflammation from the bladder. There is

also reason to believe that it may arise primarily as an idiopathic disorder from exposure to cold. The part of cord affected would depend upon the circumstances which set the inflammation in action. If from fracture of the spine, the process might be confined to the part injured, or it might proceed upwards and downwards from this spot as a focus. The softening which would result in these cases would be clearly appreciable *post mortem* by the finger gently passed along the cord, and on making a section it would be found that the knife would not cut cleanly, but would tear the substance and break it up. It would also have an altered appearance to the eye; the grey matter might have lost its definition, or become darker from small extravasations of blood. Again, portions of it only might show changes, as the centre or cornua or other parts, these being swollen or pulpy as if an inflammatory exudation had taken place in them. In these circumstances the microscope would reveal broken up nerve-fibrils, granular corpuscles, and altered ganglion cells, the whole tissue being at the same time loosened.

The symptoms of course would depend upon the amount of cord implicated; so that there might be disturbances of sensation ending in anæsthesia, or disturbances in the motor system ending in complete paraplegia, with all the attendant phenomena of paralysed bladder, rectum, &c.

Chronic Myelitis.—This may be regarded as the same process, together with the same morbid changes as before described, but of slower progress. The term, however, is generally used to express more particularly the condition known as sclerosis. This chronic inflammation or hardening may affect all parts of the cord, or only particular tracts, as will be hereafter noticed. The diseased spot or that which has undergone the change is of a greyish colour, hard, and consisting of a new fibrillated tissue which has been developed from the neuroglia. The nerve-fibres become wasted or shrunken up in the indurated mass of new substance. The blood-vessels are thickened, and there may be present fat granules and corpora amylacea.

There is, however, a form of chronic myelitis to which the name inflammation may with more propriety be given—that is, when large portions of the cord have undergone a conversion into a soft albuminous matter, and the term sclerosis is therefore not strictly applicable. A good example of this is contained in Guy's museum, and is that of the spinal cord of a girl which had undergone a complete transformation from end to end into a grey translucent lymph.

Case.—The patient had been suffering from paraplegia for many months until motion and sensation were altogether lost, but the body was not wasted. The

cord was swollen in an irregular manner throughout, and was soft to the touch. In the upper dorsal and cervical region it was enlarged, then became smaller, and below this again, swollen into three times its natural size. The grey matter was found quite destroyed, and its place occupied by a very firm semi-transparent inflammatory lymph. This constituted a kind of tube running down the whole length of the cord, since the central canal passed through its middle and was as large as a male urethra. It opened above into the fourth ventricle. Its interior was quite smooth, and no trace of grey matter was observable to the naked eye. This central hollow portion of degenerated cord resembled very much a piece of boiled macaroni. Around this tube was the soft, white, medullary matter much altered in consistence. The whole cord, indeed, presented a most remarkable appearance, being much enlarged, and consisting of a tolerably firm grey tube surrounded by a soft, white material. Where the cord was increased in size, the expression "tumour" might have been used by some observers to designate the enlargement.

A somewhat similar case will be noticed under the head of "Concussion."

Besides the *primary* inflammation or grey degenerations, as they are sometimes called, of a sclerotic character, we find there are *secondary* processesof the same kind; that is, that proceeding in given anatomical or physiological tracts certain degenerative changes may take place, having their focus in specially defined areas of the cord.

Secondary Degenerations.—By this we mean inflammatory changes of a chronic nature having their origin in some spot in the spinal cord, and proceeding either upwards or downwards in given anatomical tracts. Thus we speak of descending and ascending degenerations.

The *descending degeneration* might, for example, begin in the middle of the spine from injury or other cause involving the motor tracts. An inflammation would be set up which might then slowly progress downwards along these tracts as far as the lumbar region, where it would cease. Or it might begin in the higher regions, as we have already mentioned, and proceed downwards from the uppermost portion of the motor column in the corpus striatum. In connection with disease in the brain I have already mentioned a degenerative process proceeding through the corona radiata to the convolutions; but I now speak of a chronic inflammatory process proceeding down from the corpus striatum, through the crus cerebri, and then crossing by the pyramids, and continuing down the opposite side of the cord, especially towards the posterior part of the antero-lateral columns. At the same time a lesser degenerative process may be observed taking the extreme front border of the anterior column on the same side following the direct motor tracts.

The *ascending* degeneration would follow necessarily the course of the posterior columns, taking more especially the inner columns of Goll, and so passing up to the restiform bodies. It has also been shown by some German observers that an ascending degeneration may occupy a narrow zone at the outer periphery of the posterior lateral column, and so continue up to the cerebellum. This has been called the direct cerebellar tract of the lateral column.

Dr Taylor has lately published an interesting case in which a degenerative process proceeded downwards from the brain into the cord. The morbid process passed through the pyramidal bodies, and then continued downwards on the opposite side along the motor tract, taking, as is usually found to be the case, its posterior half and touching the hinder portion of the posterior cornu.

The extent to which this degeneration may pass is still a question. There is a tendency for changes to spread in a given anatomical and physiological route; as, for example, along the motor tract of the cord, or from the motor region of the brain downwards towards the medulla, but whether the process may continue from brain above to the extremity of nerve on surface of body is a question. The break in the course of degeneration lies in the grey matter of the cord, for although it is clear that in every motor act there must be a connection between the brain and the muscle which is made to contract, yet the tract lies through the grey matter, and there is no proof that disease of the motor tracts of the cord will necessarily affect the nutrition of the grey centres, as we have numberless examples of various forms of paraplegia as well as hemiplegia where there is no wasting. Of course there are cases where the grey matter becomes affected secondarily to the motor columns, but this is by means of a contiguously destructive rather than any direct nutritive process.

A case has been described by Dr Coats, of Glasgow, where a degeneration commencing in the brain was continued through the whole length of the cord. A young woman had right hemiplegia arising from embolism four years before death: the arm had become permanently rigid. The left cerebral hemisphere was found shrunken, the ascending frontal and parietal convolutions unduly narrow. On opening the ventricles the left corpus striatum was found shrunken, and an old cyst was seen within. The anterior part of the optic thalamus was also shrunken. Below this the fibres were wasted, and a degeneration passed down through the pons to the right side of the cord. A section of the crus showed a great contrast to the other side, the superficial anterior fibres being half gone. The pons also showed the motor tract much shrunken and

the nerve fibres replaced by connective tissue. The medulla showed to the eye a marked degeneration, the left anterior pyramid being much wasted. The degenerative tissue could then be seen crossing to the opposite side like the strands of a basket, and finally accumulated in a mass on the right side of the central canal of the cord. Throughout the cord the sclerosed mass occupied from a third to half of the lateral column, being situated in its posterior and middle parts. In the dorsal region it was smaller, and in the lumbar region still less. No change was found in the anterior columns or the columns of Türck. The explanation may be owing to the fact given by Fleichsig, that the amount of decussation varies in different individuals; and therefore in this case it is possible that the whole of the motor tract passed to the other side.

It must be remembered that the pyramidal or motor band consists of the nerve fibres proceeding from the convolutions of the cortex. Supposed to take its rise in the grey cells, it then descends through the white substance of the brain to the part called the internal capsule, and so downwards. It ends probably in the grey matter of the cord, and then other fibres proceed from this to the muscles.

For some time past it had been noticed that softening and changes in the corpus striatum extended down into the pyramidal tracts, and also that this was more usually the case when the white band interposed between the two nuclei was involved. In a work lately published by M. Brissaud, the author attempts to show that the motor tract may be divided into different regions in connection with special degenerations. Bouchard had observed that in old disease of the brain the peduncles of the affected side were smaller and their colour altered, especially in the anterior and middle parts, and that according to the seat of the disease in the encephalon so different strands of the peduncle would be affected. Probably the degeneration of the anterior, middle, or posterior part of the peduncle would correspond to changes in the anterior, middle, and posterior parts of the brain.

Its anterior part is the motor tract, and is made up of different bands. No one has yet observed degeneration of the posterior part. The middle band of the anterior strand seems that most likely to undergo degeneration, and is that most commonly described; it continues downwards to the cord. M. Brissaud says he has met with degeneration of the internal band in connection with disease of the anterior part of the brain, and that this degeneration always stops at the medulla oblongata. He thinks they are connecting fibres between the cortex of the brain and the bulb. The pyramidal band is represented by the anterior part of the capsule; if there be degeneration of the hinder part of this in con-

nection with disease of the convolutions, we find degeneration of the peduncle in its middle third, but if the front part of the capsule is degenerated, then there is degeneration also of the internal band of the peduncle. This would also be associated with disease of the anterior lobe.

This author thinks there is a third type in which a band of degeneration found between the internal and pyramidal bands corresponds to changes in the knee of the capsule.

There are four bands therefore in the cerebral peduncle. The posterior for sensory impressions, the middle and anterior for motor. The middle is connected with innervation of the trunk, as in hemiplegia. The band connected with the knee is associated with movements of the tongue and parts of the head. An internal band terminating in the bulb is associated, when degenerated, with intellectual troubles.

Syphilitic Disease of the Spinal Cord.—The cases which I have now seen are too numerous to leave any doubt that the cord may be affected by syphilis. The first case which came under my notice was one where a gummatous nodule had formed on one of the roots of the cauda equina, and this increased upwards until the cord was involved, and a fatal paraplegia resulted. Dr Fagge had lately a case of a young woman with complete paraplegia below the neck, in which a cervical meningitis was shown by the membranes and cord being united together by syphilitic material. It was for a long time a surmise whether destructive changes may go on in the cord itself, irrespective of these membranous inflammations. Of late years this has been found to be true, and that the same changes in connection with the blood-vessels are to be met with in the cord as I have already described under "syphilitic disease of brain."

The case I shall presently relate had been under treatment six months for syphilis, when he was seized with paraplegia. A similar case, which was under Dr Taylor, rapidly proved fatal, and here no gummatous or other visible changes were discoverable. The case of gummatous deposit above mentioned occurred in 1860, and I have reported it in my first paper on visceral syphilis as follows:

Case.—Mary W—, æt. 53, was taken into hospital on account of numbness and loss of sensation over the right hip, especially along the crest of the ilium. She had no outward sign of syphilis. The feeling of numbness continued until the leg on that side began to get weak, and subsequently the other leg became affected. Soon afterwards a complete paraplegia ensued, with all the usual consequences, as retention of urine, &c.

On *post-mortem examination*, the spinal cord was found to have in the lumbar region a hard deposit, three quarters of an inch in length. This involved the

posterior roots of the nerves, to which it was closely adherent. It formed a lengthened irregular mass, and in bulk was altogether about the size of a nut. It was composed of an opaque yellow substance, and resembled a similar mass found in the liver. This organ contained two or three nodules, of a tough, yellow, amorphous substance; one of these on the surface produced a cicatriform appearance. The lung contained a few hard yellow masses, corresponding to the similar deposits in the liver.

But quite lately a case has been under me, which I have no doubt can with strictness be called true syphilitic disease of the spinal cord; not one merely of gummatous deposit or syphilitic inflammation of the membranes, but one of a myelitis, in connection with a morbid state of blood-vessels, comparable in every respect with a similar condition found in the brain in syphilitic epilepsy and insanity.

Case.—A young man had been for some months an out-patient under Mr Davies Colley for constitutional syphilis, indicated by a rash, sore throat, &c., when one day he found his legs becoming weak, and in a little more than twenty-four hours he was the subject of complete paraplegia. Four days afterwards he came into the hospital. He had perfect immobility of the legs, amd complete loss of sensibility as high as the waist. He had lost control over the bladder and rectum, so that the catheter had to he used; the urine was alkaline; he had priapism, and a bed sore was rapidly forming. There was slight excito-motor action elicited by pricking the soles of his feet, but none by heat.

The case after this simply progressed; the paralysis did not reach any higher than the chest, although he felt a numbness over the region of the great auricular nerve. The bed sore increased until an immense slough formed over the sacrum and trochanters; the urine became purulent, and it was believed that his kidneys had become involved; he gradually sank, fourteen weeks after the onset of the paraplegic symptoms.

The *post-mortem* was made by Dr Fagge. The testes had undergone a fibroid degeneration, but there was no evidence of similar disease elsewhere. The liver and spleen were lardaceous to a moderate degree, and the kidneys were suppurating. On taking out the spinal cord nothing was apparent to the sight on the membranes or surface, but on feeling it a marked softened portion was found in the dorsal region. A section showed the outlines of the grey matter confused; it was quite diffluent, and presented to the microscope broken-up tissue and granule masses. The most striking change was in the blood-vessels; these had their coats very much thickened, so that when placed between glasses they were perfectly opaque, and contrasted strongly with the thin-coated, transparent vessels of the other and healthy portions of the cord.

Fibroid and other Degenerations in Connection with Diseased Vessels.—Drs Gull and Sutton in their account of Bright's disease as an arterio-capillary fibrosis, state how the smaller blood-vessels degenerate not only in other parts of the body but also in the spinal cord, and that as a consequence they have frequently observed paraplegic symptoms in the sufferers from this complaint.

They noted a fibroid thickening of the vessels and a production of connective tissue amongst the nerve-fibrils of the medulla.

I might here call to your remembrance the degeneration of the cord which occurs in connection with that of the brain in the alienated. In general paralysis of the insane the cord has been found markedly degenerated; as also in old age.

There are occasional and rare affections of the cord in connection with a distension of the central canal, and which have been called *hydro-myelitis* and *hydro-myelus*.

Hydro-myelus.—In many forms of paraplegia of obscure origin the spinal cord has been found to contain cavities within it. These are sometimes no more than the central canal immensely distended; at other times these cavities are altogether new, and have originated in a softening of an inflammatory product or neoplasm. Erb has spoken of these varieties under the name of syringo-myelus, where there was either congenital or developed dilatation of the central canal, and has distinguished them from the other, which consists of altogether independent cavities.

Gull described many years ago, in the 'Guy's Hospital Reports,' the case of a man, aged 40, who for some months had had weakness of the arms with wasting of the muscles, as seen in progressive muscular atrophy. He died of typhus fever, and there was found opposite the cervical enlargement a long cavity extending from the fifth cervical to the fourth dorsal. It was considered to be the natural canal or ventricle of the cord, which had undergone dilatation.

Dr Norman Moore reported the case of a woman who for two years had gradually been getting paralysed in the arms. There was found a cavity extending along the whole length of the cord, and large enough to admit the little finger. The ventricles of the brain were also distended with fluid.

Dr F. Taylor reported the case of a child who, at the age of five months, had a head attack, after which the head became much enlarged, and subsequently the arm became paralysed. The child died of measles, and on post-mortem examination the brain was found to contain a pint and a half of fluid; the spinal cord was flaccid in the dorsal region, and a section showed it to be hollow at this spot. The cavity extended from the cervical to the lumbar region, through the whole length of the cord, and in places it was found to be lined with epithelial cells; but Dr Taylor thought the cavity to be adventitious, for the small central canal could still be seen, and this newly-formed hollow ran down behind it.

Spinal Meningitis.—As of the brain, so of the cord, an inflammation of the membranes often implies an inflammation of the

surface of the cord itself, and of the nerves proceeding from it, the exudation being found beneath the visceral arachnoid. Owing, however, to the somewhat different anatomical arrangement of the two organs, there may exist a simple inflammation of the spinal membranes, in which the arachnoid surfaces are especially involved, and the exudation be found in the interarachnoid space. There may be recent lymph or pus, or the surfaces may be adherent, or the membranes greatly thickened and closely involving the medulla within. Even sometimes they may be ossified.

To the case where the dura mater is more especially affected the term *pachymeningitis* has been given. This seldom occurs except in connection with disease of the bone, and either the outside or the inside may be affected. If the latter, then the membrane is usually adherent to the cord. It is to inflammation of the pia mater that the term *meningitis* is usually applied, or, in contradistinction to that just mentioned, *lepto-meningitis.*

The symptoms connected with meningitis vary with the amount of implication of the cord and the nerves, and of the irritation which may be set up in the cord itself. They have reference, in the first place, more to the nerves than to the cord itself, and consist therefore of altered sensations, such as hyperæsthesia, anæsthesia, or pain; the latter is often increased by movement. Then again, either from direct implication of the motor nerves, or from irritation of the cord through the sensory nerves, there is very often spasm of the muscles. Consequently, in acute meningitis, we may have all the symptoms of acute tetanus, and in chronic meningitis of chronic tetanus.

Acute Meningitis arises generally from a direct blow or injury, although sometimes from exposure to cold. The symptoms, as before said, vary according to the number of the special parts implicated, and thus it is possible for an acute inflammation to attack the arachnoid surfaces only, and be attended by no marked phenomena. I have several times quite unexpectedly found the surface of the cord covered with lymph, where the inflammation has extended from the cranium; or, in other cases, where the spinal canal has been laid open by a bed sore. In some instances, where the visceral arachnoid is more involved, there has been pain in the back, aggravated by movement, and accompanied by spasm or stiffness of the muscles of the body and limbs, pains around the body and in the legs, and probably hyperæsthesia.

The cord would be found to have a sero-fibrinous exudation of a thick gelatinous material or sometimes purulent effused within the pia mater. The arachnoid would be thickened and perhaps adherent to the dura mater. The inflammatory product would probably be

found extending along the nerves, which would consequently be swollen, and if the microscope be used in all probability the tissue of the cord itself towards its surface might be found involved in the inflammatory process.

The following cases show spasmodic or tetanic symptoms to have been the most prominent phenomena. Their presence may be due to the implication of nerves in the effusion.

Case.—A lad, æt. 15, was admitted under Mr Birkett. He was playing with another lad three days before, when he received a blow on the back from his fist. He thought little of it at the time, but the pain becoming severe he applied to the hospital. After the application of leeches the pain was so much relieved that he thought of going out, but the pain returned more severely, and fever ensued. An abscess formed on the right side of the sacrum, which was opened. He continued daily to get worse, with much irritative fever and severe pain in the back. During the week preceding his death he was exceedingly restless, and often delirious, and complained of pain in all parts of the body, but particularly in the extremities. His head was drawn back, as in tetanic opisthotonos. He had no symptoms of paraplegia, and could move freely in bed. He died twenty-two days from the receipt of his injury. On *post mortem*, an abscess was found extending over the sacrum and ilia, and penetrating the vertebral canal. The dura mater was softened at one spot, and the cauda equina was lying bathed in the pus which filled the sacral canal. The membranes of the cord were inflamed throughout, and the purulent effusion extended as high as the dorsal region. There was also exudation beneath the visceral arachnoid; the cord itself was healthy. The inflammation had reached the cranium, and there were traces of arachnitis over the whole surface of the brain.

Case.—J. F., æt. 12. Two weeks ago began to feel some weakness in his legs, which made him stoop when he walked. He was a quick, intelligent boy, and, as a kind of amusement, he made himself some crutches, saying he must take to them. At the end of six days he was unable to walk, and had to keep his bed, and a medical man was sent for. He was then lying on his side, with his legs drawn up and complaining of pain in them. All these symptoms increased until I saw him on October 10th. He was then lying on his left side with his legs drawn up, his knees to the abdomen and heels to buttocks. On touching his legs or on attempting to move them, he screamed out with pain. The muscles were hard, as if spasmodically contracted, and the tendons were rigid. The skin also was extremely sensitive, the hyperæsthesia extending all over the limbs and reaching as high as the umbilicus. Towards the back and over the lumbar region the sensitiveness was extreme. His condition was one of spasmodic contraction of the legs, accompanied by pains. He had hyperalgesia and hyperæsthesia.

On inquiry about any injury, the lad stated that on the 24th of August he was playing with another boy, who was carrying him, when he fell off on to his back, striking himself on the kerb-stone. He felt great pain for a moment, but this passed off, and he thought no more of it until a month afterwards, when the symptoms I have described commenced. I ordered him liq. hyd. perchlorid. and potass. iodid., with ice to the spine. He remained in much the same state as above described for a few days, with the exception of having regular attacks of opisthotonos, and then gradually grew better, and on November 4th the severe

symptoms had become mitigated. After this the recovery was slow. On his visit to me on December 29th he was walking about, moving his legs well, but was still tender in the back, and seemed always in dread lest any one should touch him in this region. On January 29th he again came to see me, not being so well. He had almost recovered, so that he ran about and danced as before, but in the last few days his breathing had been oppressed, and he experienced darting pains in his abdomen, like knives passing into him. He had become quite changed in character—from being courageous was fearful and timid, and said he knew he should die. Over lumbar region pain was felt on pressure, and all the lower part of the body was hyperæsthetic. No paralysis of motion. He improved during the following month, when he was suddenly seized with symptoms like tetanus, and died. It was some time after his death that I heard of the occurrence, and that no *post-mortem* examination had been made.

Chronic Meningitis.—This may occur idiopathically, or as the result of injury, either directly or in the form of shock, as in railway collisions; or it may follow disease of the vertebræ. The symptoms are mainly due to implication of the nerves and irritation of the spinal marrow. They consist of a cord-like feeling around the abdomen, aching pains in the back and legs, sometimes of a darting, lancinating character. There are spasms of the muscles, with a tendency to permanent contraction. The spasms and pain may be sufficient to confine the patient to bed, and yet the cord itself may be healthy. This is shown by its special function remaining; in fact, from the irritation of the nerves the cord seems in over action; and you will observe that the most painful symptoms which the patient experiences are often due to its extreme excito-motility. Actions, such as sneezing, yawning, or micturition, cause reflex movements of the whole body, or are sufficient to throw it into convulsions. After a time the thickened membranes and the fluid effused beneath them may encroach on the cord, and symptoms of paraplegia ensue. In cases of chronic meningitis the progress is so slow, and the symptoms so obscure, that the case is often regarded as rheumatic. The following case was recorded by Sir W. Gull some years ago, and the specimen of thickened membrane constitutes one of the most remarkable in the museum. It will be seen that the patient's most severe symptoms were those due to the excito-motility of the cord, there being no pain nor tenderness in the back, and no hyperæsthesia.

Case.—The patient was a man of middle age; he had led a life of excess, had had a fall on the back, and was in the habit of taking much exercise. His symptoms commenced with headache, dimness of sight, pains in the neck; he was better for a time, but about a year after found he had difficulty in stepping out; then pains in the arms came on, numbness in the legs, with increasing weakness, also very troublesome jumpings in them. As he lay in bed he could move his legs, but could not stand upon them. Had a sense of constriction around his lower ribs. The *excito-motor* actions were produced by the slightest touch, or by

mere shaking of the bed, and he had constant startings when the urine dribbled through the urethra. The legs were more or less permanently flexed. He said his back was quite strong, and if struck with a hammer it would not hurt him. The urine became more ammoniacal, and the rigidity and flexion of legs increased; rest being quite prevented by continued spasm of the lower extremities, which on one occasion was so violent as to jerk him off the bed on to the floor. He remained in much the same state a long time, the heels drawn up to the nates and the knees to the abdomen. Sensation was diminished, but moving the limbs gave him great suffering, and increased the contraction. On *post-mortem* examination the membranes were found excessively thickened, adherent to one another and to the cord, the posterior layer of dura mater in the dorsal region having become ossified; the cervical and lumbar portions of the cord less affected The surface of the cord had undergone slight degeneration.

Case.—The following case I lately saw with Mr Manser, in the Tunbridge Wells Infirmary. A young man, æt. 21, was taken in three weeks before, for stiffness of his back and neck. The history was that a year before he had suppuration in the right hand and forearm, for which one finger was amputated. After the abscesses healed the arm never recovered itself; the skin became hard and brawny; subsequently ulcers appeared, and small fibroid lumps. Excepting this disease of the arm he was a healthy man. A few days before admission the stiffness of the back came on, which gradually increased; and at the same time he got rapidly weaker and thinner.

The stiffness of neck and back increased until the time when I saw him, when he was in the following remarkable condition. He was lying on his side, with his head arched strongly backwards, and his throat thrown as prominently forward; this was from the strong spasm of the erector spinæ. The other muscles, which are usually affected in tetanus, were supple, as rectus abdominis and sterno-mastoid. The chest moved well, and the diaphragm was unaffected. There was much difficulty in swallowing, from the arching of the neck. He was lifted out of bed on to his legs. He rested his weight on them, but his body was curved back like an arch. There was much wasting of the muscles. No paralysis of motion or of sensation, so that the opisthotonos constituted the only nervous symptom. The continuous galvanic current had no effect on the spasmodically contracted muscles, nor did faradisation, although this caused pain. It was clear that he was suffering from a spinal irritation, or excitation of the spinal nerves. A distinguished physician had seen him, and suggested amputation of the affected arm, but it was clear that the symptoms were not of the ordinary tetanic kind arising from an eccentric cause. During the three weeks he was under the care of Mr Manser he had every kind of treatment which could be devised. Under chloroform the spasms ceased. He died four days afterwards of inanition. The *post-mortem* examination showed much old thickening of membranes (meningitis) of the upper part of the cord in dorsal region.

The case is one of great interest, clinically and pathologically, from the symptoms being clearly due to irritation of the spinal nerves from the meningitis, and the possibility of the latter being the result or a continuation of a neuritis passing up the arm. Although the nerves of the arm were not examined, the ulcers and brawny skin suggested a chronic inflammation of these structures.

A complete recovery may take place as in the following case.

Case.—The wife of a medical man got wet through on a steam-boat, and then rode home in an open carriage. She soon began to feel ill, with flying pains about her; these increased, and at the same time weakness came on, so that she was scarcely able to walk or move her arms. Then optic neuritis ensued, which destroyed for a time the sight of the right eye. The symptoms continued for many months, when she gradually recovered.

It will be seen that in Sir W. Gull's case the cord itself was slightly involved on the surface; but it is clear, from the pain and increased excitability of the cord, that it was but little affected throughout the illness, thus proving that the disease was one mainly of meningitis. In many cases, however, the cord may be involved in connection with the membranes, and consequently a difficulty arises as to which portion of the structures to appropriate the symptoms. I shall therefore defer the further consideration of these cases of rigidity until I come to speak of sclerosis of the cord.

Meningitis confined to the Cervical Region, forming a Growth.—In the case which was in Tunbridge Wells Infirmary it was suggested that the meningitis might have been due to an extension of inflammation from the nerves of the arm, and this supposition is somewhat strengthened by the circumstances of a local meningitis being so often confined to the cervical region. So limited and circumscribed is the meningitis that it is sometimes regarded as a growth rather than an inflammatory deposit. These cases of local affections of the meninges present great difficulties in diagnosis, for during a considerable part of their progress the symptoms are mainly of a neuralgic character. They begin usually with a pain in the neck, shoulders, and arms, followed by a stiffness of the neck and arms, and afterwards by paraplegia. Thus in the case of a young man sent to Sir Wm. Gull there had been long-continued pain in the right shoulder and arm, which was called rheumatism. Afterwards there was weakness of the lower extremities, with cramps and spasmodic twitchings. These pains were the main symptoms, and finally became very distressing.

Case.—A case of the kind under my care occurred about a year ago. The patient, a female, came to the hospital with pains in her limbs and joints, from which she recovered after a short time. She attributed her symptoms to cold but afterwards said she had a fall some years before, although she but felt no ill consequences from it. She had not been out of the hospital many weeks when she was again admitted. She said she had had a difficulty in walking, owing to a pain in the back, which was much increased on exertion. There was tenderness on pressure all down the lumbar and sacral region. It pained her to bend her back, and she said she could not lie upon it. During the following two months she improved somewhat in condition. She was able to sit up, but still walked with pain and difficulty, the pain passing up to the head. During this time the diagnosis as to the character of her ailment was very doubtful. She then became worse and took to her bed; she looked ill, complained of great pain, was deli-

rious at night, and said she saw double. She then got into a listless state and threw her arms about, and occasionally was very drowsy. Finally she sank into a complete lethargy, and never moved; she died three months after admission. The *post-mortem* showed recent lymph at base of brain, and in cervical region a soft inflammatory growth limited to this part.

CASE.—A young man, æt. 27, came into my ward, September, 1878, and gave the following history :—He said that about two years before he began to feel a pain in the back of the neck and left shoulder. This was considered to be rheumatic, arising from cold, but the pain gradually increased and passed to the other arm; both arms became also weak, and at the end of eight months he was obliged to give up work. Subsequently his legs became weak, so that they dragged as he walked, and he experienced great difficulty in micturition. All these paralytic symptoms increased until he became quite unable to walk. When admitted he could not stand, but in certain positions in bed he had more power than in others. He lay towards the right side, for if on the back he lost complete power over the limbs; otherwise he could move his legs slightly, the left one best. The muscles of legs were not wasted. Both arms were very weak, so that he could scarcely grasp, and the muscles were much atrophied. The right hand was flexed and rather rigid. No exalted reflex action; no altered sensibility. Pain in spine often very great. After admission his breathing became wholly diaphragmatic, and he had constant twitches. Died in a few days. After death there was found a tumour two inches long growing on the membranes and pressing on the spinal cord opposite the cervical enlargement. It was on the front and towards the right side. The membranes were much thickened.

Sir W. Gull gives a very interesting case of inflammation of the cervical region of the cord, where the arms were principally affected.

A woman, æt. 33, had felt weak for some time, but one night went to bed as usual, when on the following morning she found her joints painful, and was unable to move her arms. She recovered under treatment, and returned to her duties. At the end of a fortnight the muscles of the arms were becoming rigid, and she soon was quite unable to move the limbs. For four months the arms were quite useless, owing to the rigidity, but she still walked about; she then began to lose power in her legs also. When admitted to the hospital she could move the legs slightly. The arms were extended and rigid; she had a feeling of suffocation or constriction about the throat, had not much breath for speaking, and could not cough nor sneeze. On evacuating the bladder or rectum the whole body and extremities became extended and rigid; she had also sudden spasmodic extension of the limbs. There was no pain in head or neck, as at first, but the limbs and joints were painful, according to the position in which they were placed. Left pupil smaller than right, and vision imperfect. A few days before death the power over the sphincters became lost, and the pain in the head most severe. The pulse was 48.

Post-mortem.—The membranes of cord thickened and completely adherent together about the origin of the third cervical nerves. Above this, the adhesion implicated the origin of the second and first cervical, and on the right side also some of the lower fibres of the origin of the pneumogastric and lingual. The roots of the whole of the cervical nerves and of the spinal accessory were matted

together by old thickening. The cavity of the arachnoid was obliterated throughout the whole of the cervical region in front, and to a less extent behind. A few spots of softening in cord.

CASE.—I had a very remarkable case of cervical meningitis with Mr Lorimore, of Farnham, in which recovery took place. The patient, a middle-aged man, came to me in the summer of 1872, stating that for some months he had suffered from great pain between the shoulders and neck, extending down the arms. The pains were clearly nervous, and due to some irritation of the roots of the nerves of the lower cervical region. No disease of the bones could be discovered, nor any growths in their neighbourhood. No medicine relieved him, but the pains became agonising, and he was obliged to take to his bed. The right arm then began to waste, and the muscles to contract; at the same time the left arm became painful and weak. He also found his leg becoming weak, so that he could scarcely stand. The spine was constantly examined for evidence of abscess or growth, but none was discoverable; in the mean time he lay in bed, a great sufferer, almost paralysed, his right arm being most affected. The hypodermic injections of morphia were constantly practised, in order to give him relief. When it was attempted to move him, or to draw his legs round over the edge of the bed, they would become spasmodically contracted, and at all times the reflex action was so marked that a slight touch would convulse the whole body. He afterwards lost all power over the legs. The paralysis was complete, and the bladder had to be relieved by the catheter. After lying in this apparently hopeless state for some months he began slowly to mend, the power of his limbs gradually returned, and now, after four years' illness, he is walking about as well as ever, and conducting his business; the arm is contracted and withered, but he can use it.

This affection has been called by Charcot *Spinal hypertrophic meningitis*. He pictures a peculiar contraction of the hand which takes place in consequence; varying somewhat according as the upper or lower part of the cervical enlargement is affected. In the former the hand drops from implication of the musculo-spiral nerve, in the latter it is drawn back and the fingers are contracted.

Meningitis and Myelitis of the Cord, resulting from an Extension of Inflammation from a Nerve.—Since the close intimacy has been shown between the nerve centre and the nerves themselves, in all that relates to their nutrition and their liability to contiguous inflammatory processes, an explanation has been afforded of the meaning of various phenomena which were before obscure. For example, the condition of a paralysed limb as regards contraction, pain, &c., was attributed solely to the nature of the central lesion, whereas it is now conjectured that it may be partly due to subsequent changes in the nerve trunks themselves; and, on the other hand, there is every reason to believe that an affection of a nerve may propagate itself backwards until it reaches the cord, and so give rise to a fresh set of symptoms. One theory of progressive muscular atrophy is of this nature, for we occasionally see cases of

local injury to a hand or foot, where an atrophic process gradually progresses upwards, apparently showing that an ascending disease of the nerves is taking place. This may even reach the cord, as in the cases Vulpian, Dickinson, and Dreschfield describe, where not only the nerves supplying the stump of an amputated limb are wasted, but also the portion of cord to which they are attached. The cells in the anterior cornua have been found degenerated where no change was visible to the naked eye. The cases, however, to which I wish more particularly to draw your attention are those where the character of the disease, which had propagated itself from periphery to centre, was of a more acute kind; where, indeed, a neuritis had ended in a meningitis or myelitis. Under the head of epilepsy I shall mention a case where fits followed a severe injury to the arm, and where their mode of production was the one which I suggested; and this, I should say, is not the only example of the kind I have seen. In the case just described, of the young man in Tunbridge Wells Infirmary, the facts were highly suggestive of the meningitis in the lower cervical region having resulted from a propagation of inflammation of the neurilemma of the brachial nerves along the cervical plexus. In the 'Guy's Hospital Reports' I related the case of a lad under the care of Dr Barlow, who had received a severe injury to the arm, which rendered it useless, and who subsequently had paralysis of the other arm, and then of the leg, until the whole body was paralysed. After death there was found a chronic inflammation of the spinal cord.

Case.—A gentleman, æt. 55, has been obliged to retire from his profession on account of paralysis of the right arm and leg. He drags his leg when he walks, and his arm shakes so that he can only write with difficulty. There is no paralysis of the face, and the intellect is normal. The case is regarded as one of hemiplegia by his friends but the history is altogether peculiar. About twelve years ago he struck his right arm; an abscess formed above the elbow, which was opened, and found to reach the bone. As it healed, the soft parts became matted together, which prevented him flexing the limb well; it became at the same time weak and shaky, so that he never could use it as before. Between two and three years afterwards his leg became weaker on the same side, and at length he walked with considerable difficulty. He now drags his leg, and has little power in the arm. The face is quite unaffected.

Cerebro-spinal Meningitis.—Occasionally cases occur which are rapidly fatal, and where the appearances found after death show no other disease in the body than an acute inflammation of the membranes of the spinal cord and base of the brain. I shall presently tell you that there is an epidemic disease in which these appearances are found, and therefore it may be that the cases we now and

then meet with are examples of this specific disease. In these isolated cases the head is often retracted, and there is great pain experienced in moving the neck. Arising from accidental causes, a cerebro-spinal meningitis is not uncommon, as from caries or injury to the skull or spinal column. An injury, for example, to the head may affect the brain, and so set up an inflammation of the surface, or of the ventricles, and pass down to the fourth ventricle, and even to the spinal cord. On the other hand, injuries and diseases of the spine may set up a spinal meningitis which shall run upwards as far as the base of the brain. We occasionally, however, meet with cases of inflammation which are apparently idiopathic, as the following.

Case.—A young man, after one day getting cold, began to feel unwell. On the following day he was in a high state of fever, very restless, and short-breathed. In the evening he was delirious, and on the following day it was evident that he was suffering from inflammation of the brain; he had become unconscious, his eyes were fixed, and he was paralysed on the left side, whilst the right was convulsed. On the next morning, the third from the seizure, he died. The *post mortem* showed the surface of the brain to be slightly greasy; some little exudation was observed at the sides, and on removing the organ a large quantity of lymph was seen covering the base and proceeding down the spine. The ventricles contained turbid lymph, and the walls were soft. On opening the spine and sheath the whole length of the cord was seen to be covered with lymph; the subarachnoid space was completely filled from its upper end down to the cauda equina. The cord itself was healthy. There was no disease of the bones, and no tubercle. Kidneys and other organs healthy.

Case.—A young man, æt. 23, was admitted to the hospital, and died twelve hours after admission. No good history was obtainable, but it was said that he had been ill only a very short time. The body was that of a strong, muscular man; no sign of injury. There was a recent meningitis, shown by green lymph covering the pons and neighbouring parts at base of the brain, and this inflammation extended downwards along the cord, where there was a slight effusion. All the other organs were healthy.

Case.—A child, æt. 3, was lately under my care in the Clinical Ward. She was taken with shivering, vomiting, headache, and convulsions. Pupils dilated. The base of the brain was covered with lymph, and this extended down the cord as far as the lumbar region. There was no tubercle anywhere discoverable.

Tubercular Cerebro-spinal Meningitis.—I have already said that this is more common than was formerly supposed, for the sufficient reason that our post-mortem examinations are more perfect than they once were. We had quite lately, occurring on two successive days, the case of a young woman who died with all the usual symptoms of meningitis, where we found the inflammation extending down the cord, and the membranes granular; and the case of a child, which also showed a similar complete tubercular meningitis throughout the brain and cord.

Epidemic Cerebro-spinal Meningitis, or Cerebro-spinal Fever.—The definition of this disease, as given in the nomenclature of the College of Physicians, is as follows:—"A malignant epidemic fever, attended by painful contraction of the muscles of the neck and retraction of the head. In certain epidemics it is frequently accompanied by a profuse purpuric eruption, and occasionally by secondary effusions into certain joints. Lesions of the brain and spinal cord and their membranes are found on dissection." Our first knowledge of this disease in Great Britain was about the year 1846, when it occurred in the neighbourhood of Dublin, and mostly amongst young boys of the poorer classes. It had appeared, however, as an epidemic in France three or four years before, and had received the attention of the Academy, being an altogether novel and undescribed disease. The patients were seized suddenly with vomiting and prostration, followed by reaction, when the characteristic symptoms began: the muscles of the neck became rigid, and the head was thrown back, as in tetanus; there was also much fever. The average course of the disease was three or four days. The *post-mortems* showed exudation of lymph at the base of the brain and along the whole length of the spinal cord.

Little was then heard of the disease until 1864, when it broke out in America, and received much careful attention in that country. In many of the cases an eruption occurred on the body, suggesting a resemblance of the malady to typhus. In the following year it created great alarm in Russia and the north of Europe. In our own country it has never existed as an epidemic, but the cases must be considered as partaking of the epidemic nature when several occur together in the same locality.

It must be regarded as a specific blood disease, in which the characteristic symptoms are of a nervous kind. The poisoned blood is shown by the rash, the petechiæ, the tendency to hæmorrhage; the prominent affection of the nervous system is due to the effusion of lymph beneath the arachnoid of the brain and spinal cord. In well-marked cases the symptoms are described as coming on with slight febrile disturbance, lassitude, and the other phenomena of pyrexia; these are succeeded by headache, vomiting, pains in all the limbs, and cramps. As the case becomes developed the nerve symptoms increase; the headache becomes more intense, and is attended by delirium. The pains in the muscles are very severe, more especially in those of the spine and at the back of the neck. The head is thrown backwards, owing to the muscular contraction, and this constitutes the most characteristic feature of the complaint. The other muscles, as of the face and limbs, are less affected; sometimes there is constant twitching of the limbs. Herpes, or a

vesicular rash, is often noticed on the face, and a rose-coloured rash on the body. There may be no disturbance of the bowels or other organs, except anorexia. The patient eventually falls into a comatose state, with dilated pupils, and so dies. In some epidemics the malignant variety prevails, and then the patients have petechiæ all over the body, and hæmorrhages from various surfaces; these cases are soon fatal. Occasionally, an inflammation of the eye or ear has been noticed, and in some instances affection of the joints. The rash, if present, would enable us to distinguish the complaint from a simple meningitis, but the most characteristic symptoms are the intense headache and pain at the back of the neck, with retraction of the head. Pains, however, do occur in all the muscles of the body, especially in those of the abdomen. These additional symptoms mark it as different from the isolated cases of basal meningitis.

The post-mortem examination shows more or less congestion of the brain and cord, with effusion into the subarachnoid space. This may be serous or purulent, and mixed with flakes of lymph. The brain and spinal cord exhibit no marked changes in their interior, but it is by no means improbable that they are affected, and that the effusion is merely the outward manifestation of a more general inflammation of the nerve centres. The disease is questionably contagious.

Isolated cases are constantly occurring in various parts of this country, and occasionally there is an outbreak in some particular locality, when several persons are attcked by it. Thus, in London, Dr Dowse has published several cases of cerebro-spinal meningitis, which lasted some weeks, and where, after death, lymph was found at the base of the brain extending down the cord. In these cases there was pain and weakness of the legs, dimness of vision, difficulty of breathing, and headache; also numbness and hyperæsthesia of various parts. In some cases there was neither rigidity nor tetanic spasms.

In Ireland, during the epidemic, a purpuric rash was present, and this is observed now whenever isolated cases occur there. Two or three lately in Dublin, of a very severe form, were marked by a purple rash, vomiting, and diarrhœa, stiffness and pain in the neck, with retraction of the head. The arms were weak, stiff, and hyperæsthetic. The eyes were inflamed, and there was swelling of some of the joints.

Several cases also have lately been reported by the physicians at Birmingham, and it seems to be a question with them whether they have been treating a new disease or an old one only lately recognised. Dr Foster has seen eight cases, of which some proved

fatal and others quite recovered. In the former the pia mater and arachnoid were found thickened and matted together by firm strings of lymph; the brain was injected and the ventricles distended with muddy fluid, their walls being coated with a half mucoid and half fibrillated material. In these cases the illness had begun suddenly, with shivering, pain in the head and spine, giddiness, vomiting, restlessness, and excitement, with stiffness of the neck and spinal column. In severe cases the retraction of the neck was an early symptom, and there was well-marked delirium; there were also shooting pains in the limbs, and hyperæsthesia of the general surface. The temperature was irregular, being about 102°—103°. The principal symptoms were restlessness, agitation, headache, sickness, stiffness of the head and spine. The hyperæsthesia had caused a mistaken diagnosis of hysteria. Sometimes herpes occurred on the lips, and occasionally red rashes and petechiæ. Occasionally disorders of sight and dysphagia. It was questionable if any treatment was of any avail.

Dr Warner informs me that he has seen several cases in children and adults, about half of which were fatal. The symptoms at first were very obscure; the fever was not high, and there was not always pain. The head was generally thrown back, and with this there was pain in the back of the neck. There was not always sickness, nor pains, nor other affections, as of the eye, which I have just mentioned. These symptoms might be present or not, but the retraction of the neck was the earliest and most characteristic condition. There was no evidence of blood-poisoning, as shown by a rash or purpura. The post-mortem examination always showed signs of inflammation, although they might be slight. These were principally an increase of fluid in the ventricles and throughout the subarachnoid space; this was opaque, and in some cases showed flakes of lymph which could be peeled off the cord. In several instances there was an herpetic eruption on the face.

Dr Russell has found in his cases, besides the inflammation of the surface, an indication of the same process in the ventricles: these were distended with an albuminous fluid, and the ependyma was thickened.

Dr Wood, who has charge of the hospital at Cape Town. informs me that this disease has existed as an epidemic at the Cape of Good Hope. He has seen it in all degrees of severity; the common and characteristic symptom is the retraction of the neck, so that the peculiar attitude of the patient, when he walks in for advice, at once indicates the nature of the disease. In many cases, even though the patient is very ill, the other symptoms, which I have named, have been wanting, except the marked hyperæsthesia. He

has never seen any rash, nor does he consider the disease to be contagious. The post-mortem appearances have resembled what has been described by others—an inflammatory effusion in the membrane of the cord, at the base of the brain, and sometimes on the hemispheres. It is often a question in any individual case of cerebro-spinal meningitis whether it be of the ordinary idiopathic form or an example of the epidemic disease. The principal grounds of diagnosis would be the contagiousness and any special peculiarities, such as a rash and the implication of the cranial nerves or special senses. It is for this reason that I regard the following case as an example of the epidemic disease.

CASE.—A. G—, æt. 8, was at school on Jan 21st, and came home feeling dull, with subsequent headache and sickness. On 22nd he was delirious, and Dr Tom Robinson was sent for. He found him rolling his head about, and complaining of pain; he was very irritable; temp. 102°. On the 23rd his right eye was observed to be dull, and the pupils dilated. He was lying on his back moaning. On the 24th he was seen by Mr Hutchinson. He was lying on his back with knees drawn up, delirious, and screaming. The right eye was opaque and blind. On the 26th he became conscious, eye quite dull, iris invisible. 31st.—Eye becoming disorganised, fever less; can lie on either side, with head drawn back, and resisting every effort to flex it. Rapidly wasting. Feb. 14th.—Dr Wilks saw him. He was lying on his side, and his head seemed fixed to his shoulders; there was pain in his neck, and he said his head felt too heavy for his body. 21st.—Was conscious; wasted. Could not sit up, but head could be rotated. Sometimes he vomited. He was quite blind with the right eye. He continued in much the same state until the middle of March, when he appeared to be slowly recovering; his eye, however, was quite disorganised and discharging pus. At beginning of April not so well. Still very thin and careworn appearance. Herpes on right side corresponds to sixth dorsal nerve, and purple spots on abdomen. Died on 21st April, three months after the onset of the attack. The post-mortem examination showed presence of lymph over base of brain and upper part of spinal cord. No tubercle.

Dr Robinson heard that two other cases had occurred in the school, one of which was fatal. The head was thrown back in the characteristic manner, and one of them had a bluish rash over the body.

SANGUINEOUS APOPLEXY OF THE SPINAL CORD

The older writers spoke of this in order to account for the occurrence of sudden paraplegia, but the event must be excessively rare, as I have never seen a well-marked fatal case of it. I read, however, occasionally of instances where effusion of blood has been found in and around the cord, but here the possibility of injury has certainly not been excluded. It may be said, on the other hand, that an effusion into the cord not being speedily fatal would induce so great ulterior changes, that its existence, after some lapse

of time, would not be appreciable, and that therefore it might not be so uncommon as is supposed. As a matter of fact, however, when met with in cases of paraplegia of some standing, the probabilities would be much in favour of the clot of blood being the result of a recent effusion. The following, for example, is a case where blood was found in the substance of the cord, but where it was difficult to say positively whether this effusion was the primary affection, or whether it was not an accident of the softening. In the second case the hæmorrhage in the membranes was clearly secondary.

Case.—Charles U—, æt. 21, was admitted under my care into Stephen Ward on Jan. 10th. Two weeks before admission he felt a twitching in the right leg from the hip to the knee; very shortly afterwards a pain in the loins, and he began to limp. On the following day he could not rise from his bed. The left leg then became numb, and he had difficulty in passing his urine. When admitted he had complete paraplegia of motion and of sensation below the knee; he could, however, tell the difference between heat and cold. He gradually improved until April 20th, when he could move his legs. He was then taken with shivering, vomiting, and a large sore came on his heel; all the paralytic symptoms were aggravated, cystitis came on, and he died May 3rd.

The cord was healthy, except at the lumbar enlargement, where a brown patch was observable on its surface; this occupied the mesian line and the substance of the cord just behind the grey commissure, and extended on either side of the posterior median fissure. This appearance of cord, beginning at upper part of lumbar portion, increased until the middle of the enlargement was reached, when a clot of blood was met with occupying especially its right side. It was not contained in any cyst wall, and appeared recent. It extended some distance down along the posterior fissure, and then, as a brown linear discoloration, quite to the filum terminale.

Case.—A man was brought into my ward, under the care of one of my colleagues, whilst I was away, with paraplegia of two years' standing. Soon after admission he became rapidly worse and died.

On opening the spinal cord the membranes were found to be tensely bulging with coagulated blood, which was effused beneath the visceral arachnoid and quite surrounded it. It commenced about twelve inches from the upper part, and was thickest below, as if from gravitation. The clot was firm but recent. At the middle of the dorsal region the membranes were thickened and adherent; the cord was softened at this spot, and a few hæmorrhages were seen in its substance and along its fissures.

The following case was reported by Dr Jackson, of Notting Hill, as one of spinal apoplexy; but here it is very probable that the source of the hæmorrhage was in the cerebellum, apoplexy of this organ being more common than that of the spinal cord.

Case.—A young lady, æt. 14, felt whilst dressing one Sunday morning her fingers weak, but she went to church as usual. On Monday the weak feeling had increased, but she followed her avocations as usual. On Tuesday she was quite unable to move her arms, but felt quite well. On Wednesday there was some little heaviness in breathing. On Thursday Sir Wm. Jenner saw her.

The respiration was much laboured from want of muscular power, and a spinal lesion diagnosed, with speedy death. On the following day she died. A clot of blood was found in the cerebellum and coagulum surrounding the cervical portion of the cord.

Case.—Dr Page describes in 'Lancet,' March, 1880, the case of a girl, æt. 9 who complained five days before death of pain and stiffness of shoulders, which continued until she died suddenly. The lower cervical region of cord was found infiltrated with blood, and on section a clot about the size of a horse-bean escaped.

Embolism of Spinal Cord.—From Vienna is reported a supposed case of this. A boy, æt. 16, was seized suddenly with pain in back and legs. Shortly afterwards complete paraplegia came on. There were the usual symptoms of bladder-paralysis, bed-sore, &c., and he lingered on six months. The lumbar region of the cord was found quite soft, and the vessels filled with fibrin. Infarcts in spleen and kidneys. Vegetations on mitral valve.

The thrombosis might have been recent; but seeing the nature of the case it is a question whether the spinal arteries affected by embolism had not set up the myelitis and softening.

TUMOURS AND NEW GROWTHS

These are of the same kind, histologically, as are met with in the brain. They may grow in the substance or in the membranes. They are usually fibroid or sarcomatous when growing from membrane; in the cord itself gliomatous or tuberculous. The symptoms are due to their position, and to the amount of pressure they exert upon the cord. These symptoms, therefore, may be of the most varied kind, so as to include alterations in sensation and motion, as mentioned under paraplegia. Tumours are rarely diagnosed, though there may be good reasons for sometimes suspecting their existence. In looking through the histories of these cases it will be seen that the symptoms consist of vague pains, very often styled rheumatic, to which succeed actual loss of sensation and motion. In two cases of women, which came under my notice, the symptoms were at first thought to denote merely hysterical disturbance, being spasmodic contraction of the legs, pain in the back, and a burning sensation around the abdomen; these, however, were afterwards clearly seen to be due to a stretching of the cord. In other cases we have noticed jerking and twitching. In all a paralysis of motion, to a greater or less extent, ensues; and, as regards sensation, a primary hyperæsthesia often gives way to an anæsthesia, and what is remarkable, although not rare, pains in the limbs may still continue. In these cases the growth has begun on the meninges, and has subsequently in-

volved the cord; but under the term tumour by far the most important and common is that which begins in the vertebral column and afterwards involves the nerves which issue from it, and finally the cord itself. This form of paraplegia arises from cancer of the vertebral column, and is usually secondary to cancer elsewhere, as in the mammæ. In these circumstances it may be suspected from the symptoms which accompany it, as the actual existence of a growth is rarely made out. Take, for instance, the case of a woman of middle age, who has long had a scirrhous tumour in the mamma; pains begin to be felt in the leg; these are for a long time styled rheumatic, and treated accordingly; when, however, no relief is obtained, and special attention is at length paid to the character of the pains, they will clearly be seen to be of nervous origin; then the name of the complaint may for a time be changed to sciatica. When, at last, both legs become involved, this diagnosis will no longer hold, and it is clear that there is actual pressure on the nerves, from the lancinating character of the pain, described as "burning," or by other expressions of a like kind. Soon a weakness comes on in the legs, indicating still further the existence of pressure; perhaps one leg has been affected before the other, and is in advance of it in relation to the progress of the disease. If, with the symptoms described, the patient should have pain around the body, and any other paraplegic symptoms, a cancer of the spine may be suspected. The diagnosis is almost certain if cancerous tumours be found elsewhere. I have within a few weeks seen three such cases; in two of them the disease in the spine was secondary to scirrhus of the mammæ. The pain around the abdomen may correspond to the seat of the disease; and, as a consequence of the nerve pressure, we may sometimes observe atrophy of the muscles and other signs of altered nutrition. In one case I observed the skin had changed in texture, and in another there was a vesicular rash. The symptoms vary, however, according to the seat of the disease and the portion of the cord implicated, and there may be added to those already mentioned, flaccidity or rigidity of the limbs, spasm, or exalted excitability.

As might have been expected from Brown-Séquard's experiments, a tumour growing on one side of the cord has produced a hemiparaplegia on one side and anæsthesia on the other.

It may be observed that the symptoms in cases of tumours are mostly those of pain in the limbs, implying, no doubt, in most cases, an infiltration of the nerves in the neighbourhood of the new growth; this shows that its seat is in the membrane, which it stretches, and so involves the nerves issuing therefrom. According to the observations of others it would seem that pain had been

present in cases where the tumour has been within the cord itself. This has not been my experience, as it has always indicated an implication of the nerves after they had issued from the medulla. The symptoms being due in the first instance to irritation and afterwards to slow compression of the cord, we find pains and abnormal impressions in limbs followed by paralysis.

In our museum are several cases of tumour of the spinal cord, and Sir W. Gull has given the histories of most of them in the 'Guy's Hospital Reports.'

CASE.—A man, æt. 30, had a tumour, the size of a hazel nut, attached to the inner and anterior surface of the dura mater, at the commencement of the dorsal region; this had pressed upon and softened the cord. About four months before his death he was taken with symptoms which were thought to indicate incipient phthisis—cough, shortness of breath, and wasting; subsequently he had pain in the back and shoulder. After this pains in the joints, which were called rheumatic; then his legs became weak, and he had some trouble with his bladder, as well as some impairment of sensation around his chest; and the arms became slightly enfeebled. The paralysis increased, the urine became ammoniacal, a bed-sore appeared, and he had profuse sweating. He died rather suddenly.

CASE.—A woman, æt. 43, was under Dr Hughes for fibro-nucleated tumour, growing from the inner surface of the dura mater of the cord, opposite the third dorsal vertebra. About nine months before her death she began to feel pain in the shoulders, chest, and sides. She was treated ineffectually, the symptoms gradually increasing in intensity; she then began to suffer from spasmodic contractions of both lower extremities; the legs were drawn up towards the abdomen. On admission they were rigidly fixed, with heels to the nates. If extended with force they were again retracted. There was no affection of sensation, and no incontinence of urine. Even at this time, however, it was a question whether her symptoms were due to organic disease or not. She subsequently had retention of urine, and this became ammoniacal; and bed-sores appeared. The pain in the back and around abdomen was violent and incessant, and she became greatly emaciated before her death.

CASE.—*Cancer of the Vertebræ.*—A lady, æt. 50, had for some months been complaining of pains in her limbs, which were called gouty and rheumatic. When I saw her she was very weak in both legs; one was almost powerless, and in this she suffered most severe pains; these were of a burning character, sometimes alternating with a sense of coldness, and the whole limb was very sensitive to the touch. The left leg had similar but less severe pains. The right arm was also subject to neuralgic pains. On examination, a large tumour was found in the back, near the scapula, and another below it.

CASE.—*Secondary Cancer of Cervical Vertebræ.*—A lady, æt. 50, had a cancer of breast excised. Four years afterwards she began to feel pain at back of neck, which became stiff; also pains down shoulders and around chest. The pain became excruciating on moving. The patient at last was scarcely able to move from stiffness and pain in back and arms. The chest became fixed and breathing diaphragmatic; no actual paralysis or altered sensation. Post-mortem cancer was found in vertebræ.

Any disease affecting the spine may involve the cord, as in the following instances of hydatid and aneurysm:

CASE.—Elizabeth R—, æt. 58, was admitted under my care for paraplegia. She began to suffer about ten months before with pain around the abdomen, in the back, and down the legs. These symptoms increased until two weeks before admission, when the legs became quite helpless. On admission she was found to have much pain and tenderness over the lumbar spine, and a pain, like a cord, around the abdomen. She had tingling sensations in the feet, but, at the same time, the legs had almost completely lost the power of feeling, and all power over them had gone. On the dorsum of the left foot was a sore, which appeared to have arisen from pressure against the other foot; there was also a sore on the upper part of left thigh, behind, and of which the patient was quite ignorant. There was also paralysis of the bladder. She died in about a month, and there was found a mass of hydatid cysts growing in the bones of the spine, and in the canal at its lower part.

CASE.—A man, æt. 30, had suffered for four weeks with pain in the back, and a feeling around his abdomen as if a cord were tied around him. The pain then went into one leg, and then the other, and subsequently he lost all power over them. He was admitted for paraplegia, the cause of which was not discovered; there was perfect immobility of the legs as well as of almost complete loss of sensation; excito-motor action could only be induced by the application of cold. The bladder became paralysed; and afterwards a bed-sore came, and he gradually sank. After death an aneurysm was found eroding the vertebræ and involving the spinal cord.

I have just read in a foreign journal the following case where the secondary tumour was sarcomatous:

CASE.—A young woman had a secondary tumour in the lower part of the dorsal region, probably beginning in the bone and then involving the cord. For some months before her death she began to complain of feebleness of the legs with great pain in the back, passing down the limbs. These became so severe that she shrieked with pain, and was obliged to be kept under the influence of morphia. Afterwards a weakness of bladder and rectum came on with loss of sensation. The most marked symptom throughout was the intense suffering.

The following is a case of interest as exemplifying the fact that it is possible for the nerve fibres proceeding from the brain to the grey nuclei of the spinal cord governing the arm to be affected without interfering with the fibres proceeding to the other arm or the motor tracts of the legs. This boy had for several months a simple monoplegia of the left arm. Such cases are very frequently diagnosed as having a cerebral origin, either by implication of a very isolated part of the internal capsule or a special convolution in the motor area of the cortical surface. Such a case, however, has never been proved to my satisfaction, and therefore I hesitated to give the present case a cerebral origin, although there was a difficulty in placing it in the spine owing to a want of atrophy of the muscles. Some atrophy, however, subsequently occurred, and the

case turned out to be spinal, but it shows that the motor tract to the arm may be involved for a time without affecting the grey matter.

Tumour of the Cord

CASE.—Joseph U—, æt. 15, admitted under Dr Wilks, May 19th, 1882. Gardener.

About five months previously he found his left arm getting weak and his grasp not so strong, so that when wheeling a barrow he would sometimes let it fall from his hand. The weakness continued until he could no longer lift it from his side. He also then began to have pain at the back of the neck.

On admission the patient appeared to be well nourished, and tanned with the sun. No cerebral symptoms. Chest sound. Speech and sight good. Ophthalmoscopic examination showed nothing. Unable to lift left arm to his head or from the bed when lying down. No loss of sensation. No pain on pressure over spine. No wasting. Urinary organs healthy. Galvanism when applied to both arms caused contraction, but faradisation less then continued current.

After a few days, on further examination, it was found that the muscles of left shoulder, deltoid, supra- and infra-spinatus and cervical portion of trapezius were becoming flabby and wasted. Other muscles normal.

During the next month the lad walked about and continued the galvanism. The left arm on examination, although not wasted as a whole, showed commencing atrophy of the muscles of shoulder. The right arm, which was slightly weak, had not become feeble. He was then seized with vomiting which continued without cessation. He complained of constriction round his neck and difficulty of swallowing. The chest became partially paralysed, his face became livid, and he shortly died.

The post-mortem examination showed the existence of a tumour in the upper part of the cervical cord. It was of a gelatinous consistence, and gave the cord the appearance of being swollen and double its ordinary size. It was about an inch long, extending from the foot of medulla to the fifth or sixth vertebra. It grew on the left side, and in some parts the grey matter was involved.

PARAPLEGIA

The spinal cord being a complex organ, you can well see what a variety of disorders may be referable to changes in its structure, and it is evident that the symptoms will vary as different constituents of the cord are involved. To connect the structural changes of particular parts with their necessary characteristic symptoms is the aim of modern investigators. This is being attended now with considerable success, and the phenomena observed from disease are found to tally with those which appear to have been expressed to the physiologist in his experiments. The most marked symptoms attendant on disease of the cord are those referable to altered motion and sensation, and more particularly the former. Thus it was that older writers were content to speak of paralysis of the legs under the name of paraplegia as the only affection to which disease of the cord could give rise. If, however, the cord is composed of different elements, each having its own function, it is clear that

lesions of certain parts will be found intimately associated with a special class of symptoms. It it our business to analyse them as far as possible, and this I shall endeavour to do for you.

When, however, you have excluded all cases deserving a special name and having a distinct pathology, there is still a large residuum to which the general term paralysis must yet be applied. For since a simple loss of power is, as you might expect, the commonest result of a morbid condition of the cord, so *paraplegia* is a useful term for including many cases which no doubt will one day submit to a further analysis.

In one case there may be disease of the spine which has secondarily attacked the cord; in another inflammation of the membranes, which in like manner has involved the medulla; or in a third, the latter may be primarily affected. These, of course, have all different pathological causes, although the resultant effect may be much the same in all. Thus also morbid growths, as cancer of the spine or tumour of the cord itself, may lead to its destruction, and therefore during its progress we can scarcely adopt any other term for the symptoms than that of paraplegia.

When disease of the cord has commenced some loss of power ensues, which is soon evidenced by the difficulty in walking, and more especially in the ascent or descent of stairs. The inability to raise the legs is seen by the patient's stumbling up a step, or even over a stone in the street. The effort which a paralysed patient makes to move will generally distinguish the weakness of the legs from any rheumatic or other affection, and, in a woman, from hysterical paralysis. The feet flop down, and the power of pointing them in a given position has gone. You must distinguish between want of power and mere stumbling arising from a want of knowledge of the position of foot, as in anæsthesia. Then, again, one of the best evidences of diseased cord is shown in the paralysis of the bladder. First the want of ability to empty the organ without much straining, and subsequently its becoming fully charged and running over. The retention, in the first place, is probably due to mere loss of sensibility in the bladder, so that no stimulus is reflected back to the cord to excite its contraction as in health. It is observed mostly in cases where sensibility is lost and the urine has become alkaline in a few days, showing how much this organ is directly under nerve influence. In some cases there is an actual loss of voluntary power over the bladder and accessory muscles. In other cases, especially in those of disease of the lumbar region, there may be an actual relaxation of the sphincters. All these forms of real paralysis you must carefully distinguish from those of frequent emptying of the bladder or wetting of the bed from mental causes, or

simple want of appreciation of the necessity of retaining the secretion. Thus persons who are ill may urinate by simple instinct, just as a child, animal, or insane person.

There are some forms of disease of the cord, however, as of the motor columns with integrity of the grey centres, where paralysis of the bladder does not occur. The vesical nerves come from two sources, the sympathetic and the sacral plexus. It has been said that there are two motor centres: the first, in connection with the sympathetic, at the level of the third lumbar vertebra; and the second, in connection with the nerves of the sacral plexus, at the level of the fifth lumbar vertebra.

In various forms of paraplegia there is also a paralysis of the rectum. Other organs also sometimes suffer from the deficiency of nervous influence, as, for example, the digestive organs; and thus flatulence and sickness may become attendant symptoms; and in various forms of spinal disease it is not uncommon for patients to have most severe attacks of vomiting and pain at the stomach. Charcot has especially alluded to these under the name of "crises gastriques," as occurring in locomotor ataxy, but I have observed it in other forms of paraplegia as well. In the case of a young man with motor paraplegia, having probably a syphilitic origin, the gastric attack was the first symptom which attracted attention to the real nature of the disease, and subsequently he became the subject of the most severe spasms and vomiting, which lasted two or three days, and were accompanied by extreme prostration.

As paraplegia progresses the patient becomes perfectly helpless and bedridden. In such a case death does not result directly from destruction of the cord, except the upper part be affected, when the chest loses its mobility, and life cannot hold out long; but it takes place from secondary causes. A bed-sore may form, or, as it is called, *acute decubitus*, which may be sufficiently extensive to exhaust the patient; or, what is more common, the bladder becomes inflamed and the irritation there set up is propagated to the kidneys, when a suppurative nephritis occurs, with a speedily fatal result. In acute paraplegia, this bed-sore, or "acute decubitus," is a very important symptom. After two or three days a black patch of dead skin may be seen on the back, which soon sloughs leaving a large sore. In a lad in Stephen Ward, where paraplegia had become complete in two days, a bed-sore was already beginning to form, and the urine was alkaline. In a woman in Mary Ward there were also large blebs or bullæ on the legs. All these conditions we now recognise as due to changes in nutrition owing to the implication of the nerve centres. These were mentioned by Bright in his Reports published about fifty years ago, and which I shall

again refer to when I speak of nerves. Affections of the joints have occasionally been observed as a similar class of phenomena.

I might mention that the pupils of the eyes are often affected in spinal disease, being influenced, it is supposed, through the sympathetic nerves in the neck. Thus, we often see minutely contracted pupils, or an inequality in their size. This may or may not be associated with various amaurotic conditions which have altogether a different origin.

An affection of the eyes indeed has long been noticed in various forms of paraplegia. Dr Clifford Allbutt has described an optic neuritis in cases of injury to the cord, and Dr Dreschfield has described cases of myelitis of the cervical cord where the same has been observed. But even some cases have been recorded where there has been myelitis of the dorsal and lumbar cord alone, the cervical part remaining free, and where the patients have been blind from atrophy of discs. There seems therefore to be scarcely any disease of the cerebro-spinal centres which may not be accompanied by affection of the retina. Before the ophthalmoscope was discovered this fact was long observed. Many years ago a young man was in the hospital with perfect paraplegia, accompanied by paralysis of bladder and bed-sores; he became completely amaurotic, with pupils dilated and insensible to light. He eventually quite recovered from both the paralysis and the blindness.

You know that in all spinal affections we look to the back, in order to discover if there be any disease in the vertebral column, and we generally percuss it. Now, as regards any value to be derived from this method, I think we must set it down as very small. We, of course, examine the spine, for by so doing we may discover a projection or a growth; but as for informing us of the condition of the medulla within it, percussion seldom does that. Of course, should disease exist between any of the vertebræ, any violent jar on the back would be likely to produce discomfort; but, as a rule, in slowly progressing disease of the cord, as in the majority of cases of paraplegia which we meet with, there would be no pain produced. At the same time a sensitiveness of the spine is very common, but this generally implies a simple functional hyperæsthesia, so that I verily believe that were you to test the value of this method of diagnosis by the rule of averages, you would find pain mostly absent in organic diseases of the cord, and present in those persons who suffered merely from nervous excitability. But each case must be taken on its merits. Thus in an adult man, who showed no evidence of a nervous temperament, a permanent tenderness over one spot when disease was otherwise indicated would be of immense importance in the diagnosis. On the other hand, in the case of a girl who was

said to have a spinal affection owing to the existence of a variety of nervous symptoms, the diagnosis of a purely functional disturbance would be rather corroborated than contradicted by the presence of tenderness over the spine. Moreover, the tenderness on pressure, if indicative of local disease, is referable mostly to a change in the bone; whereas, in the majority of cases of paraplegia, the disease of the cord is quite independent of the vertebral column. I have no means of referring to statistics on this subject, but I am strongly impressed that the combination of disease of the bones and the cord is far less common than disease of each separately. The two affections, I know, are often met with together, but yet, I think, more commonly found apart. How often do mothers bring their children amongst the out-patients, telling us that they have discovered their backs growing out, when on examination we find an angular curvature, but attended with no symptoms of a nervous kind. Even if there have been any, they have been due to implication of the nerves, and not of the cord itself. There has been, perhaps, a fixed pain in the chest for some weeks or months, and then the projection has shown itself. If you will look in our museum you will see angular and lateral curvatures to so great an extent that the spine is bent into a sigmoid form, or doubled forward, so a s to become parallel with itself; and yet the cord has followed all these contortions with impunity. You may see other cases where the purulent and scrofulous matter lines the canal, and is yet prevented from touching the cord by means of its sheath. On the other hand, I believe the majority of cases of disease of the medulla have begun in its substance or its membranes. I leave out of the question whether these may not have resulted from an external influence, such as a blow; but I intend merely to speak of the direct propagation from diseased bone.

In some cases disease begins in the substance of the cord, and the early symptoms are those of gradual loss of power of motion or sensation. In other cases the disease begins in the membranes, and in these there may be additional convulsive movements, joined sometimes with extreme excitability of the cord or rigidity of the limbs. In some of these pain in the back may exist, showing that, whether arising from implication of the nerve roots as they pass from the cord or originating in the cord itself, uneasy sensations in the back may be present. The pain is often described as if a string were tied round the body, and is called the "girdle pain," the seat of it being the course of the nerve whose root is in an inflamed or over-sensitive part of the cord where the healthy and diseased portions meet. This is very different from the pain induced by striking the spine. There are, then, included under the name of

paraplegia, a number of diseases dependent on different causes, and possessing a variety of symptoms.

A case which may be taken in illustration of one variety of paraplegia was that in which a blow on the spine caused an effusion of blood into the grey matter, and the primary symptoms were purely referable to sensation. A slight rupture of a blood-vessel in the grey matter appears to be always attended with serious results, and probably, from the disposition of the blood, to extend itself. If one side of the cord be more injured than the other, there might be paralysis of motion of one leg and anæsthesia of the other. This may sometimes be observed in the early stages of myelitis, proving the crossing of the sensory fibres. Common sensation may be lost whilst thermæsthesia remains.

I may mention that a violent blow on the back, either from direct injury or shock, will produce a concussion which, resulting in a temporary paralysis, may be quickly recovered from, whilst, on the other hand, it may set up an acute softening, which shall be rapidly fatal; or, thirdly, produce a chronic change, accompanied by a variety of symptoms which may endure for years, or be, in fact, permanent. I have more than once seen a man receive a severe injury to the back and be taken up paralysed, but in a few days he has perfectly recovered the use of his limbs, just as in concussion of the brain with loss of consciousness and rapid recovery; there was, in fact, a stunning of the cord. I have also seen such a case fatal, where the cord was found much ecchymosed with small effusions of blood within it, but without any injury to the bone.

Treatment.—This depends upon the nature of the complaint, but it may be said generally that among the best remedies are mercury and iodide of potassium, even in cases where there is no history of syphilis. Subsequently tonics, as iron, quinine, or zinc, are often of use. Phosphorus, strychnia, belladonna, I have found of very little value. Physostigma is of occasional service. In disease of bone Sayre's splint, especially, and other mechanical means must not be forgotten.

Drunkards or Alcoholic Paraplegia.—I do not know that this is deserving of a distinct name from its possessing any pathological peculiarities, but, as arising in connection with a very well-marked exciting cause, it requires your especial attention; and I refer to it the more readily because, as far as I am aware, authors have generally overlooked it. I have already told you how long-continued habits of intemperance in alcoholic drinks tend to the production of a fibrous or fatty degeneration of the various tissues of the body, and that, as a consequence, the membranes of the brain and spinal cord become thickened, and the organs within wasted. This, of course,

would give rise to what might be called a general paralysis of body and mind. But, besides these general results, we often meet with more direct effects on the spinal cord, and to these I particularly refer. I have now seen so many cases of persons, especially "ladies," who have entirely given themselves up to the pleasures of brandy-drinking, and have become paraplegic, that I am pretty familiar with the symptoms. From what we hear from our continental neighbours it would seem that that diabolical compound styled "absinthe" is productive of an exhaustion of nervous power in even a much more marked degree; since the volatile oils dissolved in the alcohol give additional force to its poisonous effects. Of course, drunkards of all descriptions suffer from muscular and nervous weakness, but, as I before said, it is more especially in the legs that the effect is striking. A loss of power is first observed, accompanied by pains in the limbs, and in some cases by anæsthesia, which seems to indicate a chronic meningitis of the spinal cord. There is at the same time necessarily some amount of feebleness of other parts of the body as well as of the mind, and thus an approach to general paralysis is produced; but sometimes the symptoms are almost confined to the legs, and resemble in character those of the locomotor ataxy. That the brain should be affected in one case and the spinal cord in another, is due probably to the same idiosyncrasy which makes one man get drunk in the head and another in the legs. The symptoms, of course, would vary according to the region of cord affected; as, for instance, an atrophy with contraction would point to disease of the anterior cornua.

I am now visiting a young married woman who for some time past has taken to "drink." She first had engorgement of the liver, followed by an all but fatal hæmatemesis. She recovered from this, but, continuing her evil habits, she began to get feeble in mind and tremulous in her limbs. She appeared at times almost childish, and spoke thickly. She had a difficulty in rising from her chair, and then, by a great effort, staggered across the room. She is now apparently gradually recovering.

I occasionally see in this neighbourhood a publican's wife, who commenced business two years ago, previous to which time she was temperate and well. Since this, the constant presence of gin before her eyes has been too much for her, and she has drunk the burning liquid in enormous quantities. This could not continue long with impunity, and now she has been confined to her bed for six months. She is almost paralysed, having very little power to move her limbs, is not able to raise the heel from the bed, and has no power to grasp with the hand; the muscles are flabby, and she has almost complete anæsthesia; the mind is also somewhat enfeebled.

The arms therefore may be likewise affected, and occasionally anæsthesia is the principal symptom. This may affect one side only.

Such cases I could multiply to almost any extent. Several I have seen end fatally, and in some a partial recovery has taken place. A most remarkable case is now under my care. A lady, æt. 35, married, but without family, being left alone all day, had been secretly drinking, until at last she became perfectly paralysed in mind and body. She took to her bed and her end was shortly expected. She was sallow, wasted, quite unable to move her legs, and her arms but slightly; she appeared to have lost feeling also in the lower extremities. She had become almost fatuous and scarcely recognised her friends; indeed, her mind was a blank. All alcohol was at once stopped, a nurse was procured, and feeding commenced; quinine and opium were also ordered. She slowly recovered, and now, after five months, is able to walk and come to my house, having grown stout and regained her intellect. Another woman, who could not be managed at home, recovered speedily after going to a hydropathic establishment.

I have given the name paraplegia as a general term for the complaint, but, as you might suppose, the symptoms would vary very much in a chronic meningo-myelitis, according as different portions of the cord are involved. Thus, in the case just mentioned, there was anæsthesia, whilst in a young man who died here lately there was hyperæsthesia. In his case also there were severe pains in the limbs. In one young woman the symptoms very much resembled those of locomotor ataxy, both in the character of the pains, which were like electric shocks, and also in the mode of progression. I might add that drunkards often suffer from pains in the limbs long before there is any sign of paralysis.

One of the most striking results of alcoholic poisoning has been the production of "amyotrophic paralysis," where the motor tracts as well as the motor cells are involved over and above the sensory tracts and nerves, showing an implication of a great many parts of the cord; and, therefore, some of my most marked cases will be found under that heading further on.

Acute Ascending Paralysis.—One of the most remarkable affections of the cord is that known by this name. I have long recognised it, and reported isolated cases of it. It was first fully described by Landry in 1859, and has, therefore, often been styled "Landry's paralysis." It is of extreme interest, as it may be simply the result of a condition of cord which is physiological rather than pathological—a mere loss of function arising from some inhibitory action, which may cause a fatal ending before this inactivity is recovered from. Whatever its nature may be, the rapidity of its extension is most remarkable, for it propagates itself

from end to end like wild fire. In seeing such cases I am reminded of a spark alighting on a piece of touch-paper, and the fire running through its length until the whole is quickly consumed. A patient, for example, may feel some numbness or loss of power in the feet, which is soon followed by an inability to move the legs; then a paralysis of the arms and upper part of the body comes on, and in three or four days death ensues. Whether the change in the cord be due to some rapidly degenerative process in the fibrillæ arising from the causes already mentioned, whether it be inflammatory, or whether the alteration be only that which may be called dynamic, has yet to be determined. It may be remembered how the nutrition of a nerve is dependent upon the integrity of the centre whence it arises, or on the neighbouring ganglion, and that in the case of the fibres of the medullary cord these will degenerate in a given tract, according to the direction of their conducting power. It is not, therefore, difficult to understand how any cause interfering with their nutrition at one spot might be propagated along the whole length of the strands. That there are causes in operation which will arrest the function of any part of the cerebro-spinal centres without the occurrence of any organic change we every day see; as, for example, in paraplegia which is entirely recovered from, or in hysteria where a portion of brain or cord is for a time perfectly in abeyance. I am right, I believe, in saying that both in this country and on the Continent the most competent observers have failed to find any abnormal changes in the cases of which I am now speaking. It is stated by Professor Erb that the electric excitability remains normal. The urinary organs are undisturbed and the brain functions remain entire. I can call to mind several instances of this complaint.

Case.—James D., æt. 47, was a blacksmith and was admitted under my care on December 9th. He said that he was in good health until December 4th, when whilst at work, and without any assignable cause, he felt a numbness and weakness in his legs; but he managed to continue at his employment. On the following day he attempted to work, but was obliged to desist, and return home and go to bed. The weakness increased daily until the day of his admission. He was a small, dark-complexioned man, and as he lay in bed appeared to have nothing the matter with him. On examining him, however, he was found to have paralysis of motion and sensation of the lower limbs. An attempt to move them caused only slight contraction of certain muscles, and there was loss of sensation as high as the thigh.

On December 10th, the paralysis was quite complete, and on December 11th, on careful examination, there was found perfect anæsthesia as high as the umbilicus, and there was not the slightest reaction to any external stimulus. This seemed to show also that the grey matter of the cord was involved. The arms felt somewhat weak and numb, and it was observed that the lower part of the chest did not fully expand. It was thus clear that the disease had already reached the

cervical region. The pulse was quick and the tongue slightly furred, but the temperature of the body was not raised; in fact, there were scarcely any febrile symptoms. He was quite rational, though he answered questions slowly.

December 12th.—Respiration became more difficult, mucus collected in the bronchial tubes, and death occurred at last rather suddenly.

A *post-mortem* examination was made, and no disease in the body was found. The spinal cord was examined microscopically; but nothing abnormal could be discovered.

Case.—A tradesman's wife, æt. 38, living at Streatham, was seen by me for an acute paraplegia, and I received the following history: Whilst in her shop on Monday, March 11th, she fell down on account of a weakness and numbness in her legs; on the following day she could scarcely walk; on Wednesday she was worse; and on Thursday was completely paralysed in the legs. On Saturday I saw her. She could not move her legs in the slightest degree, and had completely lost sensation as high as the breasts. There was not the slightest response to the stimulation of the feet by tickling or pricking. The respiration was becoming affected; it was quick, and she was already experiencing a suffocating feeling. Just at the line where the sensitive and anæsthetic parts met she felt a burning or tingling pain. Bladder and rectum paralysed. Pulse 110.

I saw her again on the following day. The arms were paralysed, the chest was becoming immovable, and abdomen very tympanitic. She died at night.

I made the most careful inquiries respecting a probably exciting cause for the paralysis. I was told she was a perfectly healthy woman, had no uterine or other trouble, had not been exposed to cold, and had received no injury.

Case.—Within the last few days I have seen another equally remarkable case. A well-grown lady, in her twentieth year, was brought home from a friend's, where she had been visiting, perfectly helpless in her limbs, owing to what had been called rheumatism. A medical man was then called in, who seeing her paralysed sought my advice. I found her paralysed as regards motion and sensation over the whole body; the chest was being expanded with difficulty, and mucus was collecting in the tubes. This she was vainly endeavouring to expectorate, and said she should be choked. I need not detail the history, but simply say that, without having had any previous spinal symptoms, she was taken six days before with weakness and numbness in the legs; this was followed by complete paralysis, which rapidly extended upwards, until the neck was reached at the time I saw her. Her brain was unaffected, and she was quite rational; you may therefore imagine the distress of her parents when I declared that she had not long to live. She died in a few hours, and I am sorry to add, a post-mortem examination was refused me.

In some rapidly fatal cases there may be a history of injury or exposure to cold, and therefore, under these circumstances, it is probable that, had the patient survived long enough, some well-marked inflammatory changes might have been found. In the case given below the patient died of one of the accidents of the disease, and thus sufficient time might not have elapsed to develop changes which could be appreciated by the eye. In another case of acute paraplegia, fatal in twelve days, of a somewhat similar kind, softening of the cord was clearly perceptible. In the cord of a para-

plegic, which is apparently healthy, there may exist two very different conditions: there may be a state in which the so-called reflex paralysis has occurred, in which the cord is in no way structurally altered, and therefore may at any time recover its function; whilst there may be another state to which I refer, which shows no change, because the effects of the inflammation have not had time to display themselves. In the one case it may be supposed that, owing to a contracted state of the blood-vessels from reflex irritation, a part of the cerebro-spinal centres may lose its function, causing a paralysis, and that yet this condition may endure for any time, and recovery eventually take place; and in the other case, although no change may be discovered, it may nevertheless be the antecedent of a true inflammatory process or softening, as, for example, in the case where a hemiplegia has ensued after the ligature of the carotid. Now, inasmuch as this change would assuredly have come about in time, we cannot regard any condition which is preliminary to softening as of the same nature as that which might endure for an unlimited period. It is probable that the same cause which produces this fatal paralysis may be in operation in some cases which recover. For example, a rapidly increasing paraplegia may suddenly stop and recovery occur. I have seen two or three cases where ascending paralysis was diagnosed from the rapid production of paraplegia, but where the paralysis suddenly ceased.

Case.—A young man walked about in his wet clothes, and afterwards slept in them. On the following day he felt very unwell, with aching pains all over him. On the third day he was obliged to keep his bed, on account of the weakness and numbness in the legs. It was then found that there was complete paraplegia of motion and sensation as high as the pelvis; the urine had to be drawn off. These symptoms increased, and on the 10th day he was excessively ill, with febrile symptoms; abdomen tympanitic; breathing quick and interrupted. There had never been any excito-motor action. On the twelfth day he died. The *post mortem* showed acute inflammation of the bladder and kidneys, and to this death was attributed. The spinal cord showed no appreciable disease. The question in such a case is—Was the cord only functionally affected by a reflex action, or was it in the same morbid condition which precedes all cases of softening, but not yet appreciable to the eye?

Cases.—A man, of middle age, was lately under the care of Dr Taylor. He was seized, after getting wet, with pains and weakness in his legs. This gradually increased until the arms became weak, and finally his chest. His breathing became more shallow until he died; he was conscious to the last. The case lasted about ten days. The cord appeared perfectly healthy to ordinary examination.

In another case, fatal in five days, the cord appeared healthy to the naked eye, but after being placed in chromic acid and sections made, it was thought that slight degenerative changes could be perceived.

In two cases where paraplegia was complete as far as the middle of the body, in five days, and fatal through the kidneys at the end of a month, the cord appeared healthy to the naked eye, but a microscopic examination showed degeneration throughout all the tracts, as if the change had been a universal one.

The last case I have seen was that of a man under the care of Mr Chaplin, of Shepherd's Bush, in which the paralysis was complete in a week. He began by complaining of weakness in the legs, which increased until perfect paraplegia of motion and sensation resulted. The bladder was paralysed, but the urine was not ammoniacal, nor was there a bed-sore. The disease extended upwards until the arms became quite dead and useless; then the chest became fixed, so that respiration went on solely by the diaphragm. He then ceased to be able to put out his tongue or speak. Swallowing became impossible, and so he died, the brain and intellect remaining intact until the last.

Dr Fox, of Bath, relates a case which was fatal in a few days, in a girl the subject of syphilis. No disease was found in the cord. For the first few days she had hyperæsthesia and hyperalgesia.

As a proof how subtle may be the alterations in the cord which may give rise to paralysis, I may mention the case of a young man who was brought into the hospital after having been knocked down and receiving various injuries. He had a scalp wound, a fractured fibula, had several ribs broken, and was paralysed in the legs. His urine had to be drawn off, and he subsequently had cystitis; his motions also passed involuntarily, and he had a bed-sore. When he died, at the end of the fourth week, no injury to the spine could be discovered, and the cord itself presented nothing abnormal. The symptoms were regarded as due to concussion.

Reflex Paralysis.—That this constitutes an established form of paralysis is by no means proved; it cannot at present be regarded otherwise than as a theoretical explanation of those cases of paralysis where no visible lesion is found. We are looking for an interpretation of the cases which resemble in every way those organic forms of disease which I have mentioned, but yet, being recoverable, cannot be considered as identical with them. I have told you that the changes which our naked eyes or microscopes detect are all of the destructive kind—broken fibres, or new products which have taken the place of the old; and we can only conjure up to our fancy some of those alterations which we please to call dynamic. In the case of the brain and spinal cord it is possible that changes may occur of a rougher and material kind, and yet be not perceptible; for we must remember that nerve-substance is complex, and that blood is a necessary ingredient for its integrity. Let the blood supply be deficient, and its function is gone. A good example of this is seen in the case where the carotid artery is tied, and a hemiplegia quickly follows; this is speedily recovered from when there is a fresh supply of nutrient fluid.

What change takes place in concussion of the brain and spinal cord we do not know, but it implies such a derangement of the integral portions of the nerve tissues that their function for a time ceases. And again, from recent experiment, we must take into account the fact of a nerve losing its function from some fault at its origin. Just as a galvanic wire ceases to be in a state of electric tension when the battery stops working, so it is almost certain that portions of the cord depend for their integrity of function on distant parts. This fact may be only removing the difficulty to a distance, but it shows that a functionless part of the cord may to the eye seem quite natural. It has been thought, however, by many, that such instances of temporary and recoverable paralysis may find an explanation in a deficient blood supply, and, since it is known that the blood-vessels are regulated by the sympathetic nerves, that we have no more to do than to suppose an irritation of these nerves in order to arrive at a theory of the cause of functional paralysis. I should not, perhaps, use the word "functional," since an alteration of this kind, although a temporary one, is none the less real. A paraplegia induced by an external irritant is styled *reflex paralysis*. It is thought, I say, that the blood-vessels are thereby diminished in calibre, that the blood supply to the spinal cord is diminished in amount, and that its power departs. Since a temporary paraplegia, or one which, if fatal, has shown no organic change in the cord after death, has been associated most frequently with some urinary disturbance, the cases of the kind which I describe have been mostly styled *urinary paraplegia*. You are aware that the theory can scarcely admit of actual proof, and is rather accepted because we have no other explanation for those cases of disease where the usual morbid appearances are wanting. Stanley was one of the first who drew attention to this in a paper to be found in the 'Transactions of the Royal Medical and Chirurgical Society' for 1833, entitled "On Irritation of the Spinal Cord and its Nerves in connection with Disease of the Kidneys." These were cases where paraplegia existed with disease of the urinary organs, and the cord was said to be healthy. Subsequently Graves suggested that disease of the intestines might cause a paralysis, and of late the German writers have included diseases of the urinary organs, diseases of the generative organs, and dysentery among causes of a reflex paralysis. After the introduction of the vaso-motor theory, Brown-Séquard explained the paralysis by a reflex contraction of the vessels of the spinal cord. More recently since the theory of inhibitory centres has come into vogue, it has been thought that the function of the cord might be arrested through the nerves derived from the organs just mentioned.

Whether a progressive neuritis may be a cause is not yet proved; it is still a question therefore whether the paralysis is physiological or pathological. Dr Gull long ago expressed his doubts, and showed that a phlebitic process might be accepted as far more explicable. With him I cannot but think that the negative evidence is important in solving the question—take, for instance, the statement of one of my senior colleagues, who has had immense experience in all diseases pertaining to the urinary organs, and yet is unacquainted with reflex paralysis as one of the consequences of them; in fact, he does not remember a single case in connection with stone in the bladder. If paraplegia and urinary troubles are seen together it may be difficult in any particular case to ascertain which has preceded the other; thus, quite lately, I have been attending a lady who has had partial paraplegia and acute nephritis; she is now recovering. What relation these two complaints have had to one another, or which is the primary one, I cannot say. Whatever explanation is given—and the theory of diminished supply of blood through nerve irritation may serve for the purpose—certain it is that a temporary paralysis may be frequently met with, not only in connection with urinary disorders, but in several other affections. Thus, I might mention the case of paraplegia succeeding to labour; this is, perhaps, not common, but every now and then we meet with it. It has been said that a pressure on the sacral nerves would suffice for explanation, or a pressure on the psoas and iliacus muscles; but these causes must be regarded as very doubtful, although I believe cases do sometimes occur where most excruciating pains have accompanied the passage of the head into the pelvis, and these have been followed by a temporary paralysis. Dr Fussell, in a paper on this subject in the 'St George's Hospital Reports,' states, on the authority of Mr Youatt, that cows not infrequently suffer from paraplegia after calving, that they lie down, are quite unable to move their hind legs, and apparently have no feeling in them when they are touched. In about a fortnight the cows get up well. In such cases the theory of reflex paralysis might be made to apply.

The doctrine is applicable, of course, to many other cases, for example, to the paraplegia which occasionally has been observed to follow typhoid fever, where the disease would be reflected from the ileum. Then, again, the case of diphtheritic paralysis which I have already alluded to, instead of being regarded as due to simple exhaustion of the whole nervous system, might be referred to a lowered condition of the spinal cord, owing to a deficiency of good blood-supply arising from an irritation of nerves in the throat. So also the cases of acute paraplegia following direct exposure to

cold might be considered due to a similar cause. In corroboration of the possibility of a deficient blood-supply being all-sufficient to render the cord functionless, I might mention the case of paraplegia following obstruction of the aorta, which occurred here some years ago. That there are causes in operation sufficient to render the brain and spinal cord powerless, and yet beyond our ken, I have already referred to in speaking of concussion, but I might allude to the more marked case of sun-stroke. Here the effect on the brain is sufficient at times to paralyse its action and cause instant death, at others to produce those changes which are subsequently displayed as epilepsy or mania. It is remarkable, however, as I before said, that changes in the brain which are invisible may be the precursors of ordinary inflammatory attacks—at least I judge so from the fact of there being well-authenticated cases of children having died in a day or two after exposure to the sun, and inflammatory lymph having been found at the base of the brain and in the ventricles.

The greatest difficulty which I have in my own mind in adopting any opinion in explanation of those cases of paralysis which recover, is that such cases are not uniform, but assume the character of every variety of nerve disease with which we are familiar. I can understand how a concussion of the spine can affect one region of the spine rather than another, or even by chance injure the exterior rather than the interior, or *vice versâ;* and I can also understand how in urinary paraplegia the lower part of the cord may be especially involved, and in diphtheritic paralysis the upper; but it is difficult to conceive how one particular strand or a certain functional area is to be alone affected by such causes as I name, and yet it is certain that limited portions of the cord can be temporarily deranged. Suppose, for instance, we hold clearly in our minds the seat of the changes in the cord in cases of fatal paraplegia of motion, paraplegia of sensation, locomotor ataxy, or progressive muscular atrophy, we are bound to believe that those same parts are affected whenever the same symptoms exist. We have, then, the problems before us which during the last few months have been asking for solution in Stephen Ward—first the case of a man who perfectly recovered of a partial paraplegia of four years' standing; then the case of a man with symptoms of locomotor ataxy who recovered; also the case of a man with early progressive muscular atrophy, who quickly got well under the application of the continuous current down the spine; and more remarkably still the case of the girl lately alluded to, who was little more than a skeleton owing to the same disease, and yet perfectly recovered under the use of faradisation. I say we want to know what must be the condition of the cord in these cases which recover. If we are led to believe

that organic changes take place in certain portions of the cord in those instances which are fatal, we might, as a matter of easy explanation, suppose that the same changes had occurred in those which recover, but, being in their incipent stage, were removable by remedies. If we are not content with this explanation, and are satisfied with the doctrine of reflex paralysis, or some analagous theory, then we must regard the several portions of the cord as much more anatomically and physiologically distinct than we have otherwise done; and it may, perhaps, be even necessary to admit this in order to explain the selection of parts for the severer organic changes.

The cases which have of late years been styled reflex paralysis have been those which have succeeded to local disease or general illness. If the paralysis has been confined to the legs, then we have had *reflex paraplegia*. This is usually described as following affections of the bladder or urethra, diseases of the uterus, and of the intestines, as dysentery. It has been thought that a sufficient number of cases of paraplegia have been collected which have immediately followed these diseases to show that a connection must in all probability exist between them. Of late, also, smallpox has been shown as tending to the production of a nervous affection. It is, however, more especially with stricture and bladder affection that the connection has been noticed, and this has given rise to the expression *urinary paraplegia*.

Diphtheritic Paralysis.—This is considered by some an example of reflex paralysis, whilst by others it is regarded as a general paralysis arising from exhaustion of the cerebro-spinal centres. Since the throat is the part most violently implicated in the original complaint, and since this also is the part which often first loses its power, it has been thought that the paralysis really has its origin or cause therein, and that the whole body is affected by a reflex action. It has been stated that changes have been found in the anterior roots of the nerves which has suggested a central origin for the affection, although if inflammatory changes be found they might be accounted for by an ascending neuritis from the pharyngeal nerves. Be this as it may, it is remarkable, as is true of the sequelæ of many other disorders, that some very severe examples of the paralysis have occurred where the diphtheritic affection was but slight. This paralysis is more deserving of the name *general* than any other which I know, for all the physical powers are affected, and sometimes the mind is enfeebled. The patient becomes utterly helpless, quite incapable of standing or moving the arms, the face loses its expression, the saliva runs from the mouth, there is thickness of articulation, and difficulty of swal-

lowing; in fact, the patient has the appearance of an idiot, and more especially so if he be not completely paralysed and is able to walk; for then he stumbles along, and with his head hanging forward and his vacant stare looks like an imbecile. There is often amaurosis, deafness, and paralysis of the sphincters. The child generally recovers, unless there is that amount of paralysis of the palate which prevents him swallowing, in which case he sinks from exhaustion.

In some instances the depression is so great, and has come on so suddenly, that the term paralysis can scarcely be adopted, and this almost obliges us to remove it from such a cause as is suggested by the term reflex.

For example, a lad, æt. 15, had an apparently slight attack of diphtheria, when one day after the lapse of a fortnight he became very prostrate, the pulse sank to 50, and soon to 28, the respiration became slow, whilst the temperature was normal, and he died on the following day. A little girl in the same way had recovered from her throat affection, when she became collapsed, with slow pulse, and died in three days. Of the same kind was the case of one of our house surgeons who had a bad diphtheritic throat; after the secreted membrane was loosened and the swelling abated, he began to improve, and I hoped he was convalescent, when I was called out of bed one morning and found him collapsed, with a very feeble, irregular, and slow pulse. It seemed sometimes, indeed, as if the heart had altogether stopped, so long was the pause between the beats; there was also a great feeling of oppression of the chest. He never rallied, and died three days afterwards.

Case.—A young man, æt. 25, the son of a medical friend, had an attack of diphtheria; this was followed by paralytic symptoms, affecting more especially the throat. From being a stout man he became thin, spoke with a nasal twang, and swallowed with difficulty. It was several months before he regained his health, and then he was constantly liable to a return of the throat weakness. About a year afterwards he had a very slight attack of modified smallpox, and he was recovering from this when he found he had difficulty of swallowing as well as of protruding the tongue. In a few hours the paralysis was almost complete; he could only speak in a whisper with his mouth, had not the slightest power of swallowing, could not cough in the least degree, and his breathing was quick and difficult. He scarcely moved his chest, and it was evident that not much air entered the lungs. A consultation took place as to the advisability of tracheotomy, but it was not done. The breathing became worse, with more lividity of the surface, and he died in about twelve hours after the accession of the symptoms. On *post-mortem* examination no morbid changes were found in any organ; the larynx, pharynx, &c., were quite healthy.

It is worthy of note that we sometimes meet with cases of general

paralysis in children exactly of that kind which is seen to follow diphtheria. But lately, I saw a little girl æt. 10, who began to feel her legs weak in walking, then the arms, subsequently the whole body, exactly as is met with in diphtheria. There was no history whatever of any preceding illness. She gradually recovered. There may, then, be other causes not yet recognised, which produce similar effects on the nervous system.

The *treatment* is by good living and tonics. In some cases the application of the continuous current down the spine has been especially useful.

Choreal Paralysis.—The connection between irregular movements and debility of the muscles is well marked in the case of chorea. In this disease not only is there the perpetual movement of the limb, but it is proportionally weak, so that it often happens that the motion may cease whilst the debility remains, and the case then constitutes one of *choreal paralysis*. It is important to recognise this, because a child may come before you for the first time with a weakened limb, and without any symptoms of chorea, and yet this disease is the originator of the paralysis, and the one which requires to be treated. Not only may a limb suffer, but the whole body; thus you may not unfrequently have a very bad case of chorea to treat, where, in the course of two or three weeks, all movements cease, but at the expiration of this time the child is quite unable to stand, or even move from the bed. A rapid recovery, however, often occurs.

Peripheral Paralysis.—I ought also to allude to the doctrine of peripheral paralysis, that is, where the nerves are not injured at their source, but in the course of their distribution. One of the commonest examples of this form is the facial paralysis arising from exposure to cold, or *coup de vent*, as it is often styled. Of the same kind might be the case of a man who was paralysed in his legs from standing for some time in cold water, although here the theory of reflex action might come in. More than one case has been recorded where, after exposure, sensation and motion were lost, the case ending in a permanent paralysis, at last proving fatal, and where, after death, a chronic inflammation of the medulla and membranes was found.

Transient Temporary Paralysis.—From such considerations as these it can be imagined how the spinal cord may cease for a time to functionise and a paralysis result. And as in the case of the hemispheres of the brain we believe that their function may cease not only for a considerable time, causing hemiplegia, as seen in hysteria, but also momentarily, as in epilepsy, so in like manner we can understand how the spinal cord may cease its activity not only

for a lengthened time, but also momentarily, causing temporary paralysis. Now this I have seen a few times, although no mention of such cases can be found in books.

Case.—M. K—, æt. 30, a butcher, a muscular, healthy-looking man. He came to me on account of the following symptoms. Some weeks previously, whilst driving, he suddenly lost power in his arms, and his fingers were fixed. This was only for a moment, when power returned. Some time afterwards he observed that the same thing occurred when he was lifting or carrying a weight on his back; without any warning his limbs would give way, and he would fall. He can walk well and can carry heavy weights, but is never sure that he will not suddenly fall under them. In speaking, too, he has sometimes lost power, and articulation has gone. It seemed as if the nerve influence over muscle became suddenly extinguished. I saw him again two months afterwards, and he still had the attacks. Without any apparent reasons seizures would come on, when his speech suddenly failed, and he was quite unable to move his limbs or even swallow, cough, or spit. I saw no reason to call the case epilepsy, as he had no loss of consciousness and no spasm.

Case.—M. G—, æt. 55, apparently well, and presenting no signs of disease whatever. He consulted me on account of attacks of nervous prostration, to which he had been subject for some months. He would be suddenly seized whilst walking, with complete loss of power in his legs, and often whilst indoors he would feel all muscular power going from him, so as to render him quite unable to speak and cause his jaw to drop. His wife has often held his jaw up until power has returned. To use his own expression, everything is going on regularly in his body, when suddenly there is a reversal of the engine. He eventually lost these attacks.

In these several forms of paralysis in which recovery occurs it is clear that nothing in the shape of what we recognise as organic change can have taken place. They are clearly dynamic conditions, in which the organ, though structurally perfect, is yet asleep, or, at all events, is not working. I am in the habit of illustrating the two conditions by the comparison of two watches which may be lying on the table motionless. You examine their interiors and you find one irretrievably damaged in its most essential parts, whilst the other is not going for the simple reason that it is not wound up. So in the brain and cord; they are often not wound up, and are not, therefore, going, but they are ready to do so when set in operation. This is the condition supposed to exist in the hysterical paralysis, where a strong effort of the will is often sufficient to start the machinery into motion. No doubt, a good supply of blood is necessary for the due performance of function, and this has suggested the theory of a reflex paralysis of the blood-vessels. Then, again, an exhausted condition of the cord is one we can understand as sufficient to account for its temporary inactivity. A person, for example, has been walking all day without any nourishment, and arrives at his journey's end so fatigued that he can

scarcely put one foot before another, his hand trembles, and his mind is incapable of any prolonged effort; the cause of the exhaustion is clear enough, but what the altered condition of the cerebro-spinal centres may be like is very difficult to conceive.

Of a like kind may probably be those cases where the sensory nerves are affected, but in a less degree than is observed in hysterical anæsthesia. For example, I have had a patient consult me for occasional attacks of numbness in the arms. Intervals of weeks might elapse when there would occur a feeling of numbness, extending all up the arm, attacking sometimes one arm and sometimes the other.

In chronic disease of the brain and in general paralytics a temporary complete loss of power of a limb is not uncommon. In these cases the vessels are often diseased, and it can be understood how an altered circulation might for a time affect the functionising power of portions of the brain.

Hysterical Paraplegia is the case where we believe the functions of the spinal cord are simply in abeyance or acting independently of the will. In the first place we find, as we might expect, a loss of motion, of sensation, and even of the vaso-motor function. The very completeness of the paralysis is an argument against its importance, since in actual disease particular tracts only are generally affected, productive of special symptoms. A case of this kind, therefore, must imply either nothing less than a complete destruction of the cord or an unimportant temporary arrest of its function, since, to use the technical expressions, we have anæsthesia, akinesia, thermo-anæsthesia, and analgesia. The legs are usually stretched out, as in a corpse, the feet taking the position they naturally would in a suspended dead body, whilst the arms are drawn across the chest and tightly flexed. It may be observed that in the hysterical form the girl remains plump, and she has no weakness of the bladder; at all events, she does not wet the bed; she merely has retention. The rectum is not paralysed, but the bowels are confined, and there is not that distension of the abdomen sometimes seen in disease of the cord.

The feet are often livid and cold; electro-mobility may be normal, but electro-sensibility is often quite gone, both in the muscle and skin.

Electricity may some day teach us to distinguish between an hysterical or ideal paralysis and a real one, since the muscular tension is probably different in the two cases. I shall refer to the subject again when I come to hysteria.

I have seen several cases of *paraplegia completely recovered from*, and of whose nature I had no knowledge. In some cases of which

I have spoken, such as ascending paralysis, the cord had become functionless, and death was due to an implication of the medulla oblongata; but where the inhibited condition ceased below this point, then recovery sometimes occurred. In other cases, associated with well-marked disease of the spine, a similar simple functionless state seems to have been induced. For example, in connection with caries of the vertebræ, we meet with complete paraplegia, and yet this may be perfectly recovered from. These cases of recovery are constantly occurring, but I have no means of diagnosing the nature of the affection of the cord, and much less of forming a prognosis.

Case.—*Paraplegia, recovery.*—Man, æt. 52, subject to rheumatic gout; never had syphilis. A month before admission he had an attack of gout in the feet after two weeks he was losing power of the legs and bladder. The paralysis rapidly increased. On admission he could not move his legs. There was a partial loss of feeling as high as the umbilicus, and reflex action was well marked. The urine was drawn off twice daily by the catheter and was ammoniacal. He subsequently had a feeling of tightness around the lower part of chest and abdomen. There was numbness passing down the arms to the fingers. He gradually got worse, and about a fortnight after admission he became feverish, with quick pulse, red tongue, rigors and hiccough; a bed-sore was forming, the urine ran away, and his mind was clouded. I suspected that he was suffering from suppurative nephritis, due to an extension from the bladder. He looked as if he had not many hours to live, and remained in a very precarious state for some days, when the constitutional symptoms abated, and some power in the legs returned. He after this made a rapid recovery, began to sit up in bed, gained power over the bladder, so as not to require the catheter, and soon was able to leave his bed and sit in a chair. He then asked for crutches, and began to stand alone, and soon was able to walk about the ward, when he wished to leave, which he did exactly two months after his admission, and six weeks from the time when his paraplegia was complete.

Case.—A woman of middle age was under my care some years ago, for almost complete paraplegia. The symptoms had been coming on for a few days, and were accompanied by swelling and pain of the joints, with some febrile disturbance, so that it was conjectured that she might be suffering from a rheumatic affection of the spinal cord.

After admission she complained of great pain in the limbs, with twitching of the muscles, and a feeling of constriction around the waist. A bed-sore formed, the urine was passed involuntarily, and was ammoniacal, and the sphincter ani was paralysed. The slough on the back became deep, and all the other symptoms continued for three weeks, when she began to recover. She took tonics, and was galvanised, and her recovery was continued, so that she left the hospital at the end of five months quite well.

In cases of disease of the spine, where paraplegia follows and is subsequently recovered from, we usually attribute the symptoms to pressure. We do so because such a cause appears to us intelligible, and we have occasional proof that the paraplegia may be thus pro-

duced in simply a mechanical way. We lately had a man in the ward with caries of the spine, followed by complete paraplegia, which was speedily fatal through bed-sore and suppurative nephritis. A mass of inflammatory product was pressing on the cord, but it had not entered within the theca or involved the substance. I have been recently seeing a gentleman who had long been suffering from pain in his back, when it was at length discovered that the bone was growing out; he then had weakness in the legs, which soon ended in a complete paralysis. A bed-sore formed, and the bladder was paralysed, obliging the constant use of the catheter. He lay in bed in a completely helpless state for several weeks, and then gradually recovered; he now walks about with an angular curvature.

CONCUSSION, RAILWAY SPINE, &c.

Railway Spine.—Every medical man with a large practice had formerly, no doubt, seen cases where a permanent affection of the spinal cord had resulted from an injury, but it has only been in railway times that we have witnessed so many cases of permanent disease from a shock to the cerebro-spinal system. When one considers the velocity of a heavy train, it is clear that the momentum with which it strikes any obstacle in its way must be immense. If one remembers, also, that some of the component parts of this mass of material are fragile human beings, made of flesh and blood, with delicate soft brains and spinal cords, no surprise can be felt in witnessing the terrible results of a train proceeding at the rate of forty miles an hour when brought to a sudden stop. It has often been credibly stated that after an accident persons have been taken up insensible, but without the slightest mark or bruise upon them; and, indeed, I see nothing marvellous in the proposition that the soft cerebral mass striking against the hard skull-case should be thrown into confusion, and insensibility result. In the same way, also, as you sometimes see persons after a blow on the head, not sufficiently violent to produce concussion, thrown into a state of maniacal excitement, so travellers meeting with such a shock as I have mentioned have often been observed to jump out of their carriage, throw their arms about, and behave in a manner which they themselves have afterwards designated as acts of madness. Well! our poor brains and spinal cords cannot be thus roughly treated without the necessary consequences, and a variety of symptoms from the day of the accident are set up, which develop into manifold troubles, or even end in a permanent palsy both of body and mind.

It is remarkable that in one or two instances which I have seen, where there was direct injury to the back, and symptoms of paralysis in particular limbs immediately following, the patient eventually got well, whilst in others, where a shake to the centre had been received, but with no apparent ill result, a slowly creeping-on paralysis ensued. These cases have now become so common, and have given rise to so much litigation, that they have become known in the profession as cases of "railway spine." A man, for example, receives a severe shock from the train having "collided" (to use the American phrase), feels unwell for a day or two, and then believes he has recovered from the shock. He soon, however, begins to be ill again, is fatigued, and unable to pursue his business with the same zest as before. In the course of some weeks the change is evident; he cannot walk as well as hitherto, staggers, his hand shakes when he writes, his memory fails him, he forgets names, and blunders in his accounts. If this be a chronic affection of the cord, slowly progressing, he becomes at last actually paraplegic, and in mental capacity is verging towards imbecility. A number of special symptoms may result, dependent probably on particular parts involved. In many cases there is tenderness along the course of the spine, and there may be hyperæsthesia in the course of some of the intercostal nerves. In some there may be pain in the back or limbs. The symptoms vary, probably, as the cord alone is affected, or as the membranes are involved in the chronic inflammatory or degenerative process.

The following account of the result of a railway shaking is taken from an anonymous letter in a newspaper, and is pretty accurate in all its details:

"In the case we are supposing you are shot like a human bullet from one side of the carriage to the other—forwards, backwards, and forwards again, with a momentum in proportion to the force of the collision; the parts generally struck being the back or front of the head, and the spine, either at the neck (the cervical vertebræ), or the lower part of the back (the lumbar vertebræ). Your head is moved as it were by its own weight, all controlling or resisting power of the muscular structure being for the moment lost. You have lights before your eyes, an odd taste in your mouth, sudden severe pain as the blows fall on you one after the other in quick succession; and then there is a pause, and you pick yourself up, or somebody else picks you up, and you find yourself feeling a little sick and giddy and a good deal bewildered. It is only that your spinal cord has received a jar, or shock, or concussion, whichever the men of science term it, the effects of which you will feel for many a long day to come. Meanwhile you 'continue your journey,'

for of course you are not 'severely injured,' and besides, you have nothing much to show after all. A few days or weeks after this your hands begin to have a queer numb sensation, or they tremble after the slightest exertion. One arm, or perhaps a leg, diminishes a very little, just sufficient to be observed by actual measurement. If your head never ached before it will ache now, and pretty frequently too. You cannot hunt or ride as you used to do. You shrink from attempting a very small fence, and exposure to wet or cold brings on agonising rheumatic or neuralgic pains on the spot where you sustained the series of blows. You fall into the hands of the doctors, and their counter-irritating remedies seem to you nearly as bad as the disease. They tell you that yours is an obscure case—that you may be better, quite well, in fact, in a couple of years, or that general paralysis may supervene, and you may, to speak frankly, become an idiot within about the same length of time. You look careworn and older, and you feel older. All your habits undergo a sensible change if only for a time. If formerly you were endowed with an almost demon-like activity, you are now reduced to accept idleness and rest as a boon. If you were good-looking, you lose a portion of your good looks; if you were ill-favoured, your ugliness becomes more pronounced; and, young though you may be, you will find before long a few grey hairs if you take the trouble to search for them. Morally, the effects are not less marked. You are demoralised as regards your nerves, and your horse is aware of the fact, and presumes accordingly. Your temper is less elastic and somewhat irritable. You feel either cowed and depressed or sublimely reckless when you enter a railway carriage; and whereas before you used second or third-class carriages, if your pockets inclined to economy, you now confess that cushions and a hot-water tin are essential to your comfort. As to claiming damages in a court of law for all these minute miseries, in your shaken mental and physical condition you naturally shrink from the multiplied surgical examinations which you would entail on yourself, and from the bullying to which you would be subjected by the opposition counsel. You may not have the sensation of perfect health and physical enjoyment and happiness that was yours before, but unless you have lost the sight of one eye, have forgotten your own name, have fits, and drag at least one leg after you, you need not expect to receive either compensation or compassion. And then you lose in pounds, shillings, and pence. Your life is not so good to insure; sometimes a sound office will reject it altogether. You call in the doctor more frequently. Being less able to bear privations in respect of warmth and luxury, your habits are of necessity more expensive. You

require more money, and you feel less capacity to earn it. You have, in truth, expended or been robbed of a good deal of vitality in a very short space of time. In general terms, it may be safely said that a person who has been really 'severely shaken' in a railway collision loses, on a favorable computation, at least three years out of his life."

It is very difficult to say, however, whether the nerve symptoms which come on are due to a myelitis or meningitis; and thus we class the two affections together. In the former we look for more direct results of impairment of the spinal function, and in the latter for symptoms which may lead on to irritation and implication of the spinal nerves. Thus severe pain in the back and around the body, increased on moving, and rigidity of muscles, we usually regard as indications of membranous inflammation; whereas more obvious paralytic symptoms we should put down to implication of the substance of the cord itself. The shock to the nervous system may give rise to numerous other symptoms, as disturbance of the special senses, and more especially of the eye, but this is due to some more direct connection between a portion of the spinal cord and the eye itself, as an actual optic neuritis is sometimes set up.

A blow on the back or sacrum may produce a concussion and a paraplegia, which may be completely recovered from, while a less injury may start into action an inflammatory process which may end fatally years afterwards.

Concussion we must regard as purely physical in its results, from shaking the cerebro-spinal centres. A *shock* may be both physical and moral in its consequences. Various emotional and hysterical symptoms may occur in a person who has received no important bodily injury. Consequently, the symptoms being both objective and subjective, it is very difficult to put a right value on each kind respectively.

Concussion of Spine

CASE.—A gentleman sustained a severe shock in a railway carriage, but it was doubtful whether he received a direct blow. He did not appear to have suffered at first, but subsequently he showed want of power simultaneously both in mind and body. He was unable to undergo any mental exertion, and was obliged to desist altogether from business. It being a question as to the amount of injury he had received, the railway company did not see its way to compensate him largely, and he therefore brought an action. Whilst this was pending his condition was very remarkable, owing to his extreme sensitiveness and hyperæsthesia. Shaking hands almost threw him into convulsions, and any noise in the house went, he said, right through his back. When my colleague, Mr Cock, went to visit him he patted him on his shoulder in a good-natured way, and made the patient give a sudden leap from the chair. He could not bear the slightest touch on the back without crying out. He remained in this

way some time, subsequently got a verdict and compensation amounting to some thousands of pounds, and then gradually and perfectly recovered.

Concussion of Brain and Spine

Case.—W. H. P—, æt. 32. On January 7th was thrown out of a chaise on to the road; he was picked up insensible and brought home. He suffered for a day or two with all the ordinary symptoms of concussion of the brain, and then it was found that the spinal cord must have been also involved in the concussion. He could scarcely move the legs, sensation was imperfect, and he had pricking and numbness in the skin. The urgent symptoms passed off, and at the end of a month he was able to sit up in his chair. He could then only just walk across the room, his legs tottering under him, and as regards his mind it was still in a very torpid state; he was unable to read, but sat in his chair all day looking out at the window; he was often delirious at night. The only thing he complained of was a sense of constriction around his body and head. It was very clear that he had received a most severe shock to his whole nervous system, and whether it would end in a general paralysis of mind and body it was impossible to say. He then went to Torquay, used salt-water baths and shampooing, and took tonics, mostly zinc, in increasing doses.

On his return at the end of two months he was comparatively well. He looked in good health, and walked pretty vigorously, although there was some hesitation in descending stairs. He also felt a constriction around his body, and could not occupy his mind as before the accident. After he had been at home some time and engaged in business he had a relapse, becoming more feeble in body and mind. This was in part attributable probably to an excess of stimulants which had been ordered him. He then went to Hastings, and again improved, and at the present time is quite well.

Case.—A young man I have seen to-day is an example of what we are constantly meeting with, and about which such different opinions are given in courts of law as to the question of recovery. A post-office clerk was violently thrown down whilst in his van, but not struck upon any part. Now, some months afterwards, he is quite unfit for his work; he is thinner, can only walk slowly, his legs totter under him, his hands shake, his vision is impaired, his virility lost, and he hesitates in his speech. He is in that nervous state that the sound of an engine always aggravates his troubles.

As a consequence of a fall or injury there may arise a concussion of the spine, from which recovery may result, or an inflammatory process may be set up, which may be fatal in a shorter or longer time. This may show itself as a myelitis or a meningitis, and be productive of various symptoms accordingly. In fact, any form of disease may possibly be started into action by an injury.

The following case is interesting from the suddenness of the symptoms, exemplifying, perhaps, the opinion held by some, of the ready laceration of fibres which have undergone softening. The small amount of mischief discovered in the cord would lead to the belief that if death had occurred earlier from paralysis of the chest no change whatever would have been appreciable in its structure.

The next case is an example of the result of an injury at a later period of time.

CASE.—Joseph P—, æt. 32. He was a railway porter, and whilst engaged in pushing a railway truck along the line, he suddenly came to an ash-pit, when, for fear of falling, he made a jump into it, and "cricked" his back. He seemed for a moment to be powerless, but soon resumed his work. On the following day he continued also his work as usual. On the third day, whilst walking along the Borough, he suddenly fell in the street, and was unable to rise, owing to the weakness of his legs; this increased during the next two days, when he was brought to the hospital. He was then completely paraplegic, had no power over his bladder, and bed-sores were already appearing. Subsequently the chest became affected, and he died in six weeks after the accident. The spinal cord appeared quite healthy to the naked eye. When examined by the microscope, some fatty granules were found in parts, but the change from the normal appeared very slight.

CASE.—Wm. A—, æt. 21. He fell on his back more than a year before his death, and then had symptoms referable to concussion of the spine. He gradually recovered, and resumed his work, when subsequently symptoms of paraplegia slowly came on. These gradually increased, so that for about four months before his death his legs were completely paralysed; then his arms became affected, and subsequently his eyesight. The intellect quite clear. After his death, when the cord was removed, it appeared at first healthy, as regards its general look and its firmness. A section, however, showed the presence of disease extending its whole length, and passing through the pons to the corpus striatum. There was no disintegration or softening, but a remarkable change had occurred from the presence of a translucent albuminous material within its substance. This was for the most part situated towards the surface of the cord, so that a section showed its circumference converted into a grey translucent material. The contrast between the original white medullary matter within and the adventitious substance around it was great. In some places the latter had penetrated more deeply, so as to involve the grey matter of the cord. The pons Varolii had on its surface two or three patches of the same material, and passing into the substance to the extent of about one eighth of an inch, and on the corpora striata and thalami optici, especially the former, there were some similar patches of translucent matter on the surface. These did not penetrate deeply, and were not observable in the interior. In this case death was due immediately to suppurative nephritis.

Mr Herbert Page has lately published a work on spinal injuries referring more especially to that class of case which has arisen in connection with railway accidents. As surgeon to one of the largest companies, his experience has been very great, and his conclusions therefore must be received with due respect. He throws considerable doubt upon the serious consequences which are said to arise from the so-called "spinal concussion," for in a long list of cases he fails to give well-authenticated instances to corroborate this popular piece of pathology. He says if we exclude all those cases which are soon fatal or show unequivocal injuries, the re-

mainder are those of persons who seek compensation from the railway companies in consequence of failure of health from the shock which they have received to their nervous system. The symptoms which torment these patients, Mr Page attributes to the physical effects of a violent shaking, to a moral shock, to the fright or to the continued attention given to their feelings during the time of litigation and in anticipation of the impending trial. He denies until more proof is forthcoming that these persons have received any such definite injury as a concussion of the spinal cord, and even if there had been any evidence of concussion, that it would have led to all those destructive changes in the organ which are usually attributed to it. In many cases he has not hesitated to bring the charges of malingering or actual deception.

It is impossible not to accept much that Mr Page so clearly sets forth; at the same time judging from my own experience I cannot at once renounce an opinion long held, that a violent shaking in a railway carriage at the time of a collision will produce a stunning effect on the cerebro-spinal centres, and that this concussion may be the starting point of subsequent morbid changes.

Some special results of Spinal Injury.—Besides these chronic effects arising from a general concussion of the spine, it is interesting to note some of the immediate results of injury. These necessarily vary with the part of the cord which is involved, and depend on whether or not the nerves which issue from it also participate in the injury. Thus, if the latter are affected there may be great pain in the parts to which they are distributed, or the muscles may waste, or there may be various disturbances in the vaso-motor system, shown by alterations in temperature. According to the part of the spinal cord injured so may the respiratory process be interfered with, or the heart's action impeded, and, as I have before mentioned, the general temperature of the body may be remarkably disturbed.

I have notes of some cases which I have seen, and of others which have been related to me, showing these remarkable deviations in temperature which tend to corroborate the opinion of physiologists as to the existence in the spinal cord of a heat-regulating centre. Thus, in the case of a man who fractured the upper part of the cervical spine and injured the phrenic nerve, the temperature reached 107°. In another similar case the breathing became very slow, the pulse very slow, and the temperature rose to 107°; after death it reached 109°. In another case of fractured sixth cervical vertebra the patient lived three days, and the temperature rose to 106°; and in another man, who lived ten days, it was 106°. The most remarkable case of high temperature on record is that described by Mr Teale, of a lady who injured her

spine, and who perfectly recovered. Her temperature at one time reached 122°. In a case of fracture of the lower cervical vertebræ, where the patient lived five weeks, the temperature rose during the first few weeks to 103°, but subsequently fell, and during the last three weeks was only 91°. Mr Hutchinson related the case of fracture in cervical region, where the patient lay like a corpse for five days from the depression of temperature. In other cases, too, the temperature has been lowered, but whether this is due to a different seat of the lesion is not explained. This supposed heat centre is in the so-called cilio-spinal region, a part which has some influence over the eye through the sympathetic, as was exemplified in a case of fracture through the seventh cervical vertebra where the pupils were minutely contracted.

One cannot but contrast these cases with those where an affection of the abdomen exists, either from injury or from disease, and where the coldness of the body is so remarkable.

One might allude to another symptom of spinal injury—priapism. This seems to be due to a paralysis of the vaso-motor nerves which regulate the supply of blood to the vascular tissue, and in this way turgescence takes place. It has no reference to sensation, for it occurs when the pudic nerve is destroyed. Emissions continue, and cases are recorded where, owing to injury, a complete anæsthesia of the genital organs has existed, and yet fruitful copulation has taken place.

Fractured Spine. Permanent Paraplegia

CASE.—Bearing upon this, I may refer you to a case which was long under the care of Mr Cock. It is now seven years ago, and when he was 16 years of age, that he received the injury. Some wood fell upon him, fracturing his spine in the lower dorsal region. He was completely paralysed below the seat of injury; he remained in the hospital many months, when repair took place in the bones, but none in the cord, so that he returned home completely paralysed in the legs. He is now 23 years of age; he lies in bed all day; and has grown since the injury; his legs not so well developed as his arms, but no especial wasting, as seen in progressive muscular atrophy. He has the legs flexed and everted, and he cannot feel below a line drawn around the body just below the ribs, although sensation reaches a little higher on one side than the other. All feeling is lost in the genital organs, and no sensation is experienced during micturition and defæcation. There is, however, a slight reflex movement passing up to the head when the bowels are moved. He often finds when he wakes that the penis is erect, and that he has had a seminal discharge, but no sensation has accompanied it. His chest has undergone a remarkable alteration in shape, having become quite flat, with a depression of the lower part of the sternum, and a bulging forward of the ribs on either side. He has often attacks of herpetic eruptions around the buttocks and backs of the thighs.

The following case is interesting as showing how localised

must have been the injury to have affected more especially one arm :

Case.—Wm. M—, æt. 28, admitted February 8th, 1882, with great pain at back of head and loss of power over right arm.

On December 9th, whilst returning home from work, he fell down on the road which was being repaired and struck his head violently on the kerbstone, feeling at the time that he cricked his neck. He was carrying a leather bag, and this being thrown forward as he put his arms out, came between his head and the kerb. His forehead was thus not bruised, but his head was thrown back. He had only cut his hands and knees, but felt much confused. He walked home and went to work next day and continued to do so for six weeks, although all this time he suffered great pain at the back of his head. Then finding also his sight becoming affected he applied to Croydon Hospital, and attended there three weeks. Getting no better he came to Guy's, and was put to bed. He lay straight on his back and did not move head or body, as movement caused him great pain. He had a worn look, eyes sunken, pupils unequal, right pupil larger than left. The right arm was weak, and on raising it from the bed great pain was produced. On moving his head a grating could be heard, and this he felt himself, also great tenderness when the neck was pressed. There seemed to be impaired sensation at lower part of legs which were also feeble. Bladder natural. In a few days after admission he was troubled with sickness and had some difficulty of swallowing; the right arm was almost completely powerless, with a marked wasting going on of all the muscles. At beginning of March, after having lain in a perfectly quiet position, the arm began to improve, and he was able to move it.

On March 22nd much better. Could move arm better; it was apparently growing bigger. Less pain in neck; he could swallow without difficulty.

April 17th.—Been gradually improving, and got up for first time. A leather support ordered for the head.

On 29th he went out, being pretty well, having gained the use of his arm again.

On May 8th he returned to the hospital, the pain in the neck having returned and the arm become weaker. He was again put to bed, but being unwilling to remain he was allowed at the end of a week to get up provided he had the support on his neck, and on the 26th he again left. He remained at home for two months, but at the end of that time not being well was again admitted. He complained of seeing double; the right pupil was larger than left. Less power in right than left hand, and muscles softer; he seemed to drag his right leg slightly. Pain at back of neck. He again left better at the end of a month. He was told that he had seriously injured his spine, and that he ought to keep perfectly quiet for several months. This advice he would not heed, but left his bed and the hospital as soon as he felt better.

A case was lately reported by Dr Muller of a woman who was stabbed in the back opposite the fourth dorsal vertebra, whereby the left half of the cord was severed, and also the right posterior roots of the nerves. The surgeon who was called in found her paralysed in the left leg, and with great pain in it, every touch being acutely felt. On the right side there was free movement, but no

feeling. The upper extremities were unaffected. The left pupil was smaller than the right. An interrupted current was felt painfully in the left leg, but there was no contraction. The right leg contracted, but there was no feeling in it.

While I am speaking of the effects of shock, I may observe that these are by no means always due to concussion of the brain or spinal cord, seeing that the sympathetic system must take its share in producing some of the phenomena. These are best seen when we are certain that neither the head nor the back has received any injury. For example, a little girl, æt. 9, fell down some steps flat on her belly; she got up and was put to bed; she was very faint and pale. She did not rally, and after some hours she was thought to be dying. On the following day she was very white, restless, with dilated pupils, and pulse 140. There was no tenderness, fulness of abdomen, or other evidence of any ruptured viscera. She slightly rallied during the next two days, when the ankles were observed to be somewhat swollen, and her urine was found to be scanty, slightly bloody, and albuminous; this passed off in another three days. It was then ascertained that she had passed no urine for several hours after her fall. Nine days afterwards she was still very ill, pulse 140, skin and conjunctiva slightly yellow. Recovery in a fortnight. It seemed as if the shock to the nervous system had produced collapse and disturbed the functions of all the organs of the body.

PARALYSIS COMBINED WITH ATROPHY

It has now been clearly ascertained that the nutrition of the muscle depends upon the nerve which supplies it, and that the integrity of the nerve is only preserved by its connection with the grey matter of the anterior cornu whence it springs. Hence it follows that any disease of the latter will produce a paralysis and atrophy of the muscle. In those cases, therefore, where the muscles have been long wasted it is usual to find the nerve which supplies them also wasted; and not this alone, but also atrophy of the anterior part of the spinal cord in connection with the anterior cornu of grey matter. In cases where this wasting had progressed slowly it would not be directly obvious that the first morbid impulse had taken place in the spinal cord, and, consequently, opinions still differ as to the true origin and nature of these conditions; but when, on the contrary, the paralysis is sudden, and this paralysis is followed by wasting, it is evident that the disease has commenced in the nerve centres, and in the particular spot in the cord before indicated.

For instance, in the so-called infantile paralysis the attack is sudden, and soon followed by a rapid wasting of the muscles; we

know, now, from pathological observations that the cause is in the anterior cornu of the spinal cord. In the adult, too, if we have a sudden paralysis followed by wasting, we place the disease in the same spot. In the bulbar paralysis, if the attack be sudden and if wasting, which is a usual concomitant of the disease, result in course of time, we again place the starting-point of the disease in the anterior cornu.

But in these cases, as I have said, where the disease commences slowly, as in the progressive muscular atrophy or in lead paralysis, it is still a question whether the origin is in the cord, the nerve, or the muscle; whether, in other words, it be a neuropathy or a myopathy.

I shall first describe consecutively all those cases of paralysis which are combined with atrophy, and then, for convenience, any other forms of disease which are allied to them.

Progressive Muscular Atrophy.—This disease had formerly been observed by Sir C. Bell and others, but it is only a few years ago that Cruveilhier more particularly drew attention to it, and gave it a name. According to his belief it is due to a degeneration of the muscular tissue. He stated that the nerves of the limbs might sometimes be found wasted, as well as the anterior roots proceeding from the spinal cord, but that the cord was not itself primarily affected; for, if this was found shrunken (as some had described) on its front aspect, the condition, together with the atrophy of the nerves, was altogether secondary.

Cruveilhier and his followers believed that the real seat of the disease was in the muscles, but later observers have thought that they have proved after more accurate investigations the existence of a real and tangible lesion in the medulla itself—an opinion always held by Virchow and Gull, and more recently by Clarke and Charcot. The latest writer, however, on this disease, Friedreich, supports the original view, and brings forward cases where the muscles had undergone atrophy, and where a most careful investigation failed to discover any change in the spinal cord. There seems to be no theoretical objection against either statement—that the disease might in one case be primarily muscular, and in another be in the nerve centres, or even, thirdly, that it might commence in the nerves themselves. For one of the best ascertained facts in nerve pathology is that impairment of the motor nerve or its root in the cord is associated with muscular atrophy. There seems no reason, with this fact before us, to introduce another cause in the action of the vaso-motor nerve, since the one view rests on a clinical and pathological basis, and the other is purely theoretical. I may here remind you of such a case as that of the biceps femoris,

which would waste if the sciatic were injured, although its vasomotor system in connection with the femoral artery remains unimpaired.

Clinically, the disease is a clear one; the muscles waste, and a form of paralysis is produced of a very striking kind. It generally commences in the upper extremities, and is often confined to them, originating in one arm or a part of the arm. Thus very frequently our patients walk into the hospital and appear to have little amiss with them until you observe their drooping shoulders, and their arms hanging at the sides as though not belonging to them. On stripping the patient you see his remarkable condition —not a mere thinness or ordinary wasting from the absorption of fat, but a degeneration of the muscle itself; you see the acromion projecting, and the deltoid flat, the trapezius wasted, and the head falling forward; from this wasting of the trapezius and rhomboids the scapula is tilted up, and the inferior border raised so as to form a hollow, into which the hand can be placed. The biceps in the same manner is wasted, as well as the muscles of the forearm and hand; it is in the latter generally that you at once recognise the disease. The muscles of the thenar and hypothenar eminences have disappeared, and, owing to the shrinking of the interossei, there are deep furrows between the metacarpal bones. The hand is hollow, and the patient cannot separate his fingers. As a consequence, the fingers become drawn back until the hand puts on the appearance of the talons of a bird of prey, whence the French have given it the name of *main en griffe*, or claw-like. The forearm in like manner has lost its roundness and has become flattened. The whole appearance of the patient is most striking; he stands with his head bent forwards, or even in bad cases with his chin resting on his breast and his arms hanging down in front of him as if they were merely attached to him by strings or ligaments. His chest does not expand freely, and his abdomen is loose and protruding. If his legs have become affected, they have lost their roundness, and the muscles of the face may lastly have become involved, so that the patient presents an idiotic expression, and dribbles from the mouth. Finally, the chest may become more affected, then the laryngeal muscles; the vital process of respiration is attacked, the voice is lost, mucus collects in the tubes, expectoration fails, and death ends the scene. Some writers have said that the skin over the affected muscles sometimes undergoes a thickening.

You will see that the muscles connected with the limbs are primarily affected, then those of the trunk, and the muscles of the special senses rarely. The disease usually commences with wasting of the small muscles of the hand, then of the forearm, and so

progresses upwards; but this is not invariably the case, for in instances I shall presently mention the muscles of the forearm remained plump and firm, whilst those of the upper arm were wasted; and I have seen more than one case where the disease especially alighted on the muscles of the shoulder. Duchenne, moreover, has spoken of the special liability of the trapezius and rhomboids.

It is remarkable that just as in the locomotor ataxy the disease is more especially confined to the lower end of the cord, and as a consequence the legs may be solely affected, so in the progressive muscular atrophy it is the arms which are primarily and principally paralysed. Duchenne, however, states that in quite young children the disease begins with the affection of some of the muscles of expression, and that it is sometimes only after some years that the muscles of the limbs and trunk are atrophied.

In the early cases you will have carefully to test what muscles are affected, and to what degree, and you will find that the paralysis does not follow the distribution of any particular nerve. As you are treating your patient, you test the increase of power by making him raise his arm, then place it before him, seeing how far he can stretch it behind him, and then test the extension, flexion, and pronation of the forearm, &c. You may sometimes remark, as Cruveilhier pointed out, a remarkable tremor or quivering of the muscles, especially the trapezius when you attentively watch it; or you may bring the movement out by gently tapping the surface. This last characteristic, however, may be met in numerous forms of disease where the muscle is wasted.

The sensibility of surface is not much affected, but sometimes it is slightly impaired.

It must be remembered that in this disease the paralysis or enfeeblement of the muscles seems to follow on and keep pace with the wasting. The *electrical* examination of the muscles appears to be in harmony with this. Their faradic contractility is impaired according to the degree of wasting, disappearing only with the extinction of voluntary power, and it is only in the final stages that the so-called "reaction of degeneration" is manifest under the influence of the continuous current.

The following case I shall have to refer to again, as it was not a simple case of the disease, but was combined with bulbar paralysis; a combination often seen, as the two affections are not pathologically distinct, different parts only of the cord being involved in each.

Case.—A man, æt. 46, has just died under my care from progressive muscular atrophy. He had all the symptoms which I have described in an excessive

degree. He sat in his chair scarcely able to move from extreme muscular weakness; and not only did this apply to the limbs, but also to the more important parts of the body. Thus he could only partially expand his chest, and had great difficulty in expectorating mucus from the bronchial tubes; he also had those parts affected which are involved in the labio-glosso-laryngeal paralysis. He could scarcely articulate in an intelligible manner; he had much trouble in swallowing his food, which collected in his cheeks and mouth; he could scarcely move his tongue, and hardly had any power to cough. I need not further particularise the symptoms described in cases of glosso-labio-laryngeal paralysis, but may say in a word that he had these in addition to the general muscular atrophy affecting the body. The case was therefore one of great interest; for the former class of symptoms, when standing alone, have been clearly proved to be due to disease of the medulla, and thus there existed an additional reason for supposing that the whole of the morbid phenomena might be owing to the same cause. All the severer symptoms increased, until a complete paralysis of the chest came on, when he quickly died.

The *post-mortem* examination did not reveal any evident change recognisable at first glance, but on more careful examination by removal of the arachnoid from the base of brain, medulla oblongata, and spinal cord, very marked alterations were seen to have occurred. Thus the hypoglossal nerve was very much wasted, being not more than a third of its natural size, and changed into a fine thread; in like manner the inner roots of the spinal accessory were much smaller than usual, and the same was true of all the anterior roots of the spinal nerves. This was more especially the case in the cervical region. This atrophy was not a questionable appearance, but one extremely well marked and evident to all the students. When sections of the cord itself were made it was found that this was not healthy; the anterior columns were smaller than natural; they were not however, softened, but, on the contrary, were firm, whilst the grey matter was sunken beneath them. The latter did not present a healthy appearance; its colour was not uniform; in some parts it was yellowish, in others there were deep red spots, with congested blood-vessels. At the lower part of the cervical region the grey matter was much larger than natural, and its colour more dark than seen in section below. The whole of the interior of the fourth ventricle presented an unusual appearance, and was evidently unhealthy, the surface having a reddish-brown aspect, differing very much from the ordinary surface.

Case.—The following is one of the most remarkable examples of recovery from a malady, apparently incurable, that I have ever witnessed, and one of the worst cases of progressive muscular atrophy that have ever been cured, for it is simply impossible that the disease could have existed in any more severe degree than was here present.

A girl, æt. 24, was sent to the hospital on July 4th, 1866, by my friend Dr Buzzard. She lived in the country, and owing to a number of circumstances connected with family affairs she began to fail in health about eighteen months before her admission. A weakness and wasting began in her arms, and then in other parts of the body, until in six months' time she was obliged to take to her bed. During the year she kept her bed she passed her motions involuntarily, and was in a perfectly helpless condition; menstruation had altogether ceased. On admission she was seen to be in the most pitiable condition that you can well imagine; she was so emaciated that she was little better than a skeleton. She lay on her back scarcely able to move or raise her arms from her side. Her

fingers were contracted into the claw-like shape. The interossei seemed to have quite disappeared, so that the tips of one's fingers could be felt between the metacarpal bones. The radius and ulna showed their complete outline throughout. In the same manner the legs were wasted, and the abdomen was so flat that the spine could be clearly felt. In fact, all the muscles were so atrophied that I believed that they must have disappeared, a little fibrous tissue remaining in their place. She had a slight blue line on the gums, which suggested poisoning by lead. and therefore Dr Buzzard took the trouble to visit her home, in order to see if she could have been poisoned unwittingly by this metal, but he failed altogether in proving it. She was, however, ordered some iodide of potassium and faradisation to the arms and legs. The galvanism produced no effect on the extensor muscles, and only a slight one on the flexors. It was, however, rigidly followed up by Mr Branford Edwards and my other clerks, and to these gentlemen she owes her restoration to health. In two months' time it was very evident that she was better; she could move her limbs, and the muscles had grown visibly. In another month she could use a fork, and was able to write a little. In November she was able to get up and walk across the ward by means of a chair, and the catamenia had returned. She continued the faradisation, and the cure progressed more quickly until January, when she left the hospital convalescent. It was three or four months after this that she called on me to show herself. I did not recognise her at first, as she was a ruddy, plump girl, and said she was in good health.

A similar case in many respects to this has been published by Dr Sturges, when the patient, however, a young man, recovered without electricity.

The following case was long under notice, and presented certain peculiarities:

Case.—Thomas B—, æt. 24, was under my care in the hospital on several occasions. The disease has been progressing in the slowest possible manner, beginning when he was about seven years of age, so that he has been quite unable to follow any employment, but is obliged to live with his parents. The wasting commenced, according to his account, about the shoulder, and afterwards extended to the upper arm. About three years afterwards he found his legs becoming weak and wasted, which obliged him to walk on the outer side of the foot. He has sought relief at various hospitals, but without much benefit.

On admission it was seen that the progressive muscular atrophy had affected the greater part of the body, so that he could only walk with the greatest difficulty, and could scarcely raise himself from the bed. Wben he walked he trod on the outer side of the foot, the under part turning inwards. When he stood his head projected forward, as well as the abdomen, the spine taking a corresponding curve, the arms meanwhile dropping at the side. When more carefully examined it was found that some of the muscles of the face were affected; he had a blank, expressionless face, although he was really intelligent; the muscles supplied by the facial being involved, as the orbicularis palpebrarum, prevented him closing his eyes tightly, and the buccinator was also somewhat wasted; the masseters were good, and he breathed and swallowed without difficulty. No strabismus, but he said it existed once. Protruded the tongue straight. The sternal portion of the sterno-mastoid appeared to have almost gone; on moving the head the omo-hyoid was visible.

As regards the upper extremities, the deltoid, biceps, coraco-brachialis, and

brachialis anticus, were found much wasted, and also the trapezius; the scapula could be rotated, in such a manner that its base became horizontal, and the inferior angle pointed inwards. He was quite unable to raise his arm at a right angle with the body. The pectorals were much wasted, the left side of chest was much flatter than the right, and the eighth and ninth ribs projected forward. The muscles of the arm were so wasted that the arm could be easily spanned with the finger and thumb, and this smallness of arm contrasted strangely with the size of the forearm, which appeared quite unaffected, at least as regards its size, the muscles feeling large and firm; the hands also were but little affected, which was unusual, the fingers being perfectly straight. The muscles of the thigh were wasted, as also were the peronei and those of the calf. All the functions of the body were properly performed, and the temperature was ordinarily normal. He was galvanised for a very lengthened period along the course of the spine. There was no evident result from it, but the patient always maintained that it did him good, and was anxious for its use. On three different occasions, at some weeks' intervals, he was seized with severe febrile attacks, which confined him to his bed for several days. He was unable to rise, had pain in the back and loins, and felt excessively low. These attacks were probably due to some nervous disturbance in the cord, as I have seen similar ones in the course of locomotor ataxy and the infantile paralysis of children.

I have notes of several other cases of progressive muscular atrophy each presenting its own peculiarities, but most of them began, without apparent cause, in the arms. Take for example that of a man, where the wasting commenced in the right arm, subsequently involving the left arm, and then the leg. Also in a man, lately in the hospital, the atrophy commenced in one arm, and after several months affected the other. In his case the shoulder-blades stood out like the wings of a bird, the outer edge horizontal, and the external and inferior angle on the same level. This was due mainly to extreme atrophy of the rhomboids.

Pathology.—I have already told you that opinions differ at the present time as to the true pathology of this disease, although there is nearly perfect agreement as to the facts. The muscles are found to have undergone an atrophy, the various elements have withered, and granules have taken the place of the markings. Some of these granules are composed of fat, but the change is not due primarily to a fatty degeneration; it is rather a granular alteration, and with this is associated sometimes an excess of fibrous tissue. Cruveilhier, who first accurately described the disease, believed that its origin lay in the muscle, although he had observed a wasting of the motor nerves as they entered the spinal cord, together with a slight atrophy of the cord itself. He found this diminution of the nerves especially in the cervical region, where they were changed into lustreless strings, containing only a few nerve tubules, whilst the posterior nerve was healthy. He believed, therefore, that in a mixed nerve any wasting within it was due to the change in the

motor portion, and he was confirmed in this belief also by observing the great atrophy in one or two cases of the lingual nerve, this being reduced to a third of its natural size. The additional fact discovered since Cruveilhier's time is that not only is the muscle atrophied, together with the motor nerve which supplies it, but also the anterior cornu of the grey matter to which the nerve is attached.

The more recent investigations are tending to show that the spinal cord may be primarily at fault. Virchow maintained this as well as my colleague, Sir W. Gull, who had published a case where marked disease was found in the cervical region of the cord, the central canal being widely dilated in this region. Cases also have been published where it has originated from injury or disease of the spine, and I myself have seen cases where the disease broke out simultaneously in all parts of the body, together with other spinal symptoms, so that there could be no doubt as to its central origin. Friedreich is the author who has recently written on this disease, and maintains the muscular or myopathic view of its origin; he combats the central view mainly on the fact that particular muscles or portions of them may be affected by the atrophic changes, whilst the rest of the body remains whole; but the objection is valueless if it is believed that every nerve fibre has its origin in certain cells of the cord, for then it might easily be conceived that a morbid change in the medulla affecting a few cells might influence a correspondingly small number of fibres of a muscle. His objection, too, that other spinal symptoms are wanting is met by the answer that the only portions of the cord which are affected are those which involve the nutrition of the muscles. Or if it be said that overwork of a muscle may cause its fatigue and subsequent atrophy, the same suggestion might apply to the grey centre which rules over that muscle.

There is still therefore much dispute about the central origin of this affection. Both Charcot and Vulpian describe cases where they have found changes in the anterior horns; and, on the other hand, Bernhardt has lately recorded a case where the most careful examination of the cord failed to find any change whatever. Dr Ferrier is opposed to Friedreich's theory of its being a myositis, on the ground that it will not account for the phenomena. He maintains that the progress of the disease, beginning in the muscles of the hand and then spreading to the flexors and pronators until the "main en griffe" is produced, is quite in accord with what would happen if the eighth cervical and first dorsal nerves were affected. The triceps would be the last muscle affected, because its centre would be represented in the upper branches of the plexus. The dis-

ease advances as would the progress of degeneration in the cord, from below upwards, or *vice versâ*.

Dr Allen Sturge takes up the same line and says that as the muscles are affected in groups and not according to supply of nerve-trunks, it shows a primary cause in the cord. The centres here represent certain physiological movements; *e.g.* the biceps, brachialis anticus, and supinator are affected together, because the flexors are ruled over by the same centre in the cord.

In acute disease of the anterior cornua, a large mass of the muscles is affected; in chronic disease individual cells are picked out, and the affection of muscles comes on by slow degrees.

An argument against the primary central origin of progressive muscular atrophy is that it sometimes occurs after injury to a limb. Several such cases have been recorded. An example was in the hospital under Dr Pavy. It was that of a man, æt. 37, who, after injuring his right arm, found it became feeble, and in the course of some years it wasted away. Then the left arm began to waste in like manner, so that he finally presented the usual appearance of a man with progressive muscular atrophy. The arms atrophied and became so weak that he could not raise his hand to his mouth without support to the elbow; the scapulæ protruded till the lower part tilted out from the back. The deltoid, trapezius, and pectorals seemed almost gone. Of course in such a case as this it may be said that the progress of the disease from one side to the other was of necessity through the spinal cord. Nevertheless, the commencement of the disease appeared to be local.

A case tending to corroborate the spinal origin of progressive muscular atrophy was described by Dr Fox, of Bristol. His patient had a growth on the dura mater, opposite the eighth and ninth dorsal vertebræ, which pressed on the anterior part of the cord. After a certain amount of numbness and tingling in the feet, an atrophy of certain muscles began, but these did not correspond with any special nerve supply; first of all the tibialis anticus and peroneus tertius of both legs were affected, then other muscles synchronously, until the whole leg was involved. It will be observed that in the first instance the muscles involved were those supplied by the anterior tibial, but then the other muscles, those of the toes, were quite unaffected. This is inexplicable if the anterior tibial were affected or a trunk of the sacral plexus.

It seems to be now generally accepted that both in idiopathic atrophic paralysis and in lead paralysis the disease attacks muscles in groups. My own observations corroborate the statement that, in those cases where the disease does not commence in the hand but in the arm, the biceps, brachialis, and supinator

are affected together, and that the inability to flex the arm is one of the most marked symptoms. If the disease have its origin in the upper part of the cervical enlargement it would be associated with an affection of the median and musculo-spiral nerves; if in the lower part with the ulnar; the fifth and sixth cervical supplying the muscles of shoulder and flexors of arm, the seventh cervical the extensors, and the eighth cervical and first dorsal the flexors of fingers and muscles of hand.

The opinion, however, of Friedreich is that the disease is primarily and essentially one of the muscles, a myopathy and not a neuropathy, the first change being in the perimysium, occurring as a hyperplastic growth in the interstitial cellular tissue, between the primitive bundles; to this follows a swelling, increase of the muscular nuclei, and a disappearance of the markings, ending in a waxy or fatty degeneration. The result is a fibrous degeneration or cirrhosis of the muscle. Any lipomatous state is merely accessory. Friedreich believes the nerve changes are secondary, beginning first in the intra-muscular nerve, and then continuing upwards as an ascending degenerative neuritis, or leading perhaps to a chronic myelitis of the cord.

Besides the two theories of a central cause and a primarily local one, it is possible, as Jaccoud has intimated, that it sometimes might begin in the nerve itself. We know that injury to a nerve will cause wasting of the muscle to which it is distributed, as, for example, an injury to the circumflex a wasting of the deltoid, or injury to the hypoglossal a wasting of the tongue; and therefore it is quite possible that some general affection of the nerves themselves might occasionally be the cause of the malady. Jaccoud gives full details of a case where, from the peculiar distribution of the wasted muscles, the neurotic symptoms, and absence of anything denoting a central spinal disease, he was fully convinced that the origin of the malady lay in a pretty general neuritis. Then, again, the disease might begin in the nerves and ascend to the cord. I myself had a case where a man injured his arm, and the limb subsequently became useless and wasted; subsequently the other arm became involved, and then the legs. Such a case would almost suggest an ascending neuritis along the arm to the cord. I have also a case in my note-book where a man who had been standing in the water for several hours suffered from numbness, anæsthesia, and general weakness. He afterwards had the same symptoms in the arms. The limbs then gradually grew weaker, and the muscles began to waste. At the end of four years he died, when the muscles were found to be degenerated, the nerve fibres wasted, and the neurilemma thickened. The roots of the nerves at the junction of

the spine were small, and the cord itself, as seen by the naked eye, did not look healthy. At that time the microscopic method of investigation was not known. The case was regarded at the time as one of primary peripheral paralysis.

A case has been recorded by Müller, showing the intimate association between the cord, the nerve, and the muscle, where a patient had had a club foot and withered leg from infancy. The muscles of the limb had undergone fatty degeneration as well as the nerves supplying them and the anterior roots of these nerves as they entered the cord; and there was degeneration of the anterior cornu of the corresponding portion of the grey matter. Vulpian has noticed in cases of amputation of a limb in young subjects that the part of the spinal cord furnishing nerves to the limb undergoes atrophy, especially in the posterior cornu and columns. My late colleague, Dr Thompson Dickson, had an opportunity of comparing the cords of a case of progressive muscular atrophy, and a case of old amputation, and although in both he found changes in the tissue, they were of different kinds. In the latter there was merely an atrophy, whilst in the former he considered that new products were apparent.

Since attention has been more especially paid to the motor region of the cortex of the brain, cases have been observed of congenital atrophy of limb, associated with smallness of some convolutions in this region. This shows some intimate relations between the limbs and the surface of the brain.

Quite recently, a very perfect case of the pathology of progressive muscular atrophy has been recorded in the French journals by Dr Frosier, where a young man died with universal atrophy of the muscles, which began in one limb, and then progressed in the usual manner until the chest was involved. He found on examination of the spinal cord an entire absence of the large branched cells in the anterior cornu, a few atrophied ones alone remaining, or some granule-cells replacing them. The disease was almost limited to the cervical region. The anterior spinal roots were atrophied, but not the posterior, and the spinal accessory and lingual were included in the atrophy. Some slight thickening and pigmentation of the pia mater were also present. The author believed the change to be a primary one in the grey matter, the nerves being secondarily affected, and subsequently the muscles. In the analogous disease, the infantile paralysis, a febrile condition precedes the visible paralysis, as if some acute mischief was in progress, and occasionally progressive muscular atrophy has a very acute history. Thus, in six weeks, a woman I saw with Dr Taylor, of Kennington, was rendered perfectly helpless. She sat in a chair, with her head

thrown forward, scarcely able to move her arms, legs straddling, pains in all her limbs, and the muscles wasted. The only conjectural cause was spirit drinking.

I should say that, having regard to all these cases, the conclusion seems to be warranted that the spinal cord may be regarded as the seat of the disease in most instances, although there seems no theoretical or clinical objection to the opinion that the disease may sometimes have its origin in the periphery. There can be no doubt that the muscles may waste under these three different conditions: primary morbid change in the grey matter of the cord, lesions of the trunks of the nerves, primary change in the muscles themselves.

In a purely local case there is somewhat more difficulty in believing the cause to be in the cord than in the limb itself, as in the following example:

Case.—Adelaide H. M—, governess, was admitted into Clinical ward on account of her hands having been quite useless for six years. The fingers were contracted, the joints stiff, and the muscles wasted. The muscles of the forearm also were very small and flabby, whilst those of the upper arm were natural. The thumbs flexed on hand, fingers rigid, and little finger firmly contracted. When endeavouring to hold a pen she soon lost control over it, from the pain and cramping in the muscles. Ordinary sensation was perfect. In every other respect the girl was healthy. No improvement after several weeks trial of galvanism.

I am seeing a gentleman who, three years ago, began to have wasting of the muscles of the thumb, and slightly of others supplied by the ulnar nerve. He used galvanism, and they have slightly grown. The disease appears to be quite local.

Another gentleman, æt. 34, had for six months numbness and a strange feeling in his little finger, then weakness of the arm, and now has wasting of the muscles of the whole arm, especially those of the hand; whilst the biceps, triceps, and deltoid are flabby.

Very little can be said on the clinical aspect of the origin of this disease. Over-use of some muscles would seem to start it in some instances, as has already been said; but what sets light to the mischief in the cord in the cases we believe to be central remains in doubt. Duchenne remarks that all the examples of the malady which he has seen in children have been hereditary. Dr Osler, of Montreal, has recorded the instance of thirteen individuals being affected in two generations of one family, and Professor Naunyn a similar one of fourteen individuals in three generations.

With regard to *treatment*, no special remedy seems to be of any use. Nervine tonics seem to be indicated; and galvanism and

faradism to the limbs have been found useful, as well as the continuous current to the spine.

Glosso-labio-laryngeal Paralysis or Bulbar Paralysis.—In the progressive muscular atrophy of which we have been speaking, there is disease of the motor nuclei of the cord, causing the arms to be chiefly affected; if we suppose the same form of disease to occur higher up, we should have paralysis of the cranial nerves. Now this does occur in the medulla oblongata, involving the special centres of speech and deglutition. It was first described by Trousseau under the name of "labio-glosso-laryngeal paralysis," and subsequently became known as "bulbar paralysis." It may not be difficult to declare that this part of the cord may suffer disease or degeneration like any other structure, but the explanation is not forthcoming why the morbid process should so accurately involve one important centre, why it should occur in the young, why sometimes come on suddenly, and why, moreover, it should be in part recovered from. Its true pathology and causes have yet to be learned, but in fatal cases there is found disease or degeneration of the motor centres in the fourth ventricle, whence important nerves arise whose paralysis characterises the disease. It is a paralysis, as the name implies, affecting the lips, mouth, tongue, and larynx; and therefore, as might be supposed, the functions of eating, swallowing, and talking are much interfered with; the nerves known as the seventh, eighth, and ninth being in part paralysed. Whether the affection has come on suddenly, or whether it has been developed slowly, the phenomena are the same. These are so striking, that the nature of the case is soon evident. The face has lost its expression from a partial paralysis of the facial nerves, and should the sufferer attempt to speak, it is in vain, for beyond making a few unintelligible noises, his power of utterance is gone. The reason for this will be found in a weakened condition, not only of the muscles of the face and of the tongue, but of the larynx itself. The lips can be adjusted only for the formation of certain letters, as Trousseau has fully explained; the tongue can be but slightly moved, and cannot be thrust out of the mouth; and when the patient is asked to cough, he produces only the faintest sound in his larynx, not being able to close the organ. At the same time he eats with effort; he cannot collect the food in his mouth; he is obliged to assist with his fingers to extract it from his cheeks, and place it at the back of the tongue, when it is swallowed with difficulty. For the same reason the saliva cannot be retained, but is constantly pouring from the mouth; the muscles of the soft palate sometimes hang down flabbily, so that the posterior nares cannot be closed, and both the velum and the larynx may have lost

some of their sensibility. There may be a question about this, as there is no loss of sensibility of the cutaneous surface. The appearance of such a patient is generally very striking and characteristic; he is seen holding a pocket-handkerchief to the mouth, which falls open while the upper lip hangs down; the expression is vacant, or varied only by the few grotesque movements of the face made in the endeavour to force out a word; and a slate or paper lies before him, on which he writes down all his wants. The speech, it may be remarked, is not merely thick, as in simple facial paralysis, nor is there that meaningless gabble which is heard in the aphasic patient; it is either utterly lost, or only a syllable in a nasal twang[1] can be produced at a time after violent attempts to set the muscles in motion; there is, in fact, a paralysis of all the parts employed in talking.

It may be remarked that though the capability of speech is entirely destroyed, from a paralysis of the nerves which supply the muscles, yet the trunk of the nerve need not be wholly paralysed, nor have other parts supplied by it lost the whole of their functions. Thus the face may be fallen and the mouth paralysed, so that the patient may not be able to move the mouth well, as in blowing or whistling, but he has power to close the eyes, showing that the orbicularis palpebrarum is not affected. In the same way, although the larynx is paralysed for talking, it is unimpaired for breathing. This would show, Trousseau observes, that for its two separate functions, vocalisation and respiration, it must have two nerves, supplied from different sources. Now, the recurrent is almost the sole motor trunk to the muscles of the larynx, and, consequently, if it is injured or pressed upon, the organ is wholly paralysed and the patient is suffocated. It would follow, then, that this nerve is a compound one, and sends a twofold stimulation to the muscles by filaments having their sources in the centres of respiration and vocalisation. Marshall says: "When the roots of the spinal accessory are cut, the operation does not impair any of the respiratory movements, but swallowing is interfered with and the voice ceases, the animal emitting only a bubbling noise. Extirpation of one accessory nerve causes hoarseness. Thus it appears that the spinal accessory governs the momentary and voluntary opening or closure of the glottis and tension of the vocal cords necessary for the production of the voice, or for the exercise of general muscular effort, whilst the respiratory movements of the glottis are under the control of the pneumogastrics." It has long been considered that there is a region in the medulla which may be called the respiratory tract, a region to which

[1] It is curious that when any one has a cold we should say "he talks through his nose," when we mean exactly the reverse.

branches of all the nerves engaged in the respiratory process may owe their origin; in like manner it would appear that as a large number of parts are engaged in the act of talking, so the nerves supplying them must be stimulated from a common centre; and herein lies the explanation how so complex a function should suddenly cease from lesion of one small spot. Now the proof of this lies in the dissections of Mr Lockhart Clarke, which demonstrate the connection between the facial, vagus, hypoglossal, and laryngeal nerves. The last are, in fact, branches of the spinal accessory which, joining the pneumogastric, are given off as the recurrent laryngeal motor nerves. The spinal accessory has two origins: the lower from rootlets arising from the antero-lateral substance of the spinal cord and lower part of the medulla, and collected into the external branch to supply the sterno-mastoid and trapezius muscles; the upper from a special nucleus behind the central canal, which, going to form the internal branch, proceeds to the vagus, and is subsequently distributed to the larynx, pharynx, and palate. If, then, the centre whence this proceeds be injured, the larynx loses that power which this nerve had previously supplied; that is, there is a loss of vocalisation, whilst the respiratory power remains. Mr Lockhart Clarke has shown that there is a close anatomical connection between the nuclei of the hypoglossal, vagus, spinal accessory, facial, and trigeminal nerves. There is a column of cells forming the nuclei of these nerves, which supply all the parts used in speaking, found on the floor of the fourth ventricle; and it is these cells which have undergone a change. They are continuous with the grey matter of the anterior columns. The sensory nuclei lying on their outer side escape.

It appears remarkable that a small area in the medulla oblongata, coinciding with a physiological centre like that of articulation, should be picked out to undergo a rapid or slow morbid change. So remarkable is the fact that it might be worthy, in the first place, of inquiry whether or not experience justifies us in declaring that definite parts of the cerebro-spinal centres having special functions are more prone to disease than other portions of the brain and spinal cord taken indifferently; whether, indeed, all parts are not equally liable to inflammation and degeneration, but it is only when certain physiological portions are affected that we are enabled to apply definite names, because then the seat of disease has made itself manifest by the implication of nerves whose function is known, whilst in other cases we are content to use such expressions as cerebral or spinal disease. Although I believe this to be to a certain extent true, yet I consider it is proved that those parts of the cerebro-spinal system which have definite physiological properties are

more liable to disease than other spots taken indiscriminately. If so, it may show, as is most probably the case, either that the vascular supply of such physiological centres is accurately defined and circumscribed, or that a centre having a definite function, being the focus of a number of nerve-filaments proceeding from it for a special purpose, must soon be involved if any of these filaments proceeding to it be primarily attacked, seeing that morbid processes choose given anatomical tracks. If, then, degenerative processes occur in connection with a morbid state of blood-vessels, and if the anatomical supply bears a relation to defined physiological areas, the explanation of such parts being selected for chronic disease is not so difficult; and if, again, morbid processes proceed rapidly along nerve filaments, we can understand also how parts having intimate relations are concurrently affected.

It is worthy of note that in the disease especially under consideration the symptoms appeared suddenly in some of the cases, and that in others they were of slower progress. In the former it is possible that an effusion of blood might have taken place in this specialised seat of the medulla, but in the latter a slow morbid change constituting the true progressive form of the disease. It is not remarkable that in some cases the motor tracts should be also involved, and therefore that, combined with the symptoms above mentioned, there should exist various degrees of paraplegia or paralysis of the limbs; and, if the motor cells be involved, an atrophy also of the muscles.

I have seen several cases of this form of disease in private. In one, an old lady, lately dead, the disease had been progressing for some years; her difficulty of swallowing had been so great that on one occasion a probang was passed down the throat, in order to see if there was any obstruction. In another case, of a woman of middle age, the attack came on suddenly, as one of ordinary hemiplegia. She rapidly recovered the use of her limbs, so as to be able to walk two or three miles daily, but she remained speechless; she could not protrude her tongue, and could scarcely open her mouth; she was fed with a spoon, and the saliva was constantly dribbling from her mouth. In the case of a lady, somewhat older, whom I watched for two or three years, the attack came on as a fit during dinner; she fell off her chair, and was taken up to bed; it was found that her senses had not left her, but she was unable to speak. In a day or two she got up, and appeared very well; but she never spoke again, and could not swallow without great difficulty. She subsequently attended to her household affairs, would play cards with the family, and walk three or four miles daily, but she was obliged to communicate all her wants by writing. Her greatest trouble,

however, was the inability to hold her saliva, which was continually dribbling from her mouth. She had finally a fatal apoplectic attack, in which the effused blood ploughed up the pons Varolii; at its lower part there was an old brownish cyst.

In the case of a woman who was under my care in the hospital some years ago with this form of disease, combined with partial paraplegia, she was unfortunately allowed to feed herself, and on one occasion a large piece of meat stuck in her throat and choked her—an accident not unlikely to happen in this disorder.

Case.—Dominick K—, æt. 31. The patient, a bricklayer's labourer, was a single man, and of temperate habits. He always enjoyed good health until the middle of July, when he went to bed well, but was unable to rise the following morning, having lost the use of his legs and arms during the night. His left side was paralysed in a greater degree than the right, and his speech and power of deglutition were also affected. He had been under medical treatment up to the date of admission, and his health had become slightly improved in consequence. He was able to walk without a stick, but with a tottering gait, though he was scarcely able to raise his feet from the floor. He could stand on the right leg without support, but not on the left, and his left knee was stiff.

Mastication and deglutition were difficult, and the tongue was only capable of very slow protrusion and retraction. The upper part of his face was unaffected; he could close his eyes firmly and quickly, but the lower part of his face was almost motionless; he could not whistle, and there was a want of expression in his countenance. His speech was thick, so that it was difficult to understand what he said. Six to eight ounces of saliva flowed daily from his mouth, showing that the amount of saliva is immensely increased. This, no doubt, is due to the implication of the chorda-tympani nerve.

His urine came from him very slowly, and at times he had to wait a few minutes before he could pass it. It was not albuminous; his bowels were regular; his tongue was clean, and he was in no pain; his appetite was very good. Tactile sensibility perfect.

At the end of a month there was little change. His vocal cords were seen, by the aid of the laryngoscope, to move freely, both during respiration and when he made an effort to utter a sound; but when he tried to cough the vocal cords scarcely moved at all, and he was quite unable to effect his purpose, a slight hacking movement of expiration being all he could accomplish. This was probably due to a loss of co-ordination, as the vocal cords could be moved during speech.

I may here remind you that the function of the olivary body is thought to be that of co-ordination of the movements of speech, and that the corpus dentatum is continuous with the anterior cornu of grey matter; but it is not necessarily involved in the disease.

He was readmitted at the beginning of the following year, and remained in about two months, during which time his condition somewhat improved. He could walk about the ward, though dragging his legs, and had some more power in his arms. As regards his speech, he made a great contortion of his face in order to produce a word, but it was more intelligible than heretofore. On examination of the larynx with the speculum the right vocal cord moved slightly, but the left not at all. He seemed to have power over the soft palate to raise it.

Case.—Mary Jane D—, æt. 51, had been in the hospital on several occasions; first in 1864, then in 1866, and again in 1867. She was a married woman with a large family. Her history as she endeavoured to relate it by monosyllables and by writing was, that on May 14th, 1864, she went to bed quite well, but awoke early in the morning, finding the right arm powerless and the right leg weak; the speech was somewhat affected, but this improved in the course of the day. In four or five months the arm recovered sufficiently to enable her to use her needle, and she remained tolerably well until the following May, when she had another attack, but on this occasion her jaw was almost fixed, so that she had great difficulty in speaking and eating. During the following six weeks a gradually increasing paralysis came over her, affecting all her limbs and her face.

When she was admitted on January 31st, 1866, she was observed to be a thin, short, old-looking woman, having an anxious expression of countenance, and not able to walk with any vigour from weakness of the legs; the arms were also somewhat weak, but more especially the right. She had almost total loss of utterance, so that on endeavouring to speak she only made some almost unintelligible noises; the voice was also weak. She had some difficulty in opening the mouth, which was drawn slightly to the left side; she also had some difficulty in closing the right eye, and the lower lid of the left eye was slightly drawn down; there was thus a more or less paralysis of all the muscles of the face; no loss of sensation. For a long time she had been unable to swallow any solid food, and had been living on liquids, always taking care to place everything far back on her tongue. There also appeared to be some paralysis of the right pillar of the fauces, some dimness of sight and tremor of lips. She had headache, especially over the forehead. She used a slate and pencil to communicate her wants. Heart and lungs healthy. She remained in hospital until September.

She was again admitted under my care, October 30th, 1867, and remained in for six months without much alteration in her condition. She sat in her chair all day long, as she could not walk well; the arms were also weak, although she was able to write. She had completely lost the power of utterance, and was in the habit of putting down all her wants on a slate. She usually sat with a handkerchief to her mouth to catch the saliva which was constantly dribbling from it.

Case.—Mr. H—, æt. 27, a fine young man, who had lived rather freely, and might probably have had constitutional syphilis, was seized with a fit on the night of January 5th, 1869. This appeared to be of the ordinary hemiplegic character, arising from effusion of blood. Feeling ill he attempted to get out of bed, but then he fell, the noise produced arousing those in the house, who found him on the floor and put him to bed, and when I saw him a few hours afterwards he was paralysed on the left side, but quite conscious; he rapidly recovered, and at the end of a month was able to walk about and return to his employment. He had never, however, completely regained the strength of the arm and leg. On August 3rd he again had a fit, but on this occasion it was of an epileptic nature, and soon afterwards he had another, and then a succession of them for a few hours. In these attacks he struggled violently, but he said never lost his consciousness; and between the paroxysms he talked quite rationally. On the following day he was better, and had no more fits, but it was observed that his speech was failing, and at the end of the week he could not utter a word. When I saw him again, and during some weeks afterwards (even to the present time),

he was the subject of the complaint under consideration in its most marked form. His face had lost somewhat of its usual expression, and when he smiled the mouth on the right side was slightly drawn up; at the same time the lips were well retracted, so as to show the teeth, proving that the orbicularis oris still retained much of its power. He could also close his eyes. If asked to speak he opened his mouth and laughed, but could not utter a single word. Not only was he incapable of forming a word with his lips, but his larynx failed to produce the feeblest note. On asking him to cough it was only once that a slight gurgling was made; in all other attempts he could not produce the faintest sound. The saliva was running from his mouth, necessitating the constant use of a handkerchief. When requested to drink, he allowed a good deal of the fluid to escape from his mouth. He was said to have much difficulty in eating and swallowing, the food collecting in his cheeks, and thus it was generally placed far back on the tongue to enable him to grasp it. He could protrude his tongue a little distance from the mouth, but it was done slowly and with effort. On examining the throat, the velum was seen to hang loosely down. He had no power to raise it, and touching it with the feather of a pen did not excite it to action. He, however, said he could feel it being touched. His intellect was quite clear.

These cases show that in the simplest form of the disease there is a paralysis of articulation and deglutition; while the facial, lingual, and laryngeal nerves are especially affected. It will be observed, however, that the orbicularis oris is more involved than the muscles of expression, and that the tongue can be moved slightly backwards and forwards, probably from some of its muscles being supplied by the seventh nerve. If the degenerative process extends beyond the primary defined limit, then the paralysis of the muscles of the face also increases, and at the same time the limbs may become involved. The sensory nuclei and nerves appear to escape. In the worst form the paralysis may be associated with atrophy of the muscles. This is not often witnessed in the face, and the reason may be that the facial nerve has other grey centres of origin besides the one involved in this form of disease; but as regards the ninth nerve it does seem, from cases which have been recorded, that the muscles of the tongue which it supplies undergo an atrophy.

The simple form we may regard as that where expression, phonation, mastication, and deglutition being alone involved, the disease is very localised. Should it spread to the spinal tracts, a paralysis of the limbs will ensue; if to the grey matter of the anterior columns, an atrophy also. Besides this more complex form, owing to an extension of the primary disease, which is a remarkably localised malady, we may meet with a bulbar paralysis, as a part of a more general change in the cord, due to various coarser lesions.

But lately I saw a post-mortem made of a case of Dr Pavy's, in which the pons Varolii was found softened on one side, the brain

elsewhere being quite healthy. The man had first weakness of one arm, then of one leg, and afterwards of both arms and legs. He had difficulty in articulating, in masticating and swallowing, and could scarcely protrude his tongue beyond his teeth.

In the simple form, I believe it was Lockhart Clarke who first showed the degenerative changes in the nuclei which are situated along the median line of the fourth ventricle, as in the case presently to be mentioned, where the focus of the change was at the nib of the calamus scriptorius. In more complex cases the same parts may be merely involved in larger degenerations, as in softening or sclerosis, which have commenced elsewhere in the cord. This is exemplified in the case of Mary Ann R—, presently to be mentioned.

The microscope shows a degenerative change in the ganglionic cells forming the nuclei of the nerves before mentioned. The nerve-roots themselves are atrophied, and the muscles which they supply have also undergone the usual atrophic change.

Whether the primary change in the simple form is of an inflammatory or other nature is not very clear, for its pathology must include an explanation of the cases of recovery.

I have repeatedly said that I know of no organic nerve disease which cannot have its counterpart in a functional or curable one; that is, where a healthy nerve centre may not cease to be active or functionise, and be productive of the same symptoms as if that centre were diseased. In hysteria it is known that every possible nervous disorder may be simulated; and under this designation I have seen a tolerably fair example of labio-glosso-laryngeal paralysis. We have no difficulty in appreciating these facts as regards the brain during sleeping and waking, when the terms dormant and active are supposed to correspond to our ideas of the different cerebral states; now, whatever these may be, we have only to carry the same idea into the spinal system to understand the nature of many forms of functional paralysis. Should any part of the spinal system sleep a paralysis would ensue, and should it be a part which rules over vital processes death would necessarily take place.

The following is a case of bulbar paralysis, in which the patient for a short time was on the brink of death, but this peril having been escaped, he rapidly recovered:

Case.—Thomas H—, æt. 43, admitted into Guy's Hospital on Nov. 29th. Four days before death the attack came on as a fit, his limbs became rigid and powerless, but he did not lose his consciousness. Subsequently, his left side was spasmodically affected; he then was unable to speak, and he snored. The description of all these symptoms was very obscure and imperfect. When admitted he seemed in good condition, but his face was expressionless, the mouth open, and

corners depressed. He lay on his back, and was too helpless to turn himself without assistance; pupils minutely contracted. Tongue could only be protruded as far as the teeth, could not touch the roof of the mouth, and was covered with unswallowed food. Palate hung flabbily down, and did not respond to any touch. Great difficulty in masticating and swallowing; could scarcely hold the beak of the feeder in his mouth, and then the food collected in his cheeks, and had to be washed out. Saliva constantly running from the corners of the mouth. His voice was jerky and guttural; when asked to cough he could only make the faintest sound. Respiration chiefly abdominal and diaphragmatic; at each respiration a sonorous sound was made in the throat. The intellect was quite clear, and sight unaffected. His speech was most indistinct, and he could pronounce no letter where movement of the tongue was required. He could only just raise his arms, but could not grasp anything firmly; he could move his legs, but was unable to stand upon them. Sensation and taste were perfect, and no pain anywhere. It was thought that he had acute bulbar paralysis, involving the lateral tracts of the cord. The fact of his chest being involved in the paralysis made the prognosis most doubtful. He remained in this precarious state for three days, when he began markedly to improve; he could move his limbs more freely, his breathing was more natural, and we could understand him better when he endeavoured to speak. On the next day the improvement was still marked, and he could swallow with less difficulty. On Dec. 11th he could be easily understood, and he was able to sit up in bed. On the following day he was able to stand. On the 19th he was walking about in the ward, and all the paralytic symptoms had passed off. He left on the 27th, all but well.

The following was a case where all the symptoms of bulbar paralysis were present, but no organic disease was found after death:

CASE.—A stout girl, looking well, came to the hospital on account of general weakness; she could scarcely walk or move about, she spoke slowly, and had slight strabismus. The house physician was inclined to regard the case as one of hysteria, and being an authority on diseases of the eye saw nothing in the strabismus incompatible with this view. She remained in the same condition, appearing very lethargic in her manner, for about a month, when one day I found she could scarcely walk, and her speech was very indistinct. In two or three days these symptoms had increased, until she presented all the conditions of bulbar paralysis in a modified form. Subsequently she spoke most indistinctly, swallowed with difficulty, and was unable to cough. She, however, was able to get up, when one day after going to bed she was seized with difficulty of breathing, and quickly died. The medulla oblongata was very carefully examined, and nothing very tangible was found amiss with it.

As illustrating the effects of disease or disturbance of the medulla oblongata, I will briefly mention the case of a lady who had a concussion of the spine from a fall.

Concussion of Medulla Oblongata.

CASE.—A lady fell off a pair of steps on to the back of her neck. This was followed by weakness of both arms, difficulty in deglutition, and sometimes choking. For a long time she had to be very careful how she drank, and if her head were slightly inclined to either side a small quantity of fluid would enter the

larynx and cause choking. She had difficulty in speaking, she could scarcely protrude her tongue, and there was a considerable flow of saliva. It was many months before she recovered.

Progressive Atrophy and Bulbar Paralysis combined.—It is very evident that the two diseases which I have been describing, progressive muscular atrophy and bulbar paralysis, although clinically distinct, owing to different portions of the cord being involved, are pathologically closely allied if actually not alike; in the one case the upper part of the cord being affected, whereby the paralysis is first seen in the upper extremities, in the other the medulla oblongata, whereby the cranial nerves are involved and the paralysis takes place in the face, tongue, and adjacent parts. But it is evident that should an extension of either disease happen, upwards or downwards, the two affections would be combined. This frequently occurs, and thus the labio-glosso-laryngeal paralysis is often seen associated with the progressive muscular atrophy. It requires merely an extension downwards from the medulla oblongata to the spinal cord for all the phenomena of the latter disease to arise.

Several cases have now been recorded where all the symptoms of bulbar paralysis were combined with those of muscular atrophy of the limbs and of the tongue. In these cases disease has been found in the lateral column and grey matter of the medulla oblongata and in the cord below.

Labio-glosso-laryngeal Paralysis, combined with Muscular Atrophy. Atrophy of the Medulla Oblongata, with Atrophy and Degeneration of the Spinal Motor Tracts and the Motor Roots of the Nerves.
(From the report of the ward clerk, Mr Mallam.)

Case.—William C—, æt. 46, admitted under Dr Wilks, November 9th, 1867; died December 28th. He was a leather-dresser by trade. Five years ago he was in the hospital for rheumatic fever; since then he has enjoyed good health until June last, when he began to experience some soreness in the throat and difficulty in swallowing. Towards the latter end of September he lost partial use of his hands and legs, the left side being most affected; but he continued at work until three weeks before admission, when he fell down and was unable to rise again. He has gradually been getting worse since.

On admission he was seen to be a short, old-looking man, with his head sunk between his shoulders, and a vacant expression of countenance. His was thin, and his muscles flabby. His eyesight had of late become much impaired; but his pupils contracted under the influence of light, and there was no paralysis of the muscles of the eyeball. He had had pain for some time in the course of the fifth nerve, tactile sensibility was good over the face, and the muscles of mastication appeared to act well. There was a want of expression in the face, and although the mouth was not drawn to either side, the orbicularis oris had lost some of its power, as the saliva was constantly running out of the corners of the mouth; the buccinators appeared quite useless for the purpose of mastica-

tion, and he was obliged to press the food out of his cheeks with his fingers whilst eating. He could close the eyes, and the hearing was good. The back of the throat and soft palate appeared sensitive when touched, but the contractility of the latter seemed much impaired. He had much difficulty in swallowing food and had to wash it down with fluid. He appeared to have lost power over the tongue, being able to move it but slightly. He spoke very indistinctly and thickly, so that his words were scarcely intelligible. It was seen also that he could scarcely move his chest, and that the breathing was mostly diaphragmatic; the chest was resonant, but on auscultation was found to be full of râles. He had great difficulty in expelling the mucus, being quite unable to cough out. As regards his limbs, there was a general deficiency in power, especially on the left side, so that he was scarcely able to support himself, and had very little use of his arms. The muscles at the same time were wasted, as was more especially apparent in the arms, the wrists dropped, the fingers were flexed, and the interossei atrophied.

It will be observed that this man was partially paralysed in his limbs, and had almost lost the power of eating, swallowing, talking, or coughing, from paralysis of certain muscles above named. It will also be observed that, besides the labio-glosso-laryngeal paralysis, he had progressive muscular atrophy.

He was ordered to be galvanised with the continuous current every day for a quarter of an hour, one pole to be placed behind the mastoid process on the left side, the other lower down on the spine, and to take quinine mixture. The extensors of both hands were brought into action when either the induced or the continuous current was applied; but as regards the interossei, those of the right side were alone affected.

It appeared as if the galvanism was giving some tone to his muscles, and he expressed himself better, but at the same time it was evident that he was in constant danger of suffocation, from the accumulation of mucus in the air-passages; his slight hacking cough was constant and most distressing, and he would wake up in the night in fear of imminent choking.

He continued on with much the same symptoms, having great trouble in expectorating and difficulty in swallowing, so that he had to push his food to the back of his mouth. He then began to be troubled with various neuralgic pains in the face, in the eyes, in the throat, and along the arms.

About a month after admission he appeared to have gained some power, he walked in the ward, he could raise his right arm over his head, move his tongue better and articulate more distinctly. About this time he had a fall which hurt his head and kept him in bed; after this he became worse, very low-spirited, speech less distinct, and appetite bad. The mucus collected in his chest, and his power of expectoration became lessened; it was evident that he could not live long, and on December 28th, 1867, he died.

Head and Spine.—There were no nodes, or other signs of disease of the cranial bones. The calvaria was removed, and the occipital part of the bony base cut out; the arches of the vertebræ were removed; and the cranial and spinal dura mater, their contents, and the cervical nerves, to the outer edges of the scaleni, were all removed together; the processes of dura mater in the sella-turcica, and the sphenoidal fissures, only being cut. The brain was tough and hard. There were no signs of formative disease; the changes required to be looked closely for. But on opening up the visceral arachnoid, there was a most obvious atrophy of the roots of the hypoglossal nerve, which had quite lost the natural white, opaque appearance of the nerves, and were little thin gelatinous threads as they

crossed the corpora olivaria. In the same condition were the inner roots of the spinal acessory, and, also, very markedly, the whole of the anterior roots of the spinal nerves, especially the cervical, and least the sacral. The anterior view of the cord was remarkable; the outer aspect was flat, not round, yet it was harder than natural, so that mere flaccidity was not the cause of this; the anterior roots, also, came from a line much nearer the middle line than is natural. On section, the anterior half of the white matter was atrophied; it was white, harder than natural, and on the section it stood out, while the grey matter receded; the latter was larger than natural, it was darker, containing obvious vessels, and at the lower part of the cervical cord it was double the natural size, and showed a red colour finely mingled with yellowish white; the part, so affected, was not of great length; generally the redness and largeness of the grey part, and the thin, hard shell, or coat-like layer of white matter, made the pathological state of the spinal cord. In the medulla oblongata, as seen from the front, nothing diseased was visible, except the state of the nerve roots, as before stated. But on opening up the arachnoid over the fourth ventricle, and drawing down the medulla oblongata to look at the fourth ventricle, there was a very striking diseased appearance, without obvious derangement of anatomical position; there was a red-grey change of the calamus scriptorius, so that the nib of this was quite involved, and from the nib, upwards and outwards, for half an inch, there ran this change. The lining membrane of this ventricle and its choroid plexus were of deeper colour than usual.

Case.—Mary Ann R—, æt. 22, married woman, well until three months before admission, when she had some attacks of a very peculiar nature. Her husband said he found her one day speechless, and her right side weak. From this she recovered, and remained well until the day before admission, when she was taken in the night with convulsive movements, and lost the power of speech. She was seen to be a healthy, well-grown woman. She could not speak, although she appeared conscious. The left arm and leg, as well as the face, appeared partially paralysed; the sensibility of this side was apparently exalted, and she was scarcely able to swallow. During a whole month she lay in bed in a lethargic state, as if asleep; when roused she opened her eyes and looked at persons intelligently, and gave signs of pain when the left arm and leg were moved. The respiration was irregular, and often interrupted by a deep sigh. After this time she began to improve, became more sensible, smiled when spoken to, and appeared to understand; she could move her left leg, but not the arm, which was now beginning to waste. Shortly after, she was got out of bed, and was able to stand. This improvement did not last long before she sank back into her old state, and during the next two months she lay quiet in bed, doing little more than vegetate. When roused or shaken she would open her eyes and smile, but never articulated a word: face without expression, but on emotion slightly drawn up on one side. She had difficulty in swallowing, great care having to be taken to prevent her choking, and the saliva was continually flowing from her mouth. On raising her right arm it would remain in any position it was placed, as in the cataleptic state. The left arm was flexed across the chest, and much wasted. The muscles responded to faradisation, but gave her no pain, judging from the smile which she put on during the process of galvanism. The legs were drawn up when pricked. She remained in this state, getting gradually worse, until the breathing became very irregular and for the most part diaphragmatic, apparently like an inordinate action of this muscle when over-excited to continuous contraction. After being in this precarious state for a few days she again got better; she was roused out

of her lethargy more easily, smiled when spoken to, and made strange noises when requested to speak; she also moved her paralysed arm slightly, and her other limbs more freely.

After this she gradually improved, the strength of her limbs increased, she grew stouter, looked fresh, and at the end of a month was able to get out of bed and walk about. She had now been in the hospital more than six months; walked about the ward slowly, but was very liable to fall; she could also move freely the right arm; the left was drawn across the chest and atrophied; she had little power in it. Her head fell forward and a little on one side. She appeared quite intelligent, and responded by action to everything desired, but could not utter the slightest sound. When spoken to she smiled, her mouth being drawn up on one side; when made to laugh she would get a little emotional, and during inspiration a crowing sound, evidently from partial paralytic closure of the glottis would take place. This was the only sound she ever uttered. She could not open her mouth well, nor protrude her tongue, and the latter appeared small. No loss of sensibility in any part of the face or limbs.

Dr Fagge has lately had under his care a fatal case of this kind, in which a careful post-mortem examination was made. In this case the disease began below and passed up to the medulla oblongata. The patient was a woman of 50 years of age, who began to complain two years before her death of weakness in the fingers of the left hand; this gradually progressed until the whole arm was involved, and subsequently the right arm also. At the end of about a year her speech became affected, she could not protrude her tongue, she could scarcely swallow, and the wasting of the upper part of the body and arms was extreme. After death the membranes were found thickened at the base of the brain, but the brain itself was healthy. The three divisions of the eighth pair of nerves were small, as also was the ninth. The spinal cord was diseased from an inch below the medulla oblongata throughout the cervical and dorsal regions as far as the lumbar portion, which was healthy. The changes were pretty uniform throughout the cord; there was marked degeneration and atrophy in the lateral columns, including more or less of the grey substance. At the upper part of the cord the anterior portions were most affected, and at one spot the anterior cornu was hardened, so that it stood out when a section was made. In the other parts the diseased portions were soft. The anterior roots of the nerves all down the cord were thinner than natural. The nerves of the brachial plexus, as well as other nerves, appeared normal. The microscope showed abundance of granules throughout the cord, especially in the grey substance.

Atrophic Infantile Paralysis.—The next disease of which I shall speak appears to approach very nearly in its nature to the progressive muscular atrophy. It was described by Cruveilhier under the name of essential paralysis, implying that it occurred without

any known cause. It was seen to come on so suddenly, and without the association of other symptoms, that its pathology was involved in obscurity. Of late years, however, thanks to our better means of observation, a sufficient number of cases have been collected to show that the disease is spinal, and has its seat in the anterior cornua of the grey matter of the cord. For this reason it has been called *poliomyelitis anterior acuta* (πολιος, grey). What the exact nature of the disease may be it is difficult to explain, since it is often rapidly recovered from, but in the permanent form, and where the spinal cord has been submitted to examination, a degeneration of the grey cells has been found, and there is reason to believe that it is inflammatory. In some cases the children have had fits and symptoms of cerebral disturbance before the paralytic attack, so that such cases formerly suggested an origin of the disease in the brain.

As a rule, the children who have suffered from infantile paralysis have been from six months to three years old. The patient in many instances is seized with a febrile attack, which necessitates its being kept in bed or wrapped up in its mother's arms for a few days, when it is found to have lost the use of a leg or arm, or both legs, or sometimes of all the limbs. When the child is put to the ground it is found that one leg is quite powerless, and dangles about like a dead limb; or one arm in the same way has become suddenly useless. The paralysis, indeed, is most complete. Recovery may very quickly occur, and in a few days no evidence of weakness remain; but if this favorable result does not take place the limb continues permanently paralysed, and the muscles waste; it is cold and withered, and for the remainder of the patient's life he may have to use crutches, with the leg dangling helplessly at his side; or the leg becomes contracted, a club-foot is produced, and the aid of the surgeon is required. In very many cases a partial recovery occurs, and then the patient for the rest of his life is merely inconvenienced with having one limb rather smaller than the other, the bones wasting and the joints sometimes becoming deformed. There is an absence of paralysis of the bladder and rectum, and no bed sore or anæsthesia. There is no reflex activity, and muscular contractility to electric stimulus is much impaired or quite lost. It is remarkable how rapidly the natural contractility disappears, and yet in the analogous affection, the progressive muscular atrophy, it remains for some time. Faradaic irritability is lost in a few days, and the muscles remain susceptible only to the interrupted galvanic current. Finally all reaction disappears. My experience of this disease has been very considerable, both at this hospital, the Infirmary for

Children, and in private practice. It so happens that within a very recent period I have seen every variety of the complaint, and these I will briefly recount to you as examples.

Case.—An infant, 6 months old, had a feverish attack, which lasted three days, and at the end of this time it could not move its legs or rest upon them when jumped on the lap. At the end of the month, when I saw it, the legs were quite powerless.

Case.—A child, 2½ years old, sent to me by Mr Roper, of Blackheath, was taken ill, apparently from cold, and put to bed. He always cried out when he was moved, as if he suffered pain in the loins. After a few days, when the febrile symptoms passed off, and the child was taken from his bed, it was found that he could not stand. After this a partial recovery took place in the left leg, so that when I saw the child, ten weeks afterwards, he could rest on the left leg, but had scarcely any power in the right. Sensation was unimpaired. Galvanism was ordered, but when I saw him, at the expiration of three weeks, there was no improvement, and the leg was wasting.

Case.—A child, 2 years and 4 months old, was sent me by Dr Deeping, of Southend, with the following history. Ten months before, the child was seized with paralysis of the right arm, and, within twenty-four hours, of the other arm and both legs. He lost power over the bladder and rectum, the chest was paralysed, and respiration took place solely by the diaphragm. After a few days he began to improve, and faradisation was used. Power returned in all the muscles and limbs, so that when I saw him there was no paralysis except in the right forearm and hand; the muscles were wasted and the extensors had undergone some contraction, so that the hand was kept standing out; he had no power of grasping.

Case.—A child, 2½ years old, was sent to me by Dr Paddon, of Putney; she had been seized a few days before with paralysis of the left arm and leg, the arm being first affected; no brain or other active nervous symptoms. The leg rapidly recovered its strength, but the arm was still weak when I saw her some weeks afterwards.

I saw this child again when eight years old. The child was well with the exception of the left arm. This was small, short, and feeble, and the muscles of chest on that side were flabby. The ulna had not grown equally with the radius. The middle finger was longer than the others, equalling that on the other hand, and it could be moved. There also seemed to be some portions of the flexor of the forearm less wasted than the rest of the muscle. Faradaic excitability had returned. Probably some particular grey cells in the cord had escaped destruction.

It is remarkable how limited the disease generally is to two regions in the cord, the cervical and lumbar enlargements, which rule over the upper and lower extremities. In the more recent cases there has been found inflammatory softening of the grey matter with destruction of the ganglionic-cells and of the nerve-fibres. The medullary nuclei around may be slightly affected, but not to any extent. When the paralysis has been established and an opportunity of examining the cord has occurred, a section has shown a marked shrinking on

the side affected. This has included the grey matter, and, together with some atrophy of the parts around, makes the anterior columns actually smaller in size. In these cases the microscope shows a degeneration of nerve-fibres and ganglionic-cells, with presence of connective tissue, amylaceous bodies, and granule cells; the anterior roots of the nerves are also wasted, and some nerve-fibres have undergone degeneration. The muscle itself also degenerates, being pale and converted into fat, and the whole limb wastes. Dr Taylor had the opportunity of examining the cord of a child who was the subject of infantile paralysis.

Case.—A girl, æt. 3, died of acute pneumonia. When seventeen months old, after a slight feverish attack, the left leg was found weak and painful, suggesting the presence of hip-joint disease. The limb continued weak for some time, when it so far improved that the child was able to walk, but it still remained wasted and weak. The post-mortem examination showed the muscles of the left leg to be pale, yellowish, and soft, and in marked contrast to the red muscles of the other limb. The spinal cord showed a slight diminution in size on the left side of the lumbar enlargement, and the anterior roots at this spot were smaller. A section showed the cord to be smaller on the left side in this region, more especially the antero-lateral columns.

The change in the anterior cornu was very striking, there being an almost complete absence of the ganglionic cells, of which only a few were left towards the circumference, and these were malformed. The axis cylinders had also disappeared. The region of the anterior cornu had a felt-like appearance, as if made up of the finest fibre. The antero-lateral column in the neighbourhood showed some slight changes; in structure it was more dense from the presence of connective tissue, and the nerve-tubules were smaller. The right anterior cornu showed some very slight changes of a like kind.

Dr Bramwell reported a case in the 'Edinb. Med. Journal' of a child, æt. 2½, who died eighteen weeks after paralysis of leg. He found in the lumbar region of the cord a destruction of the motor cells of the anterior cornu, with atrophy of the anterior nerve-roots proceeding from the seat of lesion.

As a proof of the inflammatory nature of the process which takes place in the grey matter, Dr Charlewood Turner described the case of a child who died six weeks after an attack of acute paraplegia from a fall on the back, where sensation and reflex excitability were also lost. The section of the cord at the lumbar enlargement showed an evident change. The anterior cornua were red and gelatinous-looking, and in some parts altered in colour, as if from extravasation of blood. The microscope showed that the grey matter had undergone profound changes, being quite confused with the abundance of leucocytes which were especially massed about the vessels, whilst the stellate cells and fibres were atrophied. There was also a great infiltration of albuminous matter.

Since attention has been called to the initial fever in this disease, and since it is seen that a perfect and rapid recovery may take place from the acute myelitis which is supposed to be present, it is probable that the disease may be frequently overlooked, and that no suspicion may arise that the child is suffering from a malady which in another degree or stage would constitute infantile paralysis. The case then would probably he called rheumatism. Even if paralysis does ensue the acute stage may not be recognised. For example, an infant a few months old suffered from an illness which the doctor called rheumatism. When it had recovered from the more severe symptoms it was found that the child could use neither leg and only one arm.

I have very little doubt that the following was a case of acute myelitis, fortunately recovered from. It occurred in the practice of Mr Roper, of Blackheath :

Case.—Ellen N—, æt. 2½, a fat, healthy-looking child. She had been ailing two or three days, when on October 7th the mother said she had a fit of laboured breathing. This was followed by lassitude and disinclination to play. On the 11th her limbs failed her, and on the 13th Mr Roper was called in. She evinced then much pain if her limbs were moved, and cried out when the right arm was raised, which she was constantly asking her mother to hold. On the 16th her legs appeared quite useless, and on the 17th she ceased to move her left arm. She could not raise it, but could only move the hand and fingers. On the 21st Dr Wilks saw her. At this time Mr Roper had given up the idea of rheumatism, and regarded the case as one of paralysis. There had been no sweating and no redness nor swelling of joints, and only a slight elevation of temperature. Fresh symptoms had now appeared ; the pains of the limbs had gone, but the child was quite helpless, and the motions and water were passed involuntarily. In this state the child continued for three weeks, when she recovered the use of the right arm and leg, but the left limbs remained powerless. Rubbing of the limbs was persevered with, and the left arm and leg began to recover themselves. At the end of sixteen weeks from the onset of the attack a perfect recovery had taken place.

Dr Andrew describes a case in the 'Med.-Chir. Trans.' of a somewhat similar kind, and in which he attributes the cause to heat:

Case.—A child, æt. 2½, had been ailing for a few days with headache, sickness, and pains all over her, when on a hot day in July she walked along the quay at New York in order to embark for England. She soon afterwards lost the use of her limbs, and remained perfectly helpless until her arrival in London, a month afterwards. She was then completely paralysed, and her limbs were soft, flabby, and wasted. She was treated by galvanism and other means, and in three months was perfectly well.

I have said it is remarkable how the disease should attack especially those important centres ruling over the upper and lower extremities, and how consequently the whole of a limb becomes

paralysed; but Dr Lees has reported two cases where the serratus magnus on one side had undergone atrophy, and these he believed to be instances of infantile paralysis. This is a muscle, however, which has frequently been observed to be paralysed in adults; and the affection has been generally put down to a local origin.

It is probable that some forms of paraplegia are of the same nature, especially when occurring in children. We sometimes meet with cases where, when a feeble child is held up, the legs hang perfectly helpless and wasted. If contraction and further atrophy come on there is little doubt that the affection is spinal.

As regards the treatment of these cases the recommendations are to exercise the limb, rub it with embrocations, and use galvanism.

In spite, however, of these measures, it is melancholy to see how little good results from them, except in very recent cases, and as the latter recover usually without any treatment whatever, it is a great question whether we possess any curative means. It is more probable that when restoration of the power quickly occurs no organic change has taken place in the spinal cord; but if this is delayed, that a hopeless degeneration of some of the grey cells has taken place. Nevertheless, I should recommend the above-named treatment, if it were only for the reason that the paralysis might sometimes have another cause; as in the case of a boy where the treatment was eminently successful from the fact that the weak limb was owing to the patient having for some time sat upon it whilst sleeping. In any case, I would advise a long trial of that form of galvanism which seemed to act best on the muscles; for by its means their nutrition is preserved.

Atrophic Spinal Paralysis of Adults.—The form of disease of which we have been speaking, has been studied more especially in connection with its occurrence in childhood because of its greater frequency at that period; but the term infantile paralysis as indicating a disease peculiar to childhood is a misnomer, seeing that it is occasionally met with in adults. Charcot has paid great attention to this subject and has satisfactorily shown that grown up persons are liable to the same acute inflammatory changes in the grey matter of the cord as infants. A man, for instance, after a day or two of febrile disturbance shows some loss of power in the lower limbs, and this is followed very soon by flaccidity of the muscles and a rapid wasting. There is no anæsthesia and no trouble with the bladder or rectum, nor are there any bed-sores, all showing that the posterior portions of the grey matter are not involved. In some cases the disease may progress until the upper

extremities are affected when the paralysis and atrophy will be complete.

As in the child, so cases are occasionally met with in the adult, where the patient will almost suddenly or in a few hours or days, have a paralysis developed in a limb and then perhaps in a few days more completely recover; or, just as in the case of the child, the paralysis may remain, soon to be followed by an atrophy of the muscles.

There is also a more chronic form of the disorder met with in the adult: a paraplegia whose principal focus seems to be in the anterior cornu. A feebleness of the legs comes on followed in course of time by atrophy; and this may slowly progress until the arms are affected. Although the result is the same as that witnessed in progressive muscular atrophy, the disease is distinguishable by its being clearly a paralysis from a central cause in the first instance, whereas in the other affection the wasting of particular muscles is the first observed phenomenon.

In all cases where the paralysis precedes the atrophy, we believe the disease to be primary in the spine, as in the affection we are describing. Thus a woman had atrophy of both arms: but she stated that paralysis of one often came on suddenly in the morning on rising from bed, and that subsequently the other arm became paralysed. Then gradually a wasting took place in all the muscles.

Case.—Geo. S—, æt. 25, admitted under Dr Wilks, Oct. 7th, 1880, for weakness of both legs. He was a ticket collector on the South Eastern Railway, and had always had good health until early in August, when he played in a cricket match, and in the evening felt very poorly. He continued at work a few days but felt ill all the time, and was then obliged to give up and take to his bed. The doctor who was called in said he had "gastric fever." At the end of a week feeling better he got up, but found both legs weak, especially the right; he however went to his employment but found he was unable to continue it from inability to step on the carriages. He then attended as an out-patient at the hospital, and sometimes had pain in the right leg in addition to the weakness.

On admission he was seen to be a well nourished man, and was healthy looking. He had no pain but complained of weakness of his legs. He could walk well along a level surface, but had great difficulty in walking upstairs. There was less power in the right than left leg. All the superficial reflexes normal except cremaster which was absent. Knee reflex, diminished on right side. No ankle clonus. Sensation perfect. The muscles of the right thigh and leg were perceptibly wasted, the circumference of thigh being one third and calf one fourth of corresponding part of right side. Electrical application showed muscles reacted very badly to faradaism; and those of right scarcely reacted at all, the muscles of thigh only slightly reacted, and those of calf gave no response at all. The limbs reacted to the primary current, but a more powerful current than usual, and the indirect current produced the stronger effect. He was treated

daily by the continuous primary current. At the end of three weeks it was found that the muscles acted to a much less powerful battery, and were beginning to act to faradaism except those of the right calf which did not respond at all. He continued to improve when he left the hospital.

Now that attention has been drawn to this form of complaint it appears far from uncommon, and I now have before me an account of three cases published by Dr Allen Sturge.

Case.—A man, æt. 44, after getting wet and cold felt a pain in his shoulders; pain and stiffness extended down the arms, and the right one became soon perfectly useless. There was acute pain in the arms, and this was increased on movement. Subsequently some pains in the legs. At the end of three weeks he was better, except the right arm which was still painful and almost powerless. On examination it was found that all the muscles of the limbs were much shrunken.

Case.—A girl, æt. 20. One evening she experienced a pain at the back of the neck. On the following day she had headache and sickness, and towards evening she found her left arm powerless. During the next few days she was ill and often sick. She then got better, but her arm remained weak and began to waste. At the end of three weeks it was markedly smaller than the other.

Case.—A girl, æt. 19. For two or three days she had pains in her legs and a feeling of tightness. She then became very ill with pains in back and all over her, with delirium. In two days' time she found she could not use her right leg. After two months when quite well her right leg remained quite helpless and was much wasted.

Pseudo-hypertrophic Muscular Paralysis.—I take this affection after progressive muscular atrophy and infantile paralysis, because it is apparently allied to both of them. It is a disease in which the limbs and other parts of the body grow weak, and at the same time the muscles become larger. This is notably seen in the legs, which, although growing more feeble in their movements, yet are becoming larger in girth. The typical cases are those of boys who are observed to be getting feeble and awkward in their gait, and on examination of their legs it is seen that the calves have grown to an enormous size. Duchenne, who first described the disease, gave the full-length-portrait of a boy who was the victim of this disease, and all his limbs were so enormous that he resembled an infant Hercules. In the cases which have been observed in this hospital the enlargement has been almost confined to the legs, and at the same time some of the other muscles had undergone atrophy. In many cases the infra-spinatus, deltoid, and triceps muscles are found much enlarged, as also the glutei. On the other hand, it is common to find wasting of the latissimus dorsi and the lower part of the great pectoral muscle. One of the most notable characteristics of this disease when it has become established is the inability of

the patient to rise from the sitting posture. This appears to be due chiefly to the weakness of the extensor muscles of the knee and hip. The mode of rising from the recumbent position is very characteristic. The boy turns over, and then raises himself on his hands and knees. He then places his hands on his feet, and gradually climbs up his legs, as it were, until he rests in a bent position on his thighs, and then by a sudden effort gets into the upright position. By these means the patients supplement the action of the weakened muscles of the joints, as has been illustrated by Dr Gowers in a recently published lecture on this disease. The term pseudo-hypertrophy shows that there is no increase of muscular development. This is merely apparent, for when the muscles are examined they are found to have undergone a degeneration. Now the fact of some other muscles being visibly wasted shows that the disease is really indicative of degeneration. In a boy lately in the hospital the legs were of enormous size, whilst the muscles of the shoulders and arms were wasted, as seen in progressive muscular atrophy. In many cases the calves only are enlarged, and these contrast most remarkably with the comparatively small thighs. The first notice of any change is the feeble and ungainly mode of walking; the boy rolls along, separates his legs, arches his back, and thrusts his belly forward.

This disease has a great tendency to run in families, several members being frequently affected. The hereditary transmission is said to be almost always on the side of the mother; but as the disease is but rarely seen in females, the immediate parents of the sufferers from this affection are rarely themselves subjects of it. Thus we see that we have to do with a disease which mainly occurs in boys in early childhood, most of the cases beginning under six years old. Cases in adults are, however, reported, and Dr Hughes Bennett mentions one of an adult male where not only the muscles of the legs, but of the face, neck, and body generally were enlarged.

Duchenne invented an instrument, called a harpoon, which being inserted into a muscle and withdrawing a small portion of it enabled him to discover what changes had taken place in it. He found that the transverse markings had disappeared, that their place was occupied by granular matter, and that amongst the fibrillæ there was a large amount of interstitial connective and fibroid tissue. In some parts there were fatty molecules. Dr Ord showed in one case that the affected leg had a temperature of one to three degrees above that of the arm. In this case he found very little change in the muscular tissue. The disease in most cases appears to be due to an interstitial overgrowth of fibrous and fatty tissue, and this, again, has its cause,

according to Lockhart Clarke, in primary changes in the nerve centres. He has shown the existence of atrophy of the nerve cells, and disintegration of the grey matter in the cornua and central portion of each lateral half of the cord, as well as wasting of the anterior roots of the spinal nerves. Some observers have thought that the childish sufferers with this complaint are disposed to be weak-minded or idiotic. One must speak doubtfully at present as to its true pathology, as cases have not been sufficiently numerous for us to form an agreement upon it. Kesteven found spots of granular degeneration scattered through the white substance of the brain, ganglia, and medulla, but other investigators have failed to find any morbid changes whatever. Dr Schultze has recorded the case of a boy, æt. 13, in whom after death he made a most careful examination of the cord and quite failed to find any disease in the cord or in the nerves. He therefore regards the disease as primarily one of muscle.

It has lately been observed that there is an absence of the so-called patellar tendon-reflex in well-marked cases of this disease. The electrical reactions are normal, or deficient only in correspondence with degeneration of muscles.

The following case is now in the hospital.

Case.—A. B—, æt. 12. The eldest of the family. For some months past has been unable to move about. His intellect is dull; he takes long in answering questions, but whilst lying quiet in bed nothing remarkable is noticeable about him. On attempting to raise himself he is seen to have lost much muscular power, especially in the lower extremities. He can sit up, but if asked to get out of bed turns over on his belly, and draws up his legs, but is unable to raise himself.

His arms are thin, the muscles being ill-developed. The lower extremities are very large—too big for a boy his size. The glutei unaffected or but very slightly wasted. The adductors of thighs wasted; when the knees are placed together a large space exists between them. The calves very large, but flabby. Muscles of back and abdomen normal. When sitting on the edge of the bed he can only raise the leg a little and the thigh not at all. Superficial reflexes normal in cremaster, epigastrium, &c., but no knee nor ankle reaction. He has no pain, and the senses are unimpaired.

Granular Degeneration of Muscles.—Under this head Dr Meryon has described some remarkable cases where several members of a family were affected with degeneration of muscles, but since the discovery of the last-named disease it has been thought that they are probably examples of it. These cases occurred in a family of many children where all the boys died of the disease. The affection was first observed when the child was in the nurse's arms, by his sitting heavily and not moving his body freely, and subsequently, at the time when he should walk, his being scarcely able to support himself. When the child grew up the muscles still remained

weak, so that he could only walk with the greatest difficulty. Various remedies were then tried, but in vain. Some of the boys reached 12 or 14 years of age, and then suddenly died, and the muscles were found pale, atrophied, and the sarcous elements changed to granular and fatty matter.

A few similar cases in other families have been reported. Dr Meryon says: "In every case of muscular atrophy which I have seen or read of, in which either disease of the spinal cord or of the medulla oblongata has been detected, some symptoms of nervous disturbance have manifested themselves during life, either in pain, or in tremor, or quivering of the diseased muscles; but in every case which I have described as granular degeneration of the voluntary muscles there has been an absolute absence of any indication of nervous disturbance as there is in my present patient. I am therefore induced to continue in the belief which I have heretofore expressed of an idiopathic disease of the muscles which is probably dependent on a defective nutrition of the sarcous elements. Every case, also, has begun in the lower extremities, and has appeared to descend in a centrifugal direction, respectless of the course and distribution of nerves."

I am not in this place speaking of diseases of muscles, for of course no one denies that the muscular fibre may undergo primary morbid changes. We see them resulting also from injury and from inflammation; and in some cases of chronic rheumatism a most remarkable atrophy of the muscular tissue occurs.

It is interesting to observe in connection with the remarkable predisposition to muscular degeneration in the family mentioned above, the similar hereditary tendency in progressive muscular atrophy.

Lead Paralysis.—I shall now briefly allude to lead paralysis, because the disease so exactly resembles the progressive muscular atrophy which I have just described that it is very often impossible to distinguish between them. If the metal has been thoroughly implanted in the system, a fatal result may ensue. All the tissues of the body degenerate; the skin assumes a remarkably waxen, and sometimes jaundiced appearance, the nerve centres more especially suffer, and the patient becomes at last paralysed both in body and mind, and may also be amaurotic; a true gouty condition is also sometimes manifested. A mania or dementia may result, accompanied by epileptic fits. In a word, in acute lead poisoning the symptoms are great muscular and nervous debility, headache, torpor, coma, convulsions, mania, amaurosis. In a less degree these effects are constantly seen, as in the dropped wrist of the painter, followed by a paralysis of the whole arm, in which the muscles waste, just as in the disease described. I have more than once

seen a patient admitted and treated for progressive muscular atrophy, in whom there has been a blue line at the junction of the gums and teeth, and a good history of plumbism. It may be observed here that accompanying the line on the gums there is often a corresponding patch on the lower lip. The line is seen to be made up of a number of black dots if minutely examined with a lens; it is mostly met with on the edge of the gum of the incisors, and is due to the black sulphide of lead formed from the sulphur of the mouth.

It has not yet been satisfactorily determined how lead is instrumental in producing muscular atrophy, but since the conditions resulting from it are those which would occur in a poliomyelitis anterior, it has been conjectured that the real focus of the disease may lie in the grey matter of the cord, and more especially as the muscles fail to react to faradaism, but are highly susceptible to the voltaic current. All examinations, however, have failed to show any special lesion of the anterior cornua of the cord. Lead is found in both muscular and nervous tissues in cases of poisoning; and it is evident that the nutrition of these structures is especially affected. Some have thought that the influence of the vaso-motor nerves on the blood-vessels is sufficient to account for all the nutritive changes.

Lead, as you know, is given to arrest hæmorrhage, and acts by constringing the vessels. You can therefore see how its overaction or its continued action would produce an atrophy of the tissues. Both muscle and nerve have been found to contain lead, and as the paralysis corresponds more with one nerve distribution than another —the musculo-spiral—there are good reasons for supposing that the nerve is affected before the muscle. Duchenne states in his work that we have one means by which we can distinguish between lead palsy and the idiopathic atrophy. In the latter, as I have told you, the most remarkable wasting is seen in the interossei and other muscles of the hand, so that the claw shape is produced. In lead palsy the effect is most marked on the extensor longus digitorum, and as this muscle, when healthy and excited by faradisation, is stated by Duchenne to act only on the first phalanges, and has no influence on the second and third digits, it consequently follows that if this muscle is paralysed, as in plumbism, and the arm and wrist be supported on a table, the fingers can still be extended or raised, which cannot occur in the progressive muscular atrophy where the interossei and lumbricales are affected.

It is seen that the radial is the nerve first affected, shown by the paralysis of the extensor digitorum, extensor ulnaris, and extensor of thumb, whilst the supinator is rarely attacked; subsequently the

paralysis and wasting may spread to other muscles. This shows that the musculo-spiral nerve is not affected until it has given off its branch to the supinator longus. Evidence of this is obtained by asking the patient to flex the elbow while the forearm is forcibly held down. The supinator is then seen to swell up.

Dr Ferrier says that in attempting to examine the cause of the symptoms of lead poisoning too much stress has been laid upon its special action on the musculo-spiral nerve. He says we shall find numerous muscles affected, and that in all cases of paralysis the extensors suffer most. What is remarkable is that many muscles fail to respond to faradisation, although they are under voluntary control. He does not think that the affection is due to a polio-myelitis, but rather, probably, to a neuritis.

It has long been observed that persons working in lead become amaurotic, but it was Mr Hutchinson who first directed attention to the fact that an actual neuritis sometimes occurs. There may be temporary blindness, as in poisoning from other causes, but in acute lead poisoning there has sometimes been observed a true optic neuritis, shown by swollen disc, infiltration, &c. In some chronic cases real atrophy has been observed. We must distinguish these facts from what occurs as an altogether secondary effect of lead in the production of gout and Bright's disease, since in both these diseases forms of retinitis and effusions occur.

You may observe that by the long-continued stretching the tendons passing over the back of the hand become thickened; the protuberances sometimes are so great that you might suspect an enlargement of the metacarpal bones.

In course of time the atrophy may extend to other muscles, until those of a whole limb are wasted. In two cases presently to be mentioned, where a remarkable cure was produced by galvanism, the wasting was very excessive and general.

A few years ago there was a woman in the hospital who had long worked in lead, and who had become at last completely paralysed. The limbs had gradually wasted, and became at last utterly powerless, and at the same time her mental faculties had almost gone. The post-mortem examination showed a marked wasting both of the brain and spinal cord.

More lately I have had a case of general softening of the brain in a plumber. He had gouty deposits in various parts and excessively diseased blood-vessels. He had given up his employment two years before and had been lying in a demented state until his death. The lead was only a hypothetical cause, but its production of arterial disease has often been observed.

As regards the treatment of these cases, it is constitutional and

local. The iodide of potassium has been found most effectual in aiding the elimination of the poison from the system, whilst as regards the local treatment, all means have been superseded by the use of electricity. We formerly bound the arm on a splint, applied blisters and counter-irritants to the wrist, at the same time a small quantity of strychnia was often sprinkled on; and in this way when the lead was removed from the system the arm recovered itself. At a time when our only electrical apparatus was the faradaic one, we were in the habit of using it, and it is remarkable that although no immediately obvious effect was produced by its application good results often followed. It might have acted in some way by stimulating the blood-vessels and so improving nutrition. It is very different with the current from a continuous battery; this acts more readily on the paralysed muscles in lead disease than on healthy ones. The experiment is a very striking one, and you should see it for yourselves. On the muscles of a healthy arm you get contractility, both by faradisation and the battery current, but in the case of lead palsy you have no effect from the former, whereas the muscle is excited by an amount of simple galvanism which would have no influence on the healthy arm.

This peculiar reaction has been called of late the *reaction of degeneration*. It has been already spoken of in the case of infantile paralysis, but in the latter the spinal cord is diseased, whereas in the case of lead paralysis it has not been shown up to the present time that any other tissues are affected than those of nerve and muscle.

Case.—Mr. S—, a gentleman of middle age, was brought to me on March 11th, 1872, by Dr Charlton, of Fareham, suffering from a most severe form of lead paralysis. His whole frame was attenuated in consequence of the atrophy which his muscular system had undergone; his limbs were very much wasted, and he was proportionately enfeebled. He tottered when he walked, his hands shook, and were so weak that he with difficulty could raise them to his head or button his coat. His condition resembled that of a man with progressive muscular atrophy, only in this case it was induced by lead and was not idiopathic.

The history which he gave of his case was as follows: He lived in Surrey, about twenty miles from London, and had enjoyed good health until June 1871, when his arms and hands became tremulous, so that very shortly he was obliged to use both hands to raise fluids to his mouth to prevent spilling. He was recommended a change of air, and took a trip to Scotland; after being there a month he got considerably better and returned home. In a fortnight all the symptoms reappeared more severe than before. He went away again to Southsea, and there used salt-water baths, when he a second time rapidly improved, and at the end of a month returned home. Shortly afterwards, however, the old symptoms reappeared, when he was advised to consult a London physician. He was ordered to use galvanism in the form (he stated) of magneto-electric shocks, which did not benefit him, when his doctor, suspecting lead, had his drinking

water analysed, and found it to be strongly impregnated by lead. He was then, of course, put on a proper course of medicine, forbidden the use of water, and he improved. He had continued the use of the galvanism. He subsequently left London, and again went to Southsea.

When I saw him in March he had got into a stationary condition, and was in the state above described; his limbs wasted, and there was little power in them. I ordered him some small doses of iodide of potassium and quinine, and wished him to use a simple galvanic current rather than electro-magnetism. Finding there would be a difficulty in making use of this at his own house, I advised him to go to Guy's Hospital every morning, and to this he readily assented.

Mr Sandy, the electrician, tried the effects of the continuous battery current upon him, and also the induced current, with the following results. In the right arm the extensor muscles contracted well by the application of twenty cells of the Daniell's battery. The induced current was applied, as strong as the patient could bear, with scarcely any contraction. In the left arm the muscles contracted well by fifteen cells, and with precisely the same results as the right arm, by the induced or interrupted current. In the legs twenty cells caused good contraction, but scarcely any result was obtained by the interrupted current.

He continued the use of the galvanism to the limbs daily, and made visible progress.

On April 18th he had considerably more power in the limbs than he had a month previously, and on the muscles being tested it was found that the "induced" current, which had been powerless before, now excited the extensor muscles of the right arm. On application of the same strength to the left arm it extended the fingers much more than the right, but the hand was not lifted to the same extent.

The patient persisted in the treatment up to July, during the period gradually improving, and in August he had quite recovered the use of his hands and was following his usual occupation.

Case.—Margaret C—, æt. 47, admitted February 29th, 1872. She has been married and has a large family. Two years ago her husband died, when she was obliged to work for her living. She gained employment in some lead mills, her business being to grind the white lead. For some months past she has been getting thin and feeble, her arms wasted, together with stiffness and pain in the shoulders. Has had slight colic.

On admission she is seen to be a small spare woman, anæmic and sallow, looking indeed extremely ill. She is thin, owing to a general wasting of the muscles of the whole body, more in the extremities, and especially in the arms. She is too feeble to walk, and therefore obliged to keep her bed. She can scarcely raise her arms from her side, owing to the atrophy and weakness of the muscles; the extensor muscles of forearm are extremely wasted, rendering the arm quite flat; the wrists drop without there being the slightest power to raise them. Muscles of hand soft and flabby, the right arm and hand worse than the left, so that she cannot use them for feeding herself. The blue line on the gums well marked, and a distinct blue stain along the lower lip corresponding to the stained border of the gums. Slight œdema of eyelids. Ordered ten grains of iodide of potassium three times a day. Tested by electricity. Faradisation:—As much power as the patient can bear has a very slight effect upon the extensors of the thumb and not upon the other muscles. Continuous battery current:—Good and well-marked contraction of all the extensors by twenty Daniell's cells.

The continuous current ordered. Mr Sandy finds the more efficient method to be by placing the fingers in water containing a little salt; the negative pole is placed in the water, and the positive pole gently stroked along the extensors. This causes contraction of the muscles and elevation of the wrist; when the poles are reversed the current and the effect are less.

April 17th.—The continuous current has been used to the limb daily up to the present time, and the improvement has been marked though gradual. The blue line on the gums is much less. She is out of bed to-day for the first time. As the improvement has been going on, so the muscles have become susceptible to faradisation, whereas they have required a larger amount of simple galvanism to affect them.

May 13th.—Improved considerably; walks about. Is able to feed and dress herself. Can extend the wrist, and the arms are larger in bulk. Blue line on gums and lips disappearing. On testing with faradisation there is marked contraction in the extensors, the hands being well lifted; this is more so in the left arm than the right, the right being always weaker and smaller.

In this case it may be remarked, that besides a well-marked blue line along the edge of the lower gums there was a dark patch on the mucous membrane of the under lip, corresponding in position to that on the gums, but rather more defined and dotted. A question is always asked in the wards whether this mark on the lip is formed independently or follows that on the gums from contact? The latter is the probable explanation.

In these cases of dropped wrist the back of the hand is often observed to be rounded, apparently from enlargement of the metacarpal bones, but due in all probability to some thickening of the thecæ.

Plumbism treated with Electric Bath

Case.—William J—, æt. 36, admitted under Dr Wilks, July 17th, 1872, and left July 27th. He began to work at grinding lead nine months ago, and at the end of about five months commenced to feel ill, with loss of appetite, pains in his head and abdomen, and general debility. He continued at his work, but daily grew worse, until a week ago, when he was obliged to desist, having pains in his limbs, sweating, inability to stand, and vomiting.

On admission he was seen to be very pale and very thin, having evidently lost a great deal of flesh. Skin hot, tongue furred, marked blue line on gums. Constipation. Recti abdominis contracted and painful.

July 20th, ordered an electric bath. This was made by Mr Sandy as follows: The bath being prepared, enough sulphuric acid was put in it to give it a slight acid taste (about ʒiv), the negative pole of the battery, attached to a large sheet of copper about two and a half feet square, was put upright in the bath, and the patient placed in it so as not to touch the copper plate; the hand of the patient was held out of the water, and in it he held the positive pole. Fifty and eighty cells were tried, but when the current was applied to the neck instead of the hand, the patient could not bear more than fifty cells. On making and breaking contact the patient felt a kind of thud through the whole of the body. A bath lined with glazed tiles was used.

The patient used the bath again on the 24th, and a third time on the 25th. He said he felt very cold after it. He always had his bowels relieved immediately after it. On each occasion he felt better, and on the 27th he was so much improved that he went out.

This method must be put into further practice, for it will no

doubt produce good results. Dr Handfield Jones informs me that he is using it with success, and showing that its value is not due to galvanism alone, I may state that lead has been found in the bath after the water has been used a few times. The placing the limbs in water and sending the current through it seems in all cases to have an advantage, as in the case of Margaret C—, just described.

Dr Jones's case was that of a man, æt. 30, who was a severe sufferer from lead poisoning, having had colic and subsequently great atrophy of muscles of arm, and was altogether much wasted. His voice, too, was very feeble. He had been in hospital for six months, and had been taking iodide and been galvanised without benefit, when the bath was used. One pole of the battery was placed to the nape of the neck and the other to the feet, while he was in the water at the temperature of 85° F. The bath was used daily. In a month he was making rapid recovery, and in three months was quite well.

Mercurial Paralysis.—There are many other poisonous substances, more especially the metals, whose effects in small doses might be advantageously studied in connection with idiopathic diseases. I have spoken of lead, since the results of its action resemble so closely those of a well-known disease; and I shall now just allude to mercury, as its poisonous effects have occasionally been referred to spontaneous causes, and because, in a complete saturation of the system, the nervous centres seem to be most strikingly affected. Formerly the effects of mercurial vapour were constantly seen in looking-glass makers and water-gilders, who exhibited the well-known mercurial tremor, and these same persons, if they persisted in the employment, became at last quite shattered in health. The mercurial paralysis was distinguished from paralysis agitans by the tremors occurring only when volition was exerted on the muscles, as in moving. When the limbs were rested they were quiet; not so in paralysis agitans. When the patient walked he staggered. If he moved his arms they trembled, and the muscles of his face trembled in talking. Such instances are at the present time by no means numerous. I have seen, however, within the last few years, two cases showing in a much more striking manner the destructive nature of mercury, but in neither case was it due to the inhalation of the metallic fumes, as formerly witnessed.

The first case was that of a man admitted into the hospital for a form of general paralysis from which he was suffering. It was discovered that he had been in the habit of packing the skins of animals, and that these had been washed with an acid solution of mercury. After he had been thus employed for three years he

began to experience a general muscular weakness. He could scarcely walk, and, when he attempted to do so, a tremulousness took place over the whole body. When lying down he had spasmodic movements of the chest and of the muscles of the trunk, resembling those of chorea. He gradually became more feeble, was delirious at times, and afterwards fell into a state of unconsciousness. The post-mortem examination showed no evident disease of any of the organs, but a chemical analysis by Dr Taylor proved the existence of mercury in many of the tissues of the body.

A more marked case than even this of the destructive effects of mercury on the body I had an opportunity of seeing in St. Bartholomew's Hospital. A young man had been engaged in the laboratory in the preparation of mercurial methide for about three months, when he began to complain of dimness of sight, numbness of the hands, and general weakness. These symptoms increased, until at last it was necessary to send him to bed. When I saw him he was almost completely paralysed; he was lying prostrate in bed, perfectly helpless, being scarcely able to move either his arms or legs, and there was paralysis of the bladder. He could not speak, and was quite deaf. The heart's action was quick and feeble. The mouth was not sore, but I was informed that the gums had been at one time spongy, and emitted a fœtor. He got weaker and weaker, and died in about a fortnight.

Another young man, employed in the manufacture of the same article, was also similarly affected, the symptoms being those of a complete paralysis of body and mind. He lost all feeling, all power of motion, became deaf, unable to speak, and quite idiotic.

But recently a girl was under my care who came from the same factory as the man whose case I have previously mentioned. She had not worked long in the skins when she began to lose power in the hands. On admission they were flexed, and she was quite unable to grasp any object; she said they felt "numby," but there was no marked anæsthesia. She stated that her feet felt like her hands, but to a less degree.

Owing to changes in various manufactures we do not often meet with cases in the hospital, but occasionally we see them recorded in the journals. Thus:

CASE.—A man, æt. 55, was under Dr Cayley at the Middlesex Hospital. He was a looking-glass silverer; he first perceived a trembling in the hands, then his speech became affected, and finally there was general weakness and emaciation. On attempting any voluntary movement, as putting a spoon to his mouth, it was done in jerks; he had little power to grasp, and he brought out his words slowly. He afterwards had paralysis of the rectum and bladder, became delirious, and had to be restrained; his pulse was very quick and feeble; his teeth were good and firm. He took iodide, good nourishment, and gradually got quite well.

CASE.—This was of a man who worked at amalgamating zinc. He first found his arms and legs shaking, then pain in chest and abdomen. Subsequently he had difficulty in speaking and tremor of face, tongue and limbs. Staggered when eyes were closed. There was no wasting nor loss of sensation. Bladder normal. He was very emotional and often cried.

SPASTIC OR SPASMODIC SPINAL PARALYSIS

In speaking of meningitis I said that the symptoms were those expressive of irritation of the cord, and that spasms and rigidity of the muscles were its constant phenomena. Later observations (especially those of German physicians) have tended to show that these symptoms are more frequently the result of a chronic myelitis of the antero-lateral columns, and that a paraplegia combined with rigidity is due to a primary *sclerosis of the lateral columns.* More cases are required, however, to place this statement on a positive basis. I think it better, therefore, to give an account of the cases from a clinical point of view, leaving their pathology to be afterwards determined; for at present it seems to me that many instances which formerly would have been regarded as chronic meningitis would now be looked upon as lateral sclerosis. I shall therefore speak of it as spasmodic or spastic paraplegia.

The disease begins as a motor paralysis, gradually increasing from below upwards until the muscles assume a permanent rigidity. There is no loss of sensibility, and no change in nutrition, nor are there any troubles connected with the bladder or rectum. In some cases where rigidity ensues the preceding symptoms have been lightning pains in the limbs or pains of a tearing character. At the same time all the reflex movements are increased. When, for example, one leg is crossed over the other, and the ligamentum patellæ is struck, the leg will jump higher than it does in the healthy state, and other muscles very readily contract when struck. When the patient attempts to walk the legs seem to stick to the ground, and he goes along with a hopping gait, as the toes strike the ground at every step. The unsteady walk makes the body look as if it were moved with great difficulty. When the foot is on the ground and walking is attempted, a great tension of the muscles immediately comes on. When the patient lies down the legs are stretched stiffly out, and if we try to raise one of them the whole body may be lifted up like a corpse; or if one leg be raised and suddenly released it will often suddenly fly across the other leg. If the foot is grasped in the hand and forcibly flexed towards the body the whole limb will undergo a violent quivering from contraction of the muscles. After a certain period the muscles of

the trunk may be affected, and subsequently the arms, and then the same reflex reactions will be observed as in the leg.

Erb and other German writers believe that in this spastic paralysis the disease is due to a primary sclerosis of the lateral columns of the spinal cord, affecting more especially the posterior parts, or those which are called the pyramidal tracts proceeding from the motor columns on the other side. The sclerosis is seen as a number of wedge-shaped hard grey masses, and so differs, it is said, from the sclerosis due to a descending degeneration, which is found more anteriorly and in a more rounded shape.

Of course if this form of paralysis is due to grey degeneration of the lateral columns there can be no cure, but one reason which I offer against the assumption that this pathological change must always be at the basis of such cases is that instances of spastic paralysis are occasionally seen which are cured, or at least recover. A case of a young woman under the care of Dr. Fagge got considerably better under the continued use of physostigma.

I have read of several cases of spastic paralysis where recovery has occurred, showing that it was not possible that sclerosis had existed. One case was reported from Strasburg of a young man with the most marked symptoms of this disease; his legs were stiff, and other muscles in a state of tension; if the leg was forcibly stretched and let go it would fly back and the heel would strike the buttock. All the reflexes were much increased. After a time he gradually improved, and at the end of a year was quite well.

Dr Russell also described the case of a patient who had spastic paralysis and quite recovered.

Freidreich doubts the pathology, although he recognises the clinical phenomena. He believes they may occur under various forms of affections of the cord.

There has however been a case recorded by Dr Morgan and Dr Dreschfield, of Manchester, which appears to corroborate the statement of Erb, and was regarded by them as one of primary lateral sclerosis.

Case.—J. N—, æt. 45, was admitted into the infirmary May 5th, 1880, and died on July 7th. He attributed his illness to standing in the water two years before. He afterwards had weakness and numbness in one leg and then in the other. Subsequently all the well-marked symptoms of spastic paraplegia came on. There was heightened reflex action, no anæsthesia, no weakness of bladder or rectum, no bed sore, &c. He died of thrombosis of the veins.

The post-mortem examination showed the brain healthy, but there was a very slight change in the anterior pyramid in the lowest portion of the medulla. The

cord showed no alteration to the naked eye either externally or on section. When hardened and stained changes were then distinctly visible. A patch was seen in each lateral column, and most marked in the dorsal region, being less in the cervical and lumbar. The upper cervical portion of cord showed a sclerosed patch close to the posterior horns. The direct pyramidal tract in the anterior column was slightly stained by the colouring matter, showing the increase of neuroglia. In the lower cervical region it was more pronounced, and both the lateral pyramidal tract and the direct tract contained a patch; it was close to the posterior horn, but did not reach the anterior horn. The dorsal region was affected in the same way. The lumbar cord was also affected by a triangular patch. The sclerotic patches showed an increase of Deiter's cells, numerous nuclei, and fibrillæ. The nerve fibres had disappeared or were reduced to axis cylinders.

In the following case the symptoms could be followed from their commencement in an injury. The disease appeared to begin externally and proceed inwards to the medulla.

Case.—Wm. B—, æt. 10, admitted under Dr Wilks, May 15, 1872. He stated that ten months ago he received a blow between the scapulæ, which hurt him very much, and required the advice of a doctor. He stayed at home for a week, being unable to walk on account of the pain in the back. He afterwards again went to school for eight months, but never lost the pain. Six weeks ago he began to lose power in his legs, and the weakness had gradually increased up to the present time.

On admission he was seen to be a well grown boy, and did not look ill; he could not walk without assistance, being only just able to stand alone. His only symptom was partial loss of power. Sensation unaffected. On the supposition that some inflammatory process might have been set up by the injury he was ordered the Liq. Hyd. Perchlorid. ℥i, and Potass. Iodid. gr. iv, three times a day

After four weeks he thought his legs were a little stronger, that he could move them better, and he was able to stand. He continued his medicine, but at the end of another month it was evident that there was no real improvement, for he was beginning to feel pain in his legs; at the same time they were less sensitive, and the muscles were beginning to be rigid. There was also some weakness of the bladder.

On July 9th he was galvanised. When a continuous current of thirty cells was applied to the spine, the arms were moved outwards, and the legs drawn up in jerks. Faradisation to spine had no effect, and when applied direct to the legs the muscles did not respond.

At the beginning of September the spasmodic contraction was increasing, so that he had a sand-bag placed across his thighs to prevent them being drawn up, the continuous current being used daily to the spine. He was ordered gr. ¼ of Ext. Physostigmatis three times a day, and after a week was increased to gr. ½. By mistake he took a double dose, 1 gr. He soon became very ill; and when the house physician was called to him an hour afterwards he found him with a clear froth coming from his mouth, perspiring profusely, his face turning blue, hands cold, numb, and almost powerless. Pupils of natural size. Pulse 130. Quite sensible. He had an emetic powder, followed by warm water, and three hours after taking the pill he had quite recovered.

The above-named paralytic symptoms increased, and at the beginning of October the legs were quite rigid, so that by lifting the heel the whole body

could be raised; the knees were bent with great difficulty, but, if so, the legs suddenly contracted or flew up to the body. Sensation had also become much impaired as high as the sixth rib. Almost complete loss of power of bladder. Ordered Succ. Conii, to see if it had any influence over the spasm, and he took it a few days, but with no result. It was observed that his abdomen was flaccid immediately after raising his clothes, but upon feeling it the recti became quite rigid. The same fact had been observed before in the legs; they became much more rigid after being touched.

On November 1st the limbs were again tested by galvanism and faradisation. The muscles responded to both, but their susceptibility was impaired, being much less than that of the arms.

Case.—James M—, æt. 33, a sailor, had a genital sore, but it is very questionable whether he has had constitutional syphilis. Six months ago, whilst in the Mauritius, he began to feel weak in his legs, and to walk as if he were tipsy. The weakness gradually grew worse, and the limbs were beginning to contract when the doctor applied a red-hot iron three times on each side of the spine. No good result followed, and the contraction gradually went on, especially in the right leg. Whilst on shipboard he used to keep the leg forcibly down by a weight.

Admitted to hospital on October 21st. When placed in a chair he sat with his knees drawn up to his chin, his heels next to his buttocks; the legs quite rigid, so that by attempting to extend one of them his whole body would be lifted up. The right leg, which was first affected, was more rigid than the left. The knees came together, although one was a little lower than the other. No pain over the spine. No difficulty with bladder. The muscles hard, extensors somewhat wasted, tendons rigid. He was placed under chloroform, when the left leg was readily extended, but the right could not be moved from its position. Tested with galvanism. On applying the continuous current to the extensors of the left thigh, and making and breaking contact, the muscles responded, but this was more marked when faradisation was used, the limb then becoming nearly straight. The muscles of the right leg acted in the same manner, but with no tendency to straighten the limb. Sensation unimpaired. Unrelieved.

Case.—Robert K—, æt. 27, admitted October 22nd. A sailor, and has passed a great part of his life abroad. He states that he had a venereal sore about seven years ago, but had no secondary symptoms. About three years ago he was attacked with violent pains in the head and neck, the latter becoming stiff, which prevented him moving it in the least. He remained in this state for a month or six weeks, when the stiffness left his neck and extended across his shoulders and down his arms, so that he was unable to raise them or to flex his fingers. He thinks some of his finger-joints were swollen at the time. Subsequently his legs became weaker and weaker, although he was able to walk about, and he thinks his knees swelled. After some time the pains appeared to descend to his loins, leaving the upper part of the body, and at the same time as his arms improved his legs became worse. He was unable at last to walk, and was forced to keep the recumbent position. His legs then began to contract and be drawn up towards his body. He began also to lose control over his rectum and bladder. For more than a year his legs have been in this position.

On admission he presents the appearance of having been a well-made and very powerful man, his chest well developed, and viscera healthy. His legs are tightly flexed on his thighs, and his thighs on the pelvis. A considerable force is required

to straighten the legs and keep them stretched out, and immediately you lose hold of them they fly up, as would a spring, into their former position, the heel striking the buttock with a sensible slap. Some little pain is experienced when practising this manœuvre. The joints are quite flexible, the resistance being due to spasm of the muscles. The legs are smaller than natural, but there is no active wasting of the muscles. Sensation is considerably impaired; he can feel, but cannot define very well the spot touched. The temperature is normal. The reflex action is very well marked, the legs, after being stretched out, being suddenly drawn up on pricking the feet. He thinks the arms are not much affected, not being more feeble than his long illness would necessitate. There is a swelling of the right ulna. He was ordered Iodide of Potass. in the Mist. Hyd. Perchlorid. He had been galvanised before he came in.

On November 12th he is better. Ssnsation more perfect. He is able, after forcing his limbs straight by pressure on the knees, to keep them straight for a short time, but any little excitement, and especially any one touching the bed, will cause them to fly up again. He was subsequently galvanised, and was ordered tonics. He again, however, returned to the mercurial mixture, and was so much better as to be able to sit up in a chair, but could never walk.

Case.—Chas. R—, æt. 26, admitted into Clinical Ward October, 1878. He went out to Australia in 1875. He was there exposed much to the weather, but had no injury except from the back of the seat of a coach striking him from its making a sudden jerk whilst on the road. For some time he had found a little difficulty in making water. He then began to experience a weariness after walking; his legs then became weak and sometimes would give way under him; they would often also suddenly jump or start up. He went to the Brisbane Hospital where the catheter had to be used, and he lost sensation as high as the umbilicus. Then the legs became gradually rigid. He then returned to England.

On admission it was found that he could scarcely feel in his legs; they lay stretched out and powerfully adducted, so that if separated they flew together again or crossed over like a pair of scissors. When he slept on his side the legs were slightly flexed. When held up he rested on his toes, and on trying to walk each leg was convulsively thrown forward in front of the other. Patellar tendon-reflex increased. Both galvanism and faradaism acted well. When placed under chloroform, although the muscles of the upper extremities were perfectly relaxed, those of the legs became only partially flaccid, the adductors still felt hard, and when the legs were separated they flew together. He was in the habit of passing the catheter himself. He was treated by mercury, iodide, and galvanism, but left the hospital unrelieved.

It will be observed that, unlike the typical cases of spastic paralysis, whose cause is supposed to be a sclerosis of the lateral columns, there was here anæsthesia and paralysis of the bladder. If the latter symptoms were due to some affection of the grey sensory column, it would have precluded the theory that this part of the cord is in a condition of superexcitation in spastic paralysis. The case, therefore, might suggest that the older theory of a chronic meningitis, by which the roots of the nerves were involved, might be a more likely interpretation of the case. The anomalies of it suggested to one of my colleagues a case of malingering.

I have now a man in the hospital who has had syphilis, and three months ago began to have pains in his legs, followed by some loss of sensation. He then found them getting stiff and beginning to contract, so that he could no longer walk or move. He is now in bed, with his legs drawn up; when pulled down they remain straight for a short time, and then contract again. The excito-motor function is increased, so that the legs jump, and he is sometimes almost thrown out of bed.

Another patient of mine has rigid legs, but they are extended out straight; if one be lifted up higher than the other, and then let go, it will fly across its fellow like a spring. We one day got him up and sat him in a chair, but the legs remained straight out as before, and when we raised him on his feet he was obliged to be supported, for his legs were of no more use to him than those of a stiffened corpse.

In these cases of paraplegia, where a slow contraction comes on, there is probably a chronic meningitis of the lower part of the cord, to which probably has succeeded a sclerosis of the antero-lateral columns. Thus, a woman was lately in the hospital suffering from pains in the legs, which afterwards became powerless, and then contracted. She lay in bed with the legs drawn up and closely flexed towards the body, the heels touching the buttocks and with sometimes spasmodic jerking in them. Sensation was not impaired, and there was no paralysis of the rectum or bladder.

In primary hemiplegic rigidity the pathology is more difficult to understand, because a disease of one side of the cord only, through a considerable part of its length, must be regarded as a very unlikely occurrence. We might, therefore, surmise that in some cases of the kind there might be only an affection of the nerves to account for the paralysis. For example, a woman, æt. 46, had found that during nine months her left arm and leg had been getting stiff and powerless, so that when admitted to the hospital she was obliged to keep her bed. The arm was flexed and the fingers clenched; the muscles also were wasted and rigid, so that the limb could not be straightened. The leg, in like manner, was flexed and contracted. Sensation was perfect.

Paroxysmal or Transient Spasm.—In the cases already mentioned an increased excitability of the grey centres has apparently existed. I say apparently, since the cause of the exaggerated excito-motor phenomena might have been owing rather to the presence of some unnatural stimulus than to any change in the cord itself. This would seem to be case where the spasm and rigidity are only paroxysmal, and induced by some outward form of stimulus. In many cases the spasm is sufficient to prevent movement, although

there is no paralysis in the ordinary sense of the term. The principal circumstance observed is the extreme excito-mobility brought into play when the surface of the body is touched. In one case of the kind the spasms of the muscles were not only most painful, but what was remarkable, a spasm of the blood-vessels occurred simultaneously, judging from the pallor and coldness of the skin which always accompanied the attack.

The following is the case of a man now in the hospital:

CASE.—Peter C—, æt. 40, was taken, four months ago, with pains in his limbs and back, followed, after another two months, by numbness and stiffness, which almost prevented him walking. Whilst lying in bed the man appears well and sound; he says he can feel well, but when his feet are tested by heat and cold he hesitates as to which one is touched, and electro-mobility seems somewhat impaired. The muscles are firm and natural, and he can throw his legs about in any position. As soon as he gets up, however, and places his feet on the ground, all the muscles of the limbs become spasmodically contracted, remarkably hard, and he is fixed to the ground. It is only by the greatest effort he can move, and slowly walk. He is being galvanised with some good effect.

The following is a case, not so simple as the one I have related, but it illustrates a morbid state of the cord when thrown into action by an effort of the will, or through some reflex influence of its nerves.

CASE.—James D—, æt. 53, admitted May 3rd, 1871, employed as a dredger on the River Thames, and consequently always exposed to the weather. A year ago he first began to experience cramps in the lower extremities, and these have gradually increased until the present time, so that he has a great difficulty in straightening his legs after having been in a sitting posture. The cramps are accompanied by much pain. He has also suffered from spasm of the abdominal muscles.

He is a healthy and powerful-looking man. All his organs sound. He can walk steadily and for some distance, apparently having nothing the matter with him, but after sitting in a chair for some time, if an attempt is made to move, the most violent pains and spasms come on. He consequently prefers to lie in bed, for then he escapes these painful symptoms. Ordered Mist. Hydrarg. Perchlor, with Potass. Iod. At the end of a fortnight he thought he was better, and therefore was ordered to get up and have the continuous galvanic current applied to the spine. After a few applications the patient expressed himself as feeling much better; his legs were more supple, he did not have so much pain, and the contractions were not so frequent. For about an hour after the galvanism had been applied he said he felt as well as ever, and his legs moved more easily. He continued improving, having no pains, except when walking or moving the limbs, until June 12th, when he complained that all his old symptoms had returned, he had shooting pains all down his legs, even when sitting still, and they awoke him at night. When walking he had more pain. Subsequently he had inflammation of the eye and sickness. When better of this he was put on Succ. Conii ℥j ter die. He improved slightly, and then relapsed. He afterwards had strychnia and on July 14th he left, being scarcely any better than when admitted.

I have also had two other cases of patients who, immediately they attempted to get out of bed and stand, were seized with violent tremors. Sir J. Paget relates the case of a gentleman who, immediately he placed his feet on the ground, was seized with numbness and coldness, so that he could not walk. He has styled it "local syncope."

Sudden spasmodic contractions or cramps of particular muscles as of the limbs or jaw, I shall afterwards refer to.

Case.—Robert R—, æt. 25, a rope twiner. For twelve months his legs had been getting weak, and for the last three months he had been unable to work, and for two months had kept his bed. He was a well-developed man, and looked in good health, his legs firm, and muscles not at all wasted. He could scarcely move them, and was unable to rest his weight upon them. The most remarkable circumstance was the constant fibrillar tremor passing from one muscle to another. This seemed increased when any effort of the will was directed upon them. He was ordered galvanism, and an improvement at once commenced; he was soon able to stand, and then to walk, so that he left the hospital cured at the end of three months.

In this case so few objective symptoms existed, that if it had not been for the tremor I should have regarded it as one of malingering I suppose it was a real temporary akinesia.

SCLEROSIS OF CORD COMBINED WITH PROGRESSIVE MUSCULAR ATROPHY

Although the tendency of morbid changes is to progress in given anatomical and physiological tracts, yet disease may be of a coarser kind, and attack several portions of the cord in succession. Consequently a combination of the affections of which I have been speaking may occur, and, amongst others, we occasionally meet with cases where a spasmodic rigidity of the muscles is combined with wasting. In these cases, in all probability, the cord has undergone sclerotic changes in the motor columns, and the anterior cornua of the grey matter have also become involved. The pains in the limbs which are met with may be due to the nerves being implicated, although there is no actual anæsthesia.

In cases of this nature described by M. Charcot under the name of *sclèrose laterale amyotrophique* the affection is said to be first noticed in the upper part of the body, differing herein from the cases of primary and unmixed lateral sclerosis, in which the legs as a rule first suffer. It is characterised by twitchings, numbness, and contraction; the arms lie semi-flexed across the trunk, and the hands are flexed. Then wasting of muscles ensues. Most cases of this kind appear to end with symptoms of bulbar paralysis.

They generally run a course of from one to three years. In the most distinct cases that I have seen the patients have been markedly inebriate. It was so in the following cases :

CASE.—A lady, æt. 40, after having given way for some time to intemperate habits, began to suffer with the ordinary gastro-hepatic derangement, and at the same time became, as is often the case, very enfeebled in mind and body. It was then evident that her cerebro-spinal centres were the parts more especially affected; she began to have pains in the legs, and an inability to raise them, as in walking up stairs. It was not many weeks before she took to her bed, and the paralytic symptoms grew rapidiy worse. She was getting imbecile, her body was wasted, she was scarcely able to draw up her legs, or to raise her arms from her side; when she did so her hands fell down, as in lead palsy, and could not be extended, and she had lost power over the fingers; the muscles were wasting especially those of the hand; she had great difficulty in appreciating touch, and, as regards the feet, there was almost complete anæsthesia of common sensation, but she could discern the difference between heat and cold. Much restlessness. No paralysis of the sphincters.

CASE.—Mrs L—, æt. 38, a married woman with children. During the last three years she had become very intemperate, and at first suffered from the more usual gastric and hepatic derangements. About four months before I first saw her, nervous symptoms set in by some failure of mental power, with weakness and pains in the limbs, and at last, six weeks before I visited her, she took to her bed.

I found her a fair, good-looking woman, who answered my questions rationally, but apparently forgetful, as she did not know how long she had been confined to her bed. She was almost completely paralysed from wasting of the limbs and atrophy of the muscles. She could just raise her arm from the chest, but it remained flexed at the elbow, which was stiff; the hand was flexed at the wrist, as is seen in painters. The interossei were wasted, and the thenar and hypothenar eminences had almost disappeared; the muscles of the forearm were also much wasted. She could not move her legs, which were very thin and flabby. There was a considerable amount of fat in the integuments. No marked loss of sensibility, the skin appearing irritable, although she hesitated when asked what part of her hand was touched. Vision not affected. No paralysis of bladder or rectum; no sickness. Fidgetiness. From the uniform onset of the symptoms there could be no doubt about the central origin of this affection being in the spinal cord. I heard that she lived for some months after this, eventually getting blind and having convulsive fits.

CASE.—A woman, æt. 43, was in hospital in July, 1879. She had been very intemperate, but had had a family and brought up children. About six months before admission she began to feel weak; had fainting fits and frequent vomiting; her memory failed and her mind became generally enfeebled, and occasionally she got excited. At the same time she had pains in her legs, with feelings of pins and needles and numbness. After a time similar symptoms were complained of in the hands, which gradually lost power and became contracted. She took to her bed, and her legs became by degrees drawn up.

On admission she lay on her side with her legs drawn up, rigid and much wasted. It caused her much pain to endeavour to straighten them. The fingers were stiff; the ring and little finger flexed, whilst the others with the thum

were extended. The arm was flexed, and the muscles had undergone atrophy, which was especially noticeable in the flattened forearm and the muscles of the thumb and little finger. She often cried out from pain in the limbs. Her mental condition was feeble; sometimes she was singing, at others crying. There was partial paralysis of rectum and bladder. After some weeks considerable improvement took place, which was seen mostly in the arms; they became flexible as well as the fingers, and the muscles grew. The legs also partially improved, remaining flexed, and she was still quite unable to stand on them. Her mind improved, but was still feeble. When she left she was considerably better than on admission.

Case.—Mrs B—, æt. 45, addicted to great excess in wine and spirits. After suffering from the usual gastro-hepatic disturbance, she became excessively weak and was obliged to take to her bed. When I saw her she was unable to raise herself in bed, and could with difficulty draw up her legs. The arms were flexed across the body, and she could only just raise them by means of the shoulder muscles. Those of forearm quite powerless. The hand was flexed, and dropped as in painters' disease; she was quite unable to extend it. Some pain was produced in the palm of the hand on an attempt at extension. All the muscles of the upper extremities were wasted, but more especially those of the forearm, both extensors and flexors of the limb being quite flat. The intrinsic muscles of the hand were also affected, as of the thumb, little finger, and interossei. There was almost complete loss of common sensation in the arms, but she could appreciate heat and cold. When my cold hand touched her palm she called out as if it had pained her. The legs were anæsthetic; she did not know when they were touched, but could distinguish between heat and cold. There was reflex action when the soles were touched. Her mind was weak.

When I saw her again, three months afterwards, the continuous galvanic current had been used to her limbs, and she thought she was better as she could raise her right arm from the bed, but the fingers of both hands were undergoing firm contraction. Although the hands were anæsthetic, pain was produced on attempting to stretch the fingers and wrist. The feet were stretched out, and the legs were anæsthetic as high as the middle of thigh.

The following case given by Dr Russell in the 'Medical Times and Gazette' for January 24th and 31st, 1880, is of a different kind, but is interesting as showing the implication of the grey matter subsequently to that of the lateral tract.

Case.—A woman began to suffer from dragging of one leg, and, after some months, of the other also, when stiffness came on. On admission to hospital there was rigid contraction of both legs. She lay with both legs stretched out. and almost powerless, although she could roll herself out of bed. One leg was disposed to be drawn across the other. None of the reflexes were exaggerated, as is usual in these cases.

She then had a febrile attack (which might possibly have been urinary, as she had some cystitis) with pain, vomiting, &c., and after two or three days the limbs became flexible, muscles soft, and no reflexes. The arms became so feeble that she could scarcely move them, and now atrophy rapidly set in. After this, slow contraction occurred, and the legs became permanently flexed.

Here there was spastic paralysis, followed by feebleness and atrophy, as if the ateral columns were first affected and subsequently the grey cornua.

PARALYSIS AGITANS

This is a disease where the muscles are in a state of tremor caused by some fault in the innervation. Generally speaking, trembling implies a want of nerve power, as may be experienced in one's self when the hand shakes from fatigue; indeed, it is one step towards absolute powerlessness; the shaking arm is the midway condition between a well-knit limb indicative of muscular force and one which is helplessly paralysed. The trembling limb is often seen in old age, in which case we can only attribute it to a degenerative change in the cells of the spinal cord; and therefore we should not be surprised to witness the same symptoms in any disease which impairs the functions of the cord, such as chronic alcholism. From these facts we might be inclined to infer that tremor implies a powerless condition of the nerve centres, arising either from an organic or some temporary exhausting cause.

Unfortunately I cannot say that this is the pathological law, since the very disease of which we are about to speak often occurs in persons of middle age, and who exhibit no loss of muscular power whatever. Eventually a weakness may ensue, but the disease may last for some considerable time, without evincing any feebleness on the part of the muscles.

It is therefore necessary to speak of *active* and *passive* tremor. The tremor of old age and of exhaustion is of the passive kind, and is only witnessed when any voluntary power is exerted on the muscle; for when at rest the limbs remain motionless. The other or active form of tremor is observed whilst the arm is rested, as if the motion were due to some intermittent action of the spinal centres; being, in fact, a kind of convulsive phenomenon. If the hand is held, it still continues to shake, and, as regards its power, it may be as strong as the other. We cannot regard, therefore, such a case as showing a want or failure of supply of nerve influence, but rather as if an abundance of nerve force stored up in the centres had passed beyond the control of the higher nervous influences, and so escaped intermittingly.

Paralysis agitans generally begins slowly by a weakness in the fingers of one hand, which is often first discovered by a difficulty in holding the pen in writing; subsequently the hand is observed to shake. After a few months, when this is more fully developed, it will be seen that the hand is in constant movement; if the hand be held the motion for a moment ceases, but it soon begins again. The trembling may remain confined to the hand for several months, and then it may gradually extend to the arm; after a time, the

other arm is affected, until both limbs are in constant agitation. Subsequently the malady may affect the legs, so as to cause tottering in walking, and finally, the muscles of other parts of the body. As regards the face, the muscles do not participate in the movement, but after a time there may be observed a loss of expression; this may be attributed to the slight rigidity which nearly all the muscles finally undergo. The head, too, is not affected in the same way as the limbs. In persons where the head is constantly seen shaking the tremor is generally due to age, and the paralysis is therefore of the passive or senile form. The disease makes a very slow progress, but when after some years it has affected a large part of the body the patient may be observed sitting in his chair, with a vacant expression, and his hands in his lap, the fingers and thumb rolling over one another in constant movement, calling to mind the action of rolling a cigarette; or as he stands his position is equally characteristic; he stoops forward in a feeble helpless way, and his face is expressionless. In some cases the hand is stretched out in a conical form, as if holding a pen; in other cases the fingers are bent so as to form a right angle with the metarcarpal joint. The joints themselves sometimes become distended, as if the patient were the subject of chronic arthritis, or as sometimes seen in various spinal affections. The speech is not characteristically altered, but it may be somewhat trembling, from the constant movement of the muscles. There is no nystagmus. When the patient rises from his seat he tumbles forward, scarcely moving his legs from the ground, so that he looks as if every moment he would fall were he not quickly to take another step to save himself. To use the words of Trousseau, he looks as if he were always pursuing his own centre of gravity. This mode of gait is so striking that the disease has received the distinct name of *paralysis festinans*.

The movements cease altogether during sleep or under the action of powerful narcotics, but during waking the movements are continually going on, quite independently of any efforts on the part of the patient, although they are aggravated by any voluntary act. We may notice that in paralysis agitans, although the limbs tremble involuntarily, the patient can arrange his movements. Now where the movements are very irregular and purposeless, to these I should rather give the name of chorea, even though the patient were advanced in years.

As regards its pathology nothing is positively known. A patient with a marked form of this disease died in the hospital of typhus, and his cord presented no marked morbid change. In old people a tremor may no doubt be reasonably attributed to senile changes in

the cord, but in the middle-aged and the strong the cause is not so obvious. In a case lately observed by Dr Murchison some degenerative changes were found in the cord. Dr Dowse has related a case where he found degeneration in various parts of the cord as well as the brain. I believe there is no reason to think that an injury might induce the disease, but several cases have been recorded where a fright or severe moral shock has preceded its development. I have myself known this as the most probable cause in two cases.

Charcot says he has seen several cases where the tremors commenced in a limb which had previously been injured or sprained.

These patients do not experience pain, but they seem as if conscious of some irritable state of their nerve centres, and thus suffer from what are commonly called "fidgets." They sometimes feel an uncontrollable want to move from one position to another; they have no sooner seated themselves than they again rise and walk round their room. When tired they resume their seat, but it is not for long; they are up again, as if influenced by some indescribable desire to keep in motion. I think you may form some notion of what these feelings are like by reflecting upon the uncontrollable desire to move one's limbs or fidget them after having been long in a restrained position in a railway carriage; some of us are very liable to them without apparent cause. I have on several occasions been consulted in the cases of patients, generally old people, in whom the "fidgets" has been the main symptom, and a most distressing complaint it is, both for the patients and those around them. I know a gentleman whom on my visit I find sitting in his chair with a slight tremor upon him, and who immediately asks if nothing can be done for him: he gets up and wanders round the room, continually complaining; if he is pacified and made to sit down, it is only for a few moments, when he again rises and roams round his room, saying he cannot bear his feelings. This patient and others have been otherwise intelligent and evinced no delusions, although their constant restlessness has certainly resembled what is so often seen in maniacs:

The following are the last two cases recorded in my note-book of paralysis agitans:

Case.—A man, æt. 49, said that a year before a trembling commenced in his right hand; this extended to the arm, which was then constantly moving, and was not relieved by resting it. It was quiet when he was asleep. He was a well-developed, healthy-looking man, and had no other complaint but the tremor of the arm; this was not at all wasted. It had been gradually getting worse, and continued to do so during the following year, when I lost sight of him. All the remedies he used were unavailing.

Case.—Mr S—, æt. 59. Three years ago he commenced to have tremors in his right hand when he grasped anything, and after some months he found the hand shaking at all times. At the end of the year the other hand and arm began to be troubled in the same way, and after some months more the legs began to shake. He still continued at his business, which compelled him to travel about; he was able to walk good distances, but shuffled and shook as he went, and thus attracted a good deal of attention to himself. He had sought advice from the best men in London, had taken the usual medicines, and also used galvanism in its different forms, both to the spine and the limbs, without any good effect, the disease having gradually progressed. At the present time he is very thin; as he lies on his couch he trembles all over, the muscles of the face being also involved in the movement, which gives a stammering character to his speech. The muscles are also getting somewhat rigid, more especially in the arms and on the right side, where the fingers are held stiffly out. There is no loss of sensation. He is quite intelligent, but fears his mind may fail, as he occasionally has fits of irritability in which he can scarcely control himself.

Treatment.—Paralysis agitans is a disease generally considered incurable. It is true that patients are prescribed medicine, because they insist upon taking something, but there is never any good result.

Since, however, we have been using galvanism in its simple form, we are in hopes that we have a remedy which may sometimes be useful. In the following case it appeared to be acting beneficially, and in the second, which is recorded in the 'Gazette,' the result was certainly better than under any other form of treatment which I have seen. A reasonable doubt might arise as to its efficacy founded upon the question whether they might not have been cases rather of the choreal type.

Case.—J. B—, æt. 40, had been suffering for three years from paralysis agitans. The complaint began in the right hand, afterwards proceeded to left, and then to the legs, until a general tremor of the whole body took place including the face, and affecting the speech. He had been under different kinds of treatment, but without any benefit. I wished to try the continuous galvanic current to the spine, and accordingly fifty cells (Cruickshank's) were used for ten days. After the second application the patient, who had previously had very restless nights, obtained refreshing sleep. After four or five applications he began to experience a decided benefit, saying he always felt lighter and steadier directly he had been operated upon. The duration of this improvement lengthened day by day. The patient then left for the country, and has not since been heard of.

Case.—A man, æt. 48, came to the hospital with shaking of his arm, so that he was unable to dress himself, could not raise his hand to his head, and was unable to cut his food; his head also had some movements from side to side. The galvanic current was applied to his spine by the positive pole being placed above and the negative drawn slowly down the back. After the application he felt more comfortable, and after the galvanism had been used six times he was much improved; he could raise his hand to his head and could wash himself; at the end

of two months he could dress himself, could hold the arm out without its shaking, and when he left the improvement was progressing.

In another case I tried the effects of a simple current running through the neck and body, but it produced no appreciable effect.

CASE.—Jane D—, æt. 40, was a sufferer from an extreme form of paralysis agitans, all the limbs being in a constant state of tremor. She was seated in a chair, and behind her was placed a battery of thirty cells, one pole of which was attached to her neck and the other to her wrist. It was allowed to work for three hours for five days in succession, but no effect was produced.

RHYTHMICAL PARALYSIS OR INSULAR SCLEROSIS OF THE CORD AND THE BRAIN

This form of disease has long been confounded with paralysis agitans, but it now appears to be a distinct form of affection both in its pathology and symptoms. As soon as the knife of the morbid anatomist began to be used to discover the cause of paralysis agitans a peculiar condition of the cord was found to exist in some cases which had been treated under that name. Further investigation, however, showed that these cases had their own characteristic symptoms, and had therefore been classified erroneously. The symptoms attending this disease of which I am now about to speak, somewhat resemble those of paralysis agitans in respect to the tremor, but they are unlike, inasmuch as the movements are not continuous and rapid. They are slow and rhythmical, and do not come into play unless volition is acting upon the muscles; the disease also has a shorter course, and terminates by spasm and contraction of the limbs. One of the best accounts of this disease is to be found in the 'Guy's Hospital Reports," by Dr Moxon, where he has recorded all the cases which have been in the hospital since the peculiarities of the disease have been recognised. I myself had observed years ago scattered patches of deposit in the cerebro-spinal centres, but had failed to associate them with any special form of malady; subsequently Charcot described this sclerosis as *multiple*, or disseminated through the cord and brain, with the prevailing symptoms which accompany it.

The disease differs from paralysis agitans in being observed most frequently in young people, rarely, according to Charcot, making its appearance after thirty years of age. It commences by a feebleness in walking, like many forms of paraplegia, but there is no loss of power over the rectum or bladder; nor is there any loss of sensibility, as is generally met with in ataxia. After some months the feebleness and tottering gait increase, until the energies of the

patient are altogether impaired and the disease is fully developed. When this has occurred, we are struck with the remarkably regular or rhythmical movements of the body and limbs. This cannot be so well recognised in the gait, but is readily seen in the action of the arms. If an attempt be made to hold out the arm, it moves slowly and in an orderly manner, so that if the patient be told, for example, to put a spoon to his mouth, the limb will ascend in regular stages until the mouth is reached, when, if the spoon is put in, it will clatter against the teeth. The rhythmical movements, however, are best observed during the action of the muscles of speech; the words are brought out one by one, or syllable by syllable, as in the case of a child learning to read, or like "scanning" verses. This interrupted or jerking mode of talking in a monotonous voice is most characteristic of the affection. If the patient be sitting up, his head also may be seen moving in a regular manner. The eyes are also constantly rolling from side to side (nystagmus). If the head be supported and the body be at rest there is no movement, as in the case of paralysis agitans, where, as I told you, movements cease only during sleep. In the sclerosis of which I am speaking, it is only when the patient rises from bed that his head and shoulders undergo an oscillatory motion. It is this volitional trembling which is characteristic of the disease.

The disease of the motor tracts often extends upwards into the cranium, and even reaches the brain proper: the muscles of the face then become affected, and the ordinary expression is lost. Tremor also may come on, and then the disease resembles somewhat that of the general paralysis of the insane. There is this difference, however, in the intellect: in sclerosis it is simply impaired without any of the positive delusions which exist in general paralysis. The patient, however, is not depressed; he is more often happy, although emotional, and is always ready to cry or laugh when spoken to; more commonly the latter. His usual expression is vacant or stupid.

After the continuance of these symptoms for some time, the next stage commences; the legs become stiff, and the patient is unable to walk; he takes to his bed, the legs are stretched out, and become absolutely rigid. Sometimes the legs are bent up and stiff, but more generally they are stretched out straight; there is no weakness of the bladder or rectum, as in paraplegia, nor do bedsores appear; there is no loss of sensation, and the electro-irritability of the muscles seems to remain. If the foot be struck, or firmly bent, a tremor will sometimes take place, passing through the whole limb. This increased irritability is often seen at an early period of the complaint, and before the characteristic symptoms appear.

In what may be called the third stage the powerlessness is complete, and the case has become one of dementia paralytica. The disease thus lasts altogether from two to three years.

Sometimes compound cases are met with where the posterior columns or anterior cornua are also affected, and then we have ataxia or atrophy of muscles, combined with the more special symptoms of this disease.

Pathology.—An examination of the cord after death shows a chronic myelitis or hyperplasia of the neuroglia, characterised by the presence of hard masses of connective tissue scattered through the motor columns of the cord and reaching upward through the pons into the cerebrum and cerebellum. They may also be found on the surface of the lateral ventricles, and extending into the fourth ventricle, or more rarely as greyish patches on the outside of the brain, seen through the pia mater. A section of the cord shows tolerably well-defined greyish or pinkish patches scattered through the antero-lateral columns. More rarely the grey matter may be involved. A section of the brain shows similar hard patches scattered through the hemispheres, sometimes in the central ganglia, but not often affecting the cortex. Occasionally a few deposits may be found in the cerebellum. Cases have been reported where both the cranial and spinal nerves have been involved in in the process. The microscope shows these masses to be composed of fibrillated tissue with remains of medullary substance, granules, corpora amylacea, &c. If the grey matter is involved then the ganglion cells are affected.

It would seem that this disease interferes with the motor function of the cord in a way by which the forces therein produced are transmitted in an irregular manner to the muscles, and so give rise to the rhythmical movement, or it might be said by those who regard muscular action as the result of a number of very rapid contractions, that in sclerosis the action is slower, so that the intervals of time between them can be appreciated.

Dr Hammond says that the *tremor* is wanting in the exclusively spinal cases.

Case.—A man, æt. 33, a veterinary surgeon, was lately under my care in Stephen Ward. He said that he was well until two years before, when he had a fit and fell to the ground; however, eight months previously to this he had a kick from a horse. Since this time he had been getting very feeble. When admitted he was unable to walk, but could for a moment stand, his legs all the while trembling under him. If asked to raise his arm or take hold of any object, it would move up in jerks or rhythmically, and his speaking was exactly of the same character; his words came out separately and singly, reminding one of a child attempting to read. He had perfect control over his sphincters, and sensation was not impaired, His eyesight was misty. He had an involuntary laugh when

spoken to. The muscles appeared to be more responsive to faradisation than to the continuous current. He had one or two febrile attacks of a similar kind which I have noticed in ataxia and in other chronic spinal disorders.

The following was the first in which Dr Moxon had an opportunity of examining the brain and spinal cord:

Case.—She was 25 years of age, and after she had been laid up for some time with febrile disturbance she found her left arm and leg weak and unsteady. This spread in the course of a few months to the other limbs and to the trunk, until she lost her power of walking and standing. When at rest her head and limbs were quiet, but any attempt at movement caused a jerking and tremulousness, with a regularity of action which at once distinguished the disease from paralysis agitans. When trying to feed herself she jerked the food about, and this jerking affected the whole body. The lips and tongue showed the same jerking and unsteadiness; the speech also was very peculiar, every syllable being followed by a pause. Her mental condition was very low. After her death insular patches of grey tissue were found scattered through the cord and brain.

Case.—A case which I have lately had in hospital was that of a sailor, æt. 36. There was no history of syphilis, or any cause to account for his symptoms. He said that about six years before his admission to the hospital he suddenly fell on deck and was unable to move his legs, so that he was carried to bed, and did not recover for ten days. Three months afterwards he had a similar attack, and a few months after that another, and from this he has never recovered. For four years he has been under treatment in various London and provincial hospitals, but without receiving any benefit. On admission to Guy's he presented all the symptoms of a case of rhythmical paralysis. He spoke in a measured way, his words coming out syllabically; his expression was vacant, and he was very readily made to laugh; indeed he often burst out into a fit of laughter without apparent cause. There was slight nystagmus, but the tremor was only marked when he attempted to move his eyes; whilst looking forward they were steady. His sight was good on testing it, and there was no neuritis, but he said he could not read, as the words ran together in black lines. On attempting to raise his arm and put his finger to his nose or head the limb was shaken in a regular and orderly way. There was also want of power and want of precision; he had great difficulty in picking up a pin. When made to sit up in bed the whole body swayed to and fro, and he found it impossible to keep it steady. On attempting to walk he did so with much difficulty, as his legs could scarcely support him. When in bed he could freely move them. On trying the patellar reflex it was found exaggerated by the leg jumping up a considerable distance. On forcibly flexing the ankle the muscles of the leg were thrown into a state of tremor to a slight extent. He was a fairly nourished man. There was no atrophy of muscles, no loss or impairment of sensation at any part, and no pain on pressure over spine. Nothing remarkable was observed in the reactions to either of the currents.

Several cases have been reported from the children's hospitals, but in none has death occurred or a post-mortem taken place, and thus some doubt must be placed upon the accuracy of the diagnosis. The symptoms were characterised by shaking of the limbs and drawling speech. There is no mention of blindness, otherwise the cases resembled those of cerebellar disease.

I have said that there is no organic disease of the nervous system but has its counterpart in a functional and curable one.

Functional Rhythmical Paralysis

CASE.—A young lady fell into a nervous and perfectly helpless state in consequence of a disappointment in marriage. When able to sit up in a chair she presented all the symptoms of a case of lateral sclerosis of the cord or rhythmical paralysis. When quiet there was no movement of the body, but directly she spoke the words came out syllable by syllable in the true scanning manner, slowly and deliberately. On attempting to raise the arm it went up in a series of jerks, and on supporting her body in walking her legs tottered in the same manner. The patellar and other reflexes were somewhat exaggerated. Sensibility normal, muscles not wasted, and reactive to both forms of galvanism. She is apparently recovering.

LOCOMOTOR ATAXY OR DISEASE OF THE POSTERIOR COLUMNS

I have already told you that the posterior columns of the cord, according to our present knowledge, are intimately related to the cerebellum, and also, by means of short fibres, connect one portion of the grey centres with another. These parts are therefore intimately associated with the cerebellum in the regulation of movement, and when diseased give rise to a condition known as "inco-ordination." The patient under these circumstances could move his limbs, but could not properly control them. He would resemble the monster which Frankenstein made, so far as the attachment and movements of muscles are concerned, which would contract when excited, but in a manner as devoid of method as in the wooden figures whose arms and legs are pulled by a string. You see that another function must be superadded to that which merely excites muscular movement—one which regulates or guides them in an orderly manner, just as a fly-wheel of a steam engine controls motions which would be otherwise unequal and irregular.

If this regulating power in the body be lost we witness the complaint known as locomotor ataxy; and should the case eventually be fatal we find the cause of the malady situated in the posterior columns of the spinal cord.

I have already told you that pathological changes correspond very often to distinct anatomical regions, and as these changes are accompanied by special and characteristic symptoms, it tends to corroborate the opinion that certain regions have their distinct physiological functions.

In this disease, then, known as "locomotor ataxy" or "inco-ordination," we have a *chronic myelitis, grey degeneration, or sclerosis of the white posterior columns of the spinal cord,* wherefore the name *leuko-myelitis posterior chronica* has been given to it. In con-

nection with this change in the cord we also very commonly find that the posterior roots of the spinal nerves are involved in the inflammatory process; and thus it happens that, besides the incoordination, we have various symptoms affecting sensation associated with it. We are indebted to Duchenne for clearly separating this form of disease from other forms of paralysis, and also, I think, for showing its true pathology; nevertheless, the facts belonging to the disease were already known under the name of "tabes dorsalis."

I should state that Dr Todd more than twenty years ago described a form of paraplegia in which the co-ordinating power was lost, and also that my late colleague, Dr Gull, had observed these symptoms of ataxy in his paraplegic patients, although he did not separate those in whom they existed into a distinct class with a new name; and more than this, he had associated these symptoms with a degeneration of that part of the spinal cord to which I have referred, and which is now said to be the true seat of the disease. In his 'Gulstonian Lectures' in 1849 reference is made to a paper by Earl, who had been struck with the peculiarity of these forms of paralysis, having observed that the patients could not walk in a straight line, that they threw their limbs forwards, and had a great difficulty in turning round. Dr Gull, in describing such cases, says: "One patient told me he could not walk without looking down at his feet all the time, because he felt as if his legs were cut off below the knees. Another patient said he had to do so because he had no apparent weight." Again, in a case recorded in the 'Guy's Hospital Reports' for 1858, he relates how a patient, whilst in the recumbent position, could flex and extend his legs with some freedom, but the movements were sudden and vague from want of control over the action of the muscles; the spinal centres, when stimulated by the will, seeming to shoot off their influence at once, making the feeble muscles contract to their full extent with a jerk. In other words, there was no power to regulate the muscular contraction. The movements of the fingers were also wanting in precision, and he was awkward in handling objects. Dr Gull then gives a drawing of a section of the cord, exhibiting a very defined disease of the posterior columns, and adds the following remarks:—"This brings us to the theory of the posterior columns proposed by Dr Todd, that they 'propagate the influence of that part of the encephalon which combines with the nerves of volition to regulate the locomotive powers, and serve as commissures in harmonising the actions of the several segments of the cord." The want of power in this case to regulate the action of the muscles was very characteristic. The legs when drawn up, as they could be

freely, went with a sudden jerk, and were extended in the same manner. The voluntary movements of the hands were also fumbling and vague.

In the year 1851 Mr Landry described cases of paralysis of the limbs where there was no anæsthesia, but a loss of muscular sense, as he proved by placing in the hand of the patient a metal goblet, which seemed to weigh no more than a feather.

Duchenne designated the disease "a progressive abolition of co-ordination of movement and apparent paralysis, contrasting with the integrity of muscular force." He exemplified this to his class by causing the patient so affected, and who had been called paraplegic, to take a student on his back and carry him across the lecture-room; he then made him sit in a chair, and showed that he was quite unable to bend the leg when the patient made resistance, proving that the muscular power still remained as good as ever. When, however, the patient was made to stand up and walk, he was seen to throw his legs about in a most extravagant manner as if he had lost control over them, was constantly looking at them to see where he was placing them, and if he closed his eyes he fell down. By this method we test the ataxic condition. We place the patient in an upright position, place his feet close together, and tell him to shut his eyes. If he be a sufferer from the complaint he is liable to fall. He appears to be unconscious of the position of his body, or where his movements are leading him. Having lost the proper control over them, it is necessary that he should always be looking at his feet when he walks, or otherwise he would fall. He is unable to walk in his own accustomed rooms and passages when it is dark without feeling his way; and you will thus see why, with this want of control and disorderly mode of performing movements, the term "ataxy" has been applied to the complaint.

From the want of control over the limbs the patient totters when he walks, or resembles the man alluded to by Sir C. Bell, who steps along a narrow ledge. He throws his feet out as if pawing the air, and feels almost as if he were walking in the clouds, or, as is sometimes the case when a partial anæsthesia is present, as if he were stepping on wool, or as if he had no legs and possessed no weight. The limbs are lifted with a jerk, turned out and separated, coming down on the heel of the foot, as if pulled with a string, and not altogether under the control of the will; and, when standing, the patient has a difficulty in maintaining his equilibrium, and is liable to fall. This staggering has been considered worthy of a new name "titubation." Unlike a blind man, who holds himself backwards, he precipitates himself forward, and, unlike a drunken

man, does not roll from side to side, although I know of the case of a man affected with this disease who on more than one occasion was charged with being intoxicated. His occupation was a rent collector, and he had a remarkable way of precipitating himself into people's houses, which suggested to the ignorant the notion of inebriety. The gait is rather like that of the man on a ledge, who is attempting to balance himself, and who is constantly looking at his feet to preserve them in position. The patient has a difficulty in starting, as some of you witnessed in a patient lately in the hospital: when requested to walk across the ward, he would stand motionless for some time, as if he were winding up a clock for the performance, and then off he would go in a most precipitous manner. When the patient is on the trot he often feels the same difficulty in arresting his own progress or in turning round. Thus, a patient of mine assured me that whilst at Margate he walked a long distance along the road, and then, wishing to stop in order to return, was obliged to guide himself up the bank, where he fell down. I know the case of a gentleman afflicted with this disease, who, if he stops to look in at a shop window, is unable to start himself again, and asks some one near to give him a push.

For this want of control or want of knowledge of the movements of the limbs the eyesight compensates, and thus the patient is continually looking at his legs. Whilst his eyes are fixed on them he may walk for miles or stand quite steady; but let him place his feet together and raise his head, he immediately falls.

The same is the case with the arms. He cannot make a straightforward thrust, for in the endeavour his arm would strike from side to side. A good method of testing the power of control which the patient possesses is to ask him to perform the manœuvre, suggested by Dr Hughlings-Jackson, of placing the thumb to the nose and at the same time extend the fingers, or, as it is usually called, "taking a sight." If he be troubled with ataxy, he will experience considerable difficulty in performing the operation. Just as the patient can walk for miles if not interrupted, or make a great resistance with his leg whilst in the sitting posture, so with these tottering arms he can carry great weights. When in bed the difference between his condition and that of an ordinary paraplegic patient is well seen; he has no difficulty in throwing his arms and legs about, but he does so apparently without a fixed purpose, and in a most ungainly manner. In this disease, I should have said, the muscles do not waste. Not only the muscles of the limbs, but also those of other parts of the body may be affected, or rather it should be said the nerves supplying them may lose their controlling power, especially those of the cranium, as the third nerve. Thus the pupils are very often

contracted and unequal in size, as occurs so frequently in many other chronic disorders of the cerebro-spinal system; there may be also strabismus, and amaurosis. In some instances there has been anæsthesia of the face as well of the extremities. Finally, the bladder and rectum may lose their tone. Towards the end of the disease, the sexual powers, as in many other nervous affections, fail; but at the onset it has been observed that they have been much increased—so much so that venereal excesses have been considered mainly instrumental in the production of the disease.

Then there are other symptoms which are pretty constantly present, and assist in characterising the disease. These are more especially pains in the limbs which, at a former time, when the peculiarity of the affection was not recognised, were thought to be rheumatic, but now are known to be spinal. They are deep-seated aching-pains, as if, to use the common expression of the patients, they were seated in the bones. Sometimes, instead of being constant or enduring like those of rheumatism, they resemble electric shocks darting through the limbs or muscles. This comparison was volunteered by a patient lately in the hospital, who, having had the limbs galvanised, described the pains which he suffered as being exactly similar to the effects of the battery. They were not persistent, but would come on at intervals, and were described as most excruciating, and generally worse at night. Pierret has described cases where there was severe neuralgia of the fifth nerve.

The pains are therefore of two kinds, and besides these, there is also a sense of constriction or pain around the body or a limb. The lancinating pains, together with the ataxia, have given rise to the French name "inco-ordination motrice et douleurs fulgurantes."

With these pains there may be some amount of anæsthesia, for, as you know, neuralgic pains may be accompanied not only by an over-sensitiveness of the part affected, but by the opposite condition. Some writers have endeavoured to discover in this fact the cause of all the phenomena of ataxia, but this we shall speak of again presently. Duchenne, who first wrote systematically on the subject, divided the *ataxie locomotrice progressive* into three stages (see 'Archives Générales') :—1. Where there was paralysis of the nerves of the eye, shown by inequality of the pupils and amaurosis, with darting pains in the limbs. 2. Characteristic unsteadiness of gait, with diminished sensibility and pains in the legs. 3. Symptoms still further increased, and the want of co-ordination progressing upwards.

The disease generally begins with pains in the limbs, either of a dull aching character commonly called rheumatic, or momentary and lancinating. There is also sometimes a constant wearying pain in the

back. These "flying" pains are absent sometimes for days together, and then recur with increased intensity, and are worse at night. At the commencement of the illness they are often called rheumatic, but they are soon seen to be neuralgic by their momentary character. I have had, for example, a patient walk into my study with the assistance of a stick, his legs straddling, and displaying at once the nature of his complaint, but quite free from pain; and yet after a while, and sitting quietly, he has shrieked out from a paroxysm of pain attacking his legs. I should say that although the pain is a very common symptom of ataxia it is not universal; and, on the other hand, there are other affections of the spinal cord in which neuralgic pains are present. Occasionally the neuralgic pains have been the only symptoms indicative of spinal disease, all the remaining characters of ataxia or of other specialised lesions being wanting. When patients have recovered from these it is clear that no definite lesion could have occurred. Sometimes, as Charcot has stated, there is at the very onset of the complaint vesical and rectal pain, with irritability of rectum and bladder, and constant desire to urinate.

After the pains have existed for some time the change in the gait is observable, owing to want of co-ordination. There is a difficulty and clumsiness in walking, the feet are thrown out, and all the other characteristic symptoms of the disease appear. After a time the upper extremities may become involved, and even the muscles of the head and face, causing imperfection in articulation. Finally, paralytic symptoms may ensue, owing probably to extension of disease to other portions of the spinal column. In some exceptional cases the arms may be found affected from the beginning, as may be seen in the act of shaking hands and attempting to write, and also in numbness and pains in the arms. Also occasionally there may be absence of pains, and the first symptom may be that of tottering. Dr Buzzard has observed that before any marked symptoms of ataxy appear, there may be a sudden giving way of the legs and speedy recovery. This I have seen in other forms of spinal disease.

Now as regards *anæsthesia*, I believe I have seen cases where sensation has not been lost, and in others where the sense of feeling has merely been retarded. You know that time is required for a sensation to be conveyed along a nerve; this being computed by some to be as slow as 300 feet per second. You can understand that the periphery of the nerve in the skin may be intact, and the sensorium likewise sound, and yet the conduction be impaired from disease of the nerve. Now in these cases of ataxy, and in some others, the sensory nerves are sometimes so thickened and their

conductivity so lowered, that a considerable time is required for the patient to appreciate any tactile impression made on his skin. You touch or prick his legs, and no response is made until sometimes two or three seconds have elapsed; and I have heard of a case where it was possible to count eight after the patient was touched and before he obtained a knowledge of the sensation.

In the same way the phenomenon of tendon-reflex is, as a rule absent in these cases of ataxia. You make the patient place one leg across the other, and then strike the ligamentum patellæ. In health the leg gives a jump, but in ataxia there is no response. Of course this phenomenon might be absent in many other diseases of the cord.

I have already said that in many cases of spinal disease the patients are subject every few weeks to most severe gastric attacks. They are seized without any apparent reason with acute pain and spasm in the stomach, accompanied by vomiting; and these symptoms last some hours, or even a day or two. Charcot has especially drawn attention to them under the name of *crises gastriques*, as occurring most frequently in locomotor ataxy.

Vulpian and others have observed that occasionally rashes on the skin occur in tabetic patients, and that these are likely to become ecchymotic. They have been observed more especially to follow the *crises gastriques* and attacks of pains in the limbs. The rash has first appeared as a lichen, and then bruise-like ecchymoses or "taches ecchymotiques" have come out on the body. The disease suggests that they are due to a nerve cause, but whether from direct irritation of vaso-motor nerves or from vaso-paralysis is not yet determined.

Nutritive changes are not shown in these purpuric patches only, but cases have been also reported of falling off of the nails, and of deep ulcers forming on the feet.

Charcot has maintained that the affection of the eye is due to a sclerosis or grey induration of the optic nerve, and so to be distinguished from the atrophy arising from neuritis. It is remarkable, however, that at a very early period of tabes the vision may be found affected, and in a partial way, causing hemiopia. Such a condition would suggest a neuritis. The pupils are for the most part small, and fail to contract under the influence of light. When, however, the eyes are directed to a near object the pupils will contract. This reflex phenomenon occurring during the act of accommodation whilst there is an absence of contraction to the stimulus of light was first pointed out by Dr Argyll Robertson, and the symptom has since been called by his name.

Sometimes all the ocular muscles are paralysed, and the eye is

fixed. The case is one of ophthalmoplegia externa, so called to distinguish it from ophthalmoplegia interna, where the ciliary muscles are paralysed.

In one of my cases the first symptom was loss of vision, and a year later the patient experienced a sense of fatigue in the legs and arms. Then more marked symptoms of ataxia came on, with white discs.

Mental derangement.—The first writers on tabes made no mention of any derangement of the mental faculties, but later observers have found distinct evidence of it in several cases of the disease. Some time ago Pierret of Lyons wrote a paper on the subject, and more lately Dr Rougier of the same place has recorded several under the name of the Mania of Persecution. He believes the derangement has had its origin in the impairment of touch and of the special senses, whereby the patient has become the subject of erroneous sensations and perceptions. The sufferer speaks of electric discharges in the limbs, tearing and burning of the flesh and bones, and falls into a state of melancholy founded on these hallucinations of sight, hearing, taste, smell, and general sensibility.

Dr Savage informs me that some of his patients in Bethlem appear to have suffered in the first instance from symptoms of ataxia.

In cases of ataxia and some other forms of spinal disease, *arthritic inflammations and swellings* may be met with. Charcot has, of late, especially drawn attention to the subject, but it had been previously observed, for I well remember Dr Addison and Dr Gull conversing about it many years ago, and Dr Alison had distinctly alluded to it. It was left, however, to Charcot to fully illustrate it, from his large experience at the Salpêtrière. In chronic cases he met with several examples where very considerable changes had taken place in the bones and in the joints, causing their dislocation or fracture, and very many of them occurred in women, although ataxia is less common in them than in men. He originally observed a case of dislocation of the shoulder and then of the hip, followed by swelling and deformity; in another instance a general shortening of the leg with swelling of the shaft, followed by fracture, took place. In some cases a re-union occurred, so that it was clear that a variety of chronic changes occurred in the bones; not only an inflammation of the shaft with enlargement, ending in shortening or fracture, but also an atrophy of their extremities leading to dislocation. A wax model, presented by M. Charcot, illustrating this is to be seen in the museum of St. Thomas's Hospital.

Dr Buzzard corroborated these facts very fully by cases taken to the Pathological Society. He showed how liable were patients suffering from locomotor ataxy to an alteration in the nutrition of the osseous tissue, whereby the articular extremities wear away

and from this fact the nervine arthropathy is distinguishable from ordinary chronic rheumatic arthritis. In one of his cases a chronic change had occurred in the hip, leading to a spontaneous fracture of the neck of the thigh bone. In another the knee had become disorganised, so that the ends of the bones could be rubbed against one another, producing a loud grating; the inner condyle was wasted, the outer enlarged, the ligamentum patellæ wasted, and the patella itself dislocated.

In these cases an erosion and absorption of the ends of the bones takes place, with loosening and destruction of the articular ligaments; the femur and tibia when they meet one another become bevelled off and knock together as would two rounded stumps. Mr Hutchinson has had a case of a patient who after suffering some time with loss of power in his legs had all his troubles centred in his right hip; a slow absorption and destruction of the bones went on, until a fracture of the neck took place. The rapid wasting distinguished it from ordinary chronic arthritis. Pitrés has also shown an occasional loss of toe-nails, and Ball a penetrating ulcer of the foot.

It may be remarked that no active muscular wasting takes place in these cases, but only an affection of the bones and joints. This accords with what is known of the connection between wasting of the muscles and disease of the anterior cornua of the grey matter. In the cases under our notice there is no disease of this part of the spinal cord. It has also been remarked in the French hospital that the *crises gastriques* were more marked in those patients who were the subjects of the joint affection.

I might here remark that as disease of certain regions of the cord will produce definite and characteristic symptoms, as in the case of sclerosis of the posterior columns giving use to locomotor ataxy, so it is conceivable that a limited disease of the same kind might produce a localised ataxia, and an explanation be thus afforded for some of those strange cases of movements of a single limb, which may be really due to want of co-ordination.

I should also say that since other portions of the cord may fall into temporary inaction, so as to produce paralysis, there is no reason why the posterior columns should not equally become functionless and be productive of an ataxia. I throw this out as an explanation of cases which are completely cured.

Now what is the morbid anatomy of this disease? My own post-mortem experience in the pure cases of ataxy has been limited, but the statements of Gull and Duchenne have been confirmed by numerous other observers, that a marked change has existed in the posterior columns of the spinal cord. These have become changed into the

grey translucent substance which I before described to you. This is composed of new connective tissue, the formation of which necessitates a certain amount of destruction of the normal tissue, so that it is found degenerated and containing amylaceous corpuscles. The disease may extend through the whole length of the cord as high as the restiform bodies, but in the less severe cases it affects more especially the lumbar enlargement, together with the cauda equina. The posterior roots of the spinal nerves have been found involved in the disease, having become grey and atrophied; sometimes even the cranial as well. The membranes, too, may be thickened and adherent, while the cord itself is shrunken.

The observations of Pierret have been confirmed by Charcot and others that the primary seat of the disease is in the external strand of the posterior columns—that known as the root column, the processus gracilis, or column of Bouchard, whilst the inner column, known as that of Goll, remains free. A sufficient number of cases of ataxia have now been recorded where the external column has alone been affected (whilst on the other hand sclerosis of the inner column has been found quite unassociated with symptoms of tabes) to prove the correctness of the view now held. In a large number of cases, however, the whole of the posterior column has been found involved. It is thought possible that if in an early stage of the disease the columns of Goll may become affected, then an ascending degeneration of these would proceed *pari pasu* with that of the external columns. In some cases the disease may extend still further and involve the posterior cornua with the fibres passing from the posterior root, and then finally the root itself. In a few cases the disease has progressed along the border of the grey matter and attacked the cells of the anterior cornua. The disease begins in the lumbar region, and may proceed upwards to the cervical. Bramwell has published a case where he found the whole of the posterior columns affected in the lumbar and dorsal regions, but in the cervical the disease was confined to the columns of Goll, as seen in ascending degeneration. It is shown embryologically that the two strands of the posterior columns are developed independently.

Vulpian seems to throw doubt upon the course of the disease described. He hesitates to admit that the disease will pass from posterior columns to posterior roots, as this is not a physiological course, thinking it more probable that the disease begins as an irritation in the posterior roots or ganglia, and then extends inwards to the strands.

Charcot believes that the primary change is in the nerve tubules rather than in the neuroglia; but this is very questionable. In the

sclerosed patches the increase of connective tissue has no doubt destroyed the nerve tubules.

Strümpell, in reporting a considerable number of cases of tabes, concludes by a *resumé* of our present knowledge as regards its morbid anatomy. He does not think that the changes in the cord are secondary to chronic meningitis: nor does he think the increase of connective tissue due to inflammation, but to atrophy. Nor does he consider that the disease spreads from the posterior roots, but that, as these and the posterior columns are closely connected, the atrophy in each is primary. He cannot think, therefore, that the disease commences simply as a degeneration of the connective tissue, nor is it a primary brain disease, nor a disease of the peripheral nerves. There remain, then, only two theories:—1. Tabes is a chronic myelitis of the posterior columns affecting primarily the connective tissue and spreading like any other inflammation. 2. Tabes is a systemic disease, a primary degenerative atrophy of nerve-fibres spreading in directions determined by anatomical and physiological distribution.

Now, having had the disease described to you in its pure and simple form, you must be careful not to give the designation "ataxy" to many varieties of spinal affection because certain symptoms are present which may be found in ataxy. For you may easily suppose that if this disease be due immediately to the changes described, such morbid alterations may not unfrequently involve other portions of the cord, and so produce a complex case. Wherefore, it constantly happens that a patient comes before us complaining of weakness of the legs, at the same time informing us that he has great pains in them, perhaps accompanied by some anæsthesia. We apply the test by requesting him to stand with his feet together, and to look upwards or shut his eyes. Immediately he does so he falls; but the man has not ataxy, for he is scarcely able to walk across the room or move his legs from the bed; he has, in fact, true motor paraplegia. You will find constantly that patients with ordinary paralysis of motion are assisted in walking by their eyes. As for the so-called characteristic pains in the legs, these are constantly met with in paraplegia. Some of you may remember the case of an old man in one of my beds with progressive muscular atrophy, in whom the muscles were so wasted that he could scarcely move his hand to his head, and could only just stand. When on his feet he invariably staggered and fell if he did not look downwards. If his arm were out of bed, he was quite unconscious of its position until he looked at it; and as for darting pains in his limbs, these were his most urgent symptoms. The case, indeed, was one of progressive muscular atrophy

and ataxy combined, if the symptoms which he had are considered in any way characteristic of the latter disease.

The disease, then, known as locomotor ataxy is believed to be due to this grey degeneration of the posterior columns of the spinal cord, and consequently various explanations of the phenomena observed during life have been advanced. There are those who would at once place the function of co-ordination of movements in this portion of the medulla, whilst there are others who still holding to its cerebellar origin, maintain that the disease spoken of manifests itself by severing the cerebellum from the nerves distributed to the muscles; or rather that, as disease of the cerebellum, the organ which rules over locomotion, causes a staggering of the gait, and finally a paralysis, and, as the posterior columns of the cord are continuous with the cerebellum, so any affection of the co-ordinating tracts lying between the cerebellum and the peripheral nerves would necessarily interfere with co-ordination.

There are some also who maintain that the affection necessitates an anæsthesia, which is always present, and that in this absence of common sensation lies the explanation of all the phenomena of the disease; whilst others somewhat modify this opinion by stating that disease of the posterior roots cuts off communication from the motor spinal columns, whose office it is to co-ordinate movements.

There have been recorded, however, several cases when there was no anæsthesia, and yet all the phenomena of rolling gait were present. Whether in these cases the patients were able to stand with their eyes closed is not stated.

Another theory is this, that wherever the actual seat of the disease may be, want of control means a loss of muscular sense. This theory of course necessitates the idea of the existence of such a sense. The truth of it need not oblige us to renounce the opinion that the equilibrium of the body is dependent upon the integrity of all our senses, and that they all contribute to a knowledge of our position. The action of our muscles aids us in this knowledge, as do the feeling the ground with the feet, the relation of objects around as seen by our eyes, and even probably the sense of hearing. If our muscular sense or sense of feeling be gone, we must use our eyes continually to assist us. If we close them our equilibrium is lost. I shall refer to this again presently.

M. Debove, a pupil of Charcot's, has taught that the peculiar gait and tottering observed in ataxia is due to the *impaired tone of the muscles.* He has invented an instrument called a "myophone," which enables him to hear the vibration and the degree of the contractile force exerted in the muscles, and he maintains that the tone is much lowered in ataxia. He first shows that the tone of a

muscle is in part dependent on the integrity of the sensitive nerves, that the action of the grey centre is only preserved by the stimulation of the sensitive nerve, as is seen in relaxation of the sphincters when the sensory nerve of the adjacent mucous membrane is divided, or, on the other hand, in the tone being increased on excitation of the sensory nerve. If the experiment be made of dividing the posterior roots of the spinal nerves the animal walks feebly, and if those of one leg only be cut it walks with irregularity. In ataxia the muscles are not equally affected, and thus the inco-ordination results ; it is owing to this unequal tonicity that ataxics employ so much force in attempts at movement. The absence of these symptoms in hysterical hemianæsthesia is owing to the complaint having another source, in the brain.

Causes of Ataxia.—In the cases where an organic lesion is found it is often difficult to surmise its cause ; but a history of cold, of injury, or syphilis may sometimes be found. Cases have been recorded which seem to have originated in injury.

The question of *syphilis* being a frequent cause became the subject of a paper and a lengthened discussion at the late International Congress of 1881. Professor Erb showed that in the majority of patients suffering from tabes a history of syphilis could be obtained. The clinical facts were doubted by some and the pathological by others. Thus, Lancereaux said a systemic disease of the cord extending through the length of the column and originating in syphilis was unknown, whereas the effects of this disease were well recognised, and were of an altogether different character. The disease was localised in one part, as in other organs, and tended to produce a change of a cicatricial character. Professor Erb replied that, however this might be, a large number of cases occurred in persons who had had syphilis. In many the patients were subjects of syphilis, and were cured by antisyphilitic remedies.

If tabes be always due to sclerosis of the posterior columns and the disease begins in the nerve-tubes, there is a great difficulty in accepting its syphilitic origin, but if, on the other hand, it begins as a meningitis, the explanation is more easy. It might also be surmised that this might be removed by remedies, leaving only the results of the myelitis, as seen after death in the sclerosis of the root columns.

In some instances unquestionably the disease may result from the same causes which are in operation in the recoverable and functional cases. In these latter, beyond doubt, all circumstances which have an exhausting influence on the nervous system are mainly instrumental in the development of the mischief, and especially those arising from sexual excesses. Some of the symptoms

may exist for years. I know two gentlemen who have had frequent urination, a feeling of coldness around the waist, troubled vision, and other ataxic symptoms for many years.

Treatment.—Probably little can be done when an organic change has already taken place in the cord, except, perhaps, in those cases where a history of syphilis suggests the use of mercury or iodide of potassium. In the hope that the case may be functional, tonics are usually employed, the best of these being quinine, iron, zinc, and arsenic. The drugs which act specifically on the nerve-centres seem, in my opinion, to have very little value as remedies, as I have never seen the slightest benefit result from the use of such medicines as strychnia or phosphorus. Ergotine has been highly commended by some physicians. When tonics are being used galvanism may also be applied. The best method is to act on the spine with the continuous current, and at the same time it may be used on the legs; for if there be severe neuralgic pains they may be often relieved by its employment. I believe no very characteristic phenomena have been observed in the limbs as regards their electrical reactions.

Nerve stretching has been adopted in a few cases, but with very doubtful result. In some cases it appears to have relieved the pain.

Theory of Muscular Sense.—The necessity for supposing the existence of a muscular sense is so great that I believe most professors of mental philosophy speak of it as an additional sense to the usual five, and giving us the knowledge of resistance, force, and weight. If this sense be destroyed from disease, the patient would have no control over his muscles, and would present the symptoms of ataxia. The muscles might be good and powerful, but he would have lost the knowledge of directing them, in a somewhat similar way as in the case mentioned by Sir C. Bell, where a woman who had lost sensation of one arm, but not the use of it, could carry her child on her arm as long as she looked at him, but as soon as she directed her eyes away the arm would fall. In this illustration there was simply a loss of common sensation, whilst in ataxy this is only occasionally wanting, but I mention the case to show that we must have a knowledge of the position of our limbs, as well as power over them, in order to use them rightly. It is thought by some that there is a special sense which conveys to our sensorium a knowledge of the actions of our muscles, and that in the disease known as "ataxy" this sense is lost. The doctrine was first advanced by Sir C. Bell, who says, "When a blind man, or a man with his eyes shut, stands upright, neither leaning upon nor touching aught, by what means is it that he maintains the erect position? The symmetry of his body is not the cause: the statue

of the finest proportion must be soldered to its pedestal, or the wind will cast it down. How is it, then, that a man sustains the perpendicular posture, or inclines in due degree towards the winds that blow upon him? It is obvious that he has a sense by which he knows the inclination of his body, and that he has a ready aptitude to adjust it, and to correct any deviation from the perpendicular. What sense is this? for he touches nothing and sees nothing; there is no organ of sense hitherto observed which can serve him or in any degree aid him. Is it not that sense which is exhibited so early in the infant in the fear of falling? It can only be by the adjustment of muscles that the body is firmly balanced and kept erect. There is no other source of knowledge but a sense of the degree of exertion in his muscular frame by which a man can know the position of his body and limbs whilst he has no point of vision to direct his efforts or the contact of any external body. In truth, we stand by so fine an exercise of this power, and the muscles are from habit directed with so much precision and with an effort so slight that we do not know how we stand. But if we attempt to walk on a narrow ledge or stand in a situation where we are in danger of falling, or rest on one foot, we become then subject to apprehension, the action of the muscles is, as it were, magnified and demonstrative of the degree in which they are excited. It must be a property internal to the frame by which we know this position of the members of our body, and what can this be but a consciousness of the degree of action and the adjustment of the muscles."

Such a doctrine as here laid down of the existence of a muscular sense is by no means, I believe, generally held, for, in the first place, Sir C. Bell's statements that sensitive fibres do pass into the muscles have not been proved. Moreover, as a matter of fact, the muscular tissue is almost devoid of feeling, except when spasmodically contracting, as in cramp. Again, in ordinary contraction of a muscle, as when we grasp anything in the hand, no sensation is experienced in the forearm.

Supposing, then, that we have no knowledge of the active or passive state of a muscle, how do we account for the fact which Sir C. Bell alludes to, that a man has no difficulty in preserving his equilibrium, or that he knows the weight of any substance which he holds in his hand, or the amount of strength which he puts out when making any exertion. This is accounted for by some on the supposition that the cutaneous nerves are sufficient to acquaint us with the posture of a limb or of the whole body; an explanation founded on a fact of which Sir C. Bell was probably ignorant—a fact which there is every reason to believe was first demonstrated

in this theatre more than thirty years ago by Mr Hilton—that the same nerve which supplies a muscle also sends a sensitive branch to the skin over it, as well as to the textures which form the neighbouring joint. It would follow that when the arm, for example, is flexed, a corresponding nerve to that which supplies the muscles is giving notice of the state of the skin and of the joint which is moved, and so we become possessed of a knowledge which is equivalent to that of a muscular sense. You might infer from this that co-existent with cutaneous sensibility would come the knowledge which we all possess, of the position and action of the various parts of our body. To a certain extent this is true, for I have seen only this day a lady who, being paralysed many years ago, recovered her power of movement in part, though sensation is almost gone. She is in the habit of using her hand, as, for instance, in carrying her bag along the streets, but only so long as her arm is across her chest can she retain it; if her eyes are turned away she immediately lets it fall. To strengthen this view, it is found that in cases of "ataxie locomotrice" anæsthesia does frequently exist, and therefore there might appear to be a ready explanation of the phenomena; but unfortunately in many cases perfect sensibility remains. Besides, we meet with anæsthesia constantly, as in hysterical women, where there is no ataxia, or want of co-ordination. Experiments have been made of destroying the sensibility of the feet by freezing, and then observing whether there be any unsteadiness of gait when the person walks, but the results do not accord. The muscular sense, according to this view, would be nothing more than the measure of pressure on the skin over the muscle. I do not think it will explain all we understand by muscular sense. A weight placed on the hand will give a certain amount of information, but a movement of the hand will make our knowledge more precise. The pressure also may be made to vary by the kind of handle which the weight possesses, but a difference of this kind will not deceive us. Every one certainly is impressed with the idea that he knows what amount of muscular exertion he can put out.

Mr G. H. Lewes maintains that there is undoubtedly a muscular sense, and that this is as much a special one as any of the senses. The method, therefore, of testing its existence by the presence or absence of common feeling is of no value, for just as irritation of the optic nerve can produce no other effect than a flash of light, so contraction of a muscle can have no other result in the sensorium than that of feeling of effort, resistance, fatigue, &c. He also argues that the distinction between motility and sensibility is not a real one, as the two are intimately associated in the various operations of the body, that motor and sensory nerves are essentially

alike, as both are equally capable of conveying sensory impressions or motor impulses; also, that in all probability the so-called motor nerves not only excite the muscles to action, but produce at the same time an impression on the sensorium corresponding to the state into which they are thrown. In his own words:—"All feeling is a complex of passive reception and active discharge. There is, therefore, a justification for the establishment of a special and distinct class of sensations produced by muscular movements, and to these the term *muscular sense* is appropriate. Such sensations are complexes of neuro-muscular active and passive sensibilities; and although their seat is neither in muscles nor in nerves, but in the sensorium acting on and affected by nerves and muscles, we have the same ground for including the motor nerves among the essential conditions of production of muscular sensations as for including the optic and auditory nerves among the essential conditions of production of sight and sound *sensations*.

Although not demonstrated by physiologists there seems to be a general belief in the existence of a muscular sense; and even if this be not admitted there must be a sense equivalent to it, even though this reside in the bones, skin, and ligaments. Otherwise we should be in the position of the statue, or the patient with ataxia. From another point of view, it seems that many physiological phenomena can scarcely be accounted for except on some such knowledge. This was hinted at by Sir C. Bell, but as far as I know, has never been thoroughly worked out by his successors. He says: "We owe other enjoyments to the muscular sense. The divisions in music, in some degree, belong to the muscular sense. A man will put down his staff in regulated time, and the sound of his steps will fall into measure in his common walk. A boy striking the railing in mere wantonness will do it with a regular succession of blows. This disposition of the muscular frame to put itself into motion with an accordance to time is the source of much that is pleasing in music, and aids the effect of melody. There is thus established the closest connection between the enjoyments of the sense of hearing and the exercise of the muscular sense." I say this subject, as far as I know, has not been thoroughly developed, for I cannot help thinking that that knowledge which we possess of the contraction and relaxation of a muscle has more to do with many phenomena of our lives and pursuits than we are aware of. Why is it, in Sir C. Bell's illustration, that the leader of the band regulates the time with his staff? The beating time is in reality the contraction and relaxation of certain muscles. This proceeds with such regularity that there is no appeal by the ear against it. When the music teacher counts to the young player on the piano,

he could do so equally well were his ears closed, the time being regulated by the contraction and relaxation of the muscles concerned in vocalisation. May not the notion of time, then, come from the muscular sense? What is meant by rhythm, by accent, and quantity in verse? What is the rising or falling of the voice but an operation brought about by muscular action? If we remember that the chest must expand and contract for purposes of life, and that we can only use for the requirements of speech as much air as can be breathed in and out in a certain time, also that during this period we contract the muscles of the larynx and again relax them, we must arrive at the conclusion that all our movements during speaking, reading, or singing, are due to alternate contractions and relaxations of muscles; that there must be a rising and falling of the voice, and what we call rhythm is dependent on simple physiological action. Accentuation of words would follow, and many other interesting points which it would be out of my province here to dwell upon. In order to prove whether this feeling of rhythm depends upon the ear or some other sense, we should naturally turn to the deaf and dumb, and inquire what knowledge of music they possess, for I think any evidence in favour of or against their possession in any degree of the perception of rhythm would be a correspondingly forcible argument as regards the exisence of a muscular sense. Now, the fact of many deaf and dumb persons having written poetry or being able to versify might appear sufficient to warrant an affirmative to the question, whether they possess a sense of rhythm or of tune. Having taken, however, some little trouble in order to investigate the matter, I find that most of these writers of poetry were not born without the sense of hearing, but, on the contrary, distinctly remembered the time when they had the enjoyment of this sense. Still there are those who never heard a sound in their lives and are able to read poetry with the appropriate accent and rhythm; but to this the objection might be made that the method had been learned by some special means. It is well known that the deaf and dumb are now made to speak by the method of watching the movements of the speaker's mouth and by feeling his larynx, and I am much indebted to the Rev. Mr Watson, the Principal of the Deaf and Dumb School in the Old Kent Road, for the opportunities he has given me of testing his scholars, and for giving me his own opinion on the subject I am now discussing. It is this gentleman's opinion that in speaking his pupils are conscious of the effort by a sensation in the larynx, and that a degree of cadence is necessarily produced by the alternate contraction and relaxation of the muscles, although, no doubt, the pronunciation and accentuation of the word are learned by

merely tracing the movements of the speaker's lips. I might state that two of the teachers in this school were born deaf and dumb. On asking them to read aloud, they did so in a somewhat discordant tone, but with a proper accentuation of the words. A book of poetry written by a former inmate was presented to them, and they read without hesitation the following verse with the correct emphasis:

"When friends a lasting farewell take,
There comes the ill-suppressèd sigh;
The sad fond heart is nigh to break,
And tears quick rising flood the eye."

The author of this book of verse, Mr Simpson, believes that the deaf and dumb are as capable of writing and reading poetry as other people, but then it must be stated that it was not until he was seven years old that he totally lost his hearing, and thus the memory of words remained to him. It was so, also, with the deaf authoress, Charlotte Elizabeth, who wrote much poetry, but who did not lose her hearing until the age of twelve. Then, again, Dr Kitto—who, I believe, lost his hearing at twelve—when writing on deafness says: "It is not wonderful that deaf mutes and those who have become deaf in childhood, never do attempt to contend with those difficulties which seem absolutely insuperable. I am utterly ignorant of any verse writted by any person under such circumstances." In answer to this I was presented with a piece of poetry composed by a late inmate who was said to have been always deaf and dumb; but of this I feel somewhat doubtful. These contradictory statements show that some further observations are required in reference to the capabilities of the deaf and dumb. At present my own opinion is in agreement with that of the Rev. Mr Watson, that they do possess a knowledge of rhythm. This gentleman informs me that they dance to music, and move their limbs in true time. If this be satisfactorily proved, it will show that we human beings are in possession of a muscular sense, or some sense equivalent to it; that is, that we are conscious of the contraction and relaxation of our muscles, or of the movements which those muscular contractions entail; and that to this sense is due not only that knowledge which is necessary to enable us to preserve our equilibrium, but that sense of tune or rhythm which is an essential part of our appreciation of music. In corroboration of this view, I am informed by a singer that when reading a piece of music he mentally "hums" the air; but if he has a sore throat, or is hoarse, he cannot appreciate its merit to the same degree as when he is well; and a lady who has become absolutely deaf reads new music with appreciation and pleasure. If this be so, it would tend to

prove what I believe is correct of the deaf and dumb, that the movements of the larynx provide us with a sense of some of the qualities of music, and also that if we have a full knowledge of all our movements, we must be in possession of what is equivalent to a muscular sense.

But quite lately an account[1] has appeared of the Deaf and Dumb Asylum at Siena, giving details of the oral method of instruction, and, amongst other incidents, the faculty which one of the inmates has of the appreciation of music. It does not say at what age he became deaf, and therefore he might have had some knowledge of it in childhood.

"Padre Marchio introduced us to a young gentleman, a former pupil, who was an accomplished musician. He took great pleasure in playing on the piano, and although he could not hear his own performance he asserted that he could *feel* it, and was an excellent timeist. A young lady kindly undertook to play some duets with him at sight, and he was quick to observe the slightest mistake on her part, gently admonishing her of the same by a corrective touch of his elbow. His speech was quite natural in tone and of his former infirmity no trace remained besides deafness."

It might be further said that we need not be conscious, in the ordinary sense, of muscular movements whilst walking, &c., and yet the spinal cord, or the centre which rules over the muscles, may possess a knowledge of its own. By giving up the idea of consciousness, or the idea of an "ego" which must be behind all our sensations and movements in order to rule over the body, and regarding our actions rather as automatic, we at once rid ourselves of many difficulties in explanation of several curious phenomena. The spinal cord is sentient, but not conscious.

[1] 'Macmillan's Magazine,' Oct., 1882, by F. J. Kerr.

PART III—GENERAL AND FUNCTIONAL DISEASES

EPILEPSY

We understand, by an attack of epilepsy, the case where a person suddenly loses his voluntary power, falls into a state of insensibility, and is at the same time convulsed; these symptoms being followed by profound sleep. The two main points to be observed are the coma and convulsions, which the older writers used to explain by saying that there was a torpor of the brain and an excitement of the spinal marrow. The severe and characteristic symptoms which I mention as being present in well-marked cases do not necessarily exist at the commencement of the disease; but, nevertheless, we are obliged to apply the term epilepsy to the minor indications, since these may be merely the precursors of the thoroughly developed complaint. We often find that long before the patient has severe convulsions he merely "loses himself"—that is, his consciousness. This state, therefore, must be styled one of epilepsy, and it is to this that the French give the name "petit mal," in distinction to the "grand mal." But you might ask, is there any other symptom which may inaugurate the attack; may there be a convulsion occasionally occurring without any loss of consciousness, and which in time passes on to the true epilepsy? Such cases are described, as for instance that of a young man who had attacks of convulsions of the face, but no loss of consciousness, subsequently becoming epileptic. Now, if these can be truly relied upon, we shall scarcely be able to frame a definition of the disease; for if sudden coma and convulsions are the two facts which characterise epilepsy, and yet we say in some cases the loss of consciousness may be absent, and in others the convulsion, we altogether fail in our definition. If I judged entirely by my own experience, I should say that loss of consciousness was necessary to constitute a case of true epilepsy, for I have constantly seen this symptom precede all the other phenomena of the disease; but I have never witnessed a

case which eventually proved to be true epilepsy ushered in by other symptoms. The cases where convulsive movements alone occurred were invariably due to a local disease of the brain.

The term epilepsy, then, as generally understood, is a malady characterised by convulsive attacks, in general of short duration, with sudden and complete loss of consciousness, turgescence of face, twisting of neck, distortion of mouth and eyes, immobility of pupil, bloody froth issuing from the mouth, &c. This is the usual attack, or the "grand mal." Many of these symptoms, however, may be absent, leaving only that which I consider as essential—the loss of consciousness. If, then, we say that epilepsy is characterised by these symptoms, is the converse true?—do these symptoms always denote epilepsy? Certainly not. If, for example, a man has an injury to the head, and he occasionally falls into a state of unconsciousness and has convulsions, is he to be called an epileptic? Is the name to be used when such symptoms occur in a puerperal woman or in a patient with Bright's disease? Now, we are here much in the same position as we were in regard to apoplexy; the question is not so much one of scientific inquiry as one of usage. Formerly "epilepsy" had a much wider signification than at present, and the existence of certain symptoms appeared a sufficient warrant for the adoption of the term, and thus you will find in the older works of medicine such a list of the various causes of epilepsy as exostosis of the skull, tumours of the brain, syphilis, &c.; but at the present day I believe that if, with such symptoms as loss of consciousness and convulsions, it was discovered after death that the patient had a tumour in his brain, we should call the disease after the latter, without regard to the symptoms which accompanied it. Indeed where any substantive morbid condition has been found, we allow the latter to determine the name of the disease. Now, it so happens in true epilepsy, so often protracted over many years, with intervals of comparative health, no very definite change is found in the brain, and thus, as a matter of practice, I believe the term epilepsy is now used only in that class of cases where there is no tangible disease in any part of the body which is exciting the symptoms. I, of course, am not speaking of those slighter and chronic changes which are so frequently met with in old epileptics. On the other hand, if we consider that the symptoms arise from any definite cause within the cranium or in any other part of the body which may excite the brain, we rather use the term epileptiform. The obstetric physician has long adopted the term "eclampsia," and I see no reason why it should not be used for all cases of secondary epilepsy.

You have all no doubt witnessed the *true epileptic fit*, and still

retain a vivid impression of the horrible sight. The person subject to the seizure generally experiences some slight mental disturbance or premonitory sensation, styled the aura; at the same time an observer would note some pallor of the face; then perhaps a cry is uttered, the patient loses his consciousness and falls. Now commences a contraction of the muscles; the thumb is placed on the palm of the hand, and the fingers are clenched, while the arm often describes a rotatory movement. The sterno-cleido-mastoid muscle is violently convulsed, so that the head is turned to the opposite side; the muscles of the face are twisted, the eyes and lips distorted, and the whole aspect is hideous. The pulse is quickened, the chest is fixed, and the respiration suspended, so that the face becomes red and purple, whilst the veins of the forehead swell as if ready to burst. Froth oozes through the teeth, which are fast set, and if the tongue has been bitten a bloody saliva is projected from the mouth. There may be also an involuntary discharge of the secretions. If the patient be uncovered the urine may be ejaculated to a great height. This spasm lasts a moment, and is succeeded by another, so that the whole duration of the fit is made up of a number of alternate contractions and relaxations, which last a minute or two, when a complete resolution occurs. The patient then takes a deep sigh, his head falls powerlessly on one side, the stertor and coma pass off, and a deep sleep succeeds. He generally remains in a dull, stupid, or apathetic state for some hours, and occasionally it would seem as if the mind were quite unhinged, for a temporary mania or dementia may be the result.

We will now analyse the symptoms of this epilepsy, or *morbus comitialis*. The *loss of consciousness* I regard as the most essential and characteristic symptom of the disease—in fact, is is sometimes the only symptom. I remember a child, some years ago in Lydia Ward, who would be sitting on a chair stitching; suddenly she would fall, but before the nurse could reach her to pick her up she would have reseated herself in a chair and be again at work. This was the example of the *petit mal*, and is what some have called "epileptic vertigo." I have for some time past had under my care a young shopman in this neighbourhoud who is subject to these attacks; he tells me that he often has them whilst serving a customer, but he thinks they are quite unobserved. A clergyman, a patient of mine, has suffered many years from momentary loss of consciousness. Whilst in the pulpit he will lose himself for an instant, and again go on with his sermon. Another clergyman told me that for many years he had been subject to sudden loss of sight; these attacks have now proved to be epileptic by his having had two

severe fits of convulsions. A lady, whom I had long known, and who at last died in a demented state, was the subject for many years of a momentary forgetfulness, so that whilst conversing she would suddenly lose the thread of her discourse, and experience what she called a bewilderment. This was merely the precursor of a very severe form of epilepsy.

The *warning*, or *aura*, is a very striking and remarkable symptom, though by no means always present. It is the more remarkable because sometimes the seat of the sensation is in a veritably morbid state, and an irritation in this part has appeared sufficient to excite the paroxysms of the disease; but in the large majority of cases the aura is a truly subjective sensation. It would seem that the whole brain becomes suddenly troubled, and, as the sensorial function is departing, some curious feeling is referred outwardly to the surface, or to one of the organs of the body. The cause of the variation probably depends on the part of the brain in which the discharge occurs.

It might be thought that if there be a true cause for irritation on some part of the body, and that a sensation be felt in that spot, the source of the fit might be found there, and that such case would not be strictly one of epilepsy, but of a convulsion arising from an eccentric cause. For instance, in a case where a sensation preceding the fit was referred to a painful corn on the toe, and a cure was effected by removal of the source of irritation, the question might arise whether it could be classed as true epilepsy. I should be inclined, however, to apply the term to the case of a girl, a patient of mine, who referred her sensations preceding the fit to a sore spot on the face, although her father assured me that the application of laudanum to this spot was sometimes effectual in arresting the paroxysm. Sometimes the sensation is that of coldness in a part, or coldness all over the body; sometimes flashes of light are seen; sometimes the patient starts up as if he were mad; sometimes a sudden and piercing cry is uttered.

As the first cases of disease which we witness often make the strongest impressions upon us, so I have a vivid remembrance of this epileptic cry. When quite a youth I was walking behind a gentleman in the street, when he suddenly gave a most painful shriek—

> "Sent forth a sudden, sharp, and bitter cry,
> As of a wild thing taken in a trap"—

and then rushed across the road, where he fell, as if dead; he then commenced to struggle, and I learned from the crowd around him that he was in a fit. My own impression was

that he had been shot dead, but had force enough left to run a few paces; since a bird or other animal, when shot, will often exhibit phenomena very like those which I witnessed in this poor gentleman.

Sometimes the impressions are conveyed through the sympathetic to the viscera, and the stomach may be the organ where the aura is felt. Thus a gentleman of fifty years of age consulted me on account of attacks of vomiting. On questioning him I found that he suddenly became giddy, and was for a moment unconscious during these attacks; and also that when a youth he had fits. Or sometimes the heart is affected in the form of a violent palpitation, or of an angina; more rarely there is a pain darting through the head. Thus, a young lady is seized suddenly with a violent palpitation of the heart, sometimes she loses herself, and at the same time wets her linen. Some of you also may remember the case of a little boy who experiences a sudden pain in his head, and then falls.

Some years ago a girl, nine years of age, was sent to me on the supposition that she had some disease of the brain, but the case was evidently one of epilepsy. It appeared that for some considerable period she had been subject to sudden seizures of pain darting through the head, with momentary loss of consciousness. These attacks occurred once a week until lately, and now there are three or four daily. She would be sitting in a chair, feel a pain dart through her head, and then suddenly fall back insensible. The child's intellect was dull, and her whole appearance answered to that of an epileptic. This is called *epileptic neuralgia*. A boy, æt. 15, was brought to me on account of sudden attacks of a strange feeling in the nose and forehead. Another lad has peculiar feelings in his limbs, and is momentarily aphasic.

Besides the phenomena connected with common sensation and visceral disturbances, the special senses may be affected, as is shown by noises in the ears, flashes of light before the eyes, or objects gradually fading away and lengthening out before the sight.

One of my patients complained of a feeling of soreness all over him, another of a feeling as if the floor were sinking under him, and another as if he were rising in the air. This sensation has been dignified by the name of *levitation*. Another of my patients, whilst sitting in his office, used suddenly to exclaim, "Yes, yes, yes," was for a moment lost, and then resumed his work. Sometimes the exclamation is accompanied by some strange thought or actual delusion; at others it is preceded by a feeling which more than one patient has styled "the horrors." Occasionally you will be consulted for these premonitory symptoms only, as in a man who came

to me on account of strange feelings suddenly coming over him, when, although he would go on walking and talking as before, he would scarcely know what he was about.

There is no part of the epileptic seizure more worthy of notice than the aura, or those symptoms preceding or associated with the attack of which the patient is conscious. Patients will come to you telling you all they know of the attack, but of the accompanying phenomena occurring during the state of unconsciousness of course they are ignorant.

I have very little doubt that the two following cases are examples of epilepsy.

Case.—M. D—, æt. 30. Says for many years he has been troubled with a dream in which he fancies a needle is stuck into his throat. He immediately jumps out of bed and expectorates a little blood. He is not aware that he has any other symptoms. I imagine that he is epileptic, for a dream will not account for the expectoration of blood nor its exact recurrence over and over again.

Case.—M. B—, æt. 25. Came to me on account of a sore tongue, supposed to be syphilitic. He had a roseolous rash on the skin, and was taking specific remedies. The remarkable circumstance in his case was that the tongue was constantly healing, and then suddenly breaking out again into fresh sores. He therefore came to me for an explanation of this remarkable form of glossitis.

On close and careful inquiry he said during the last few months he had had four attacks of glossitis with ulceration of tongue. He woke up in the night, found his mouth full of blood and his tongue sore. When I saw him, soon after the last attack, his tongue was swollen, and on the right side was a sore which might well have been produced by a bite. On direct questions being put to him in reference to any strange feeling he had ever experienced, he said he had had several giddy attacks.

These patients, with all varieties of epilepsy, do not, as a rule, complain of headache, although a pain in the head may be the principal symptom of the disease in those exceptional cases already mentioned where there is a local lesion.

As regards the *convulsions*, they are, as a rule, more on one side than the other, and sometimes almost unilateral. On closely watching the patient, you will observe that they consist of alternate contractions and relaxations. The head is turned round, and one arm violently twisted on itself, so that sometimes dislocation takes place. The dressers must be very familiar with a woman who repeatedly comes here to have a dislocated shoulder reduced after her fit. Not only is the convulsion on one side, but the whole body is sometimes violently twisted round. There is now a boy in Stephen Ward, under my care, who at the onset of the paroxysm rotates two or three times. I know a child who sometimes, instead of having a regular fit, throws out his left arm, and for a moment appears strange.

The spasm of the thorax causes suspension of respiration and resulting redness of the face; the consciousness is gone, and consequently all sensation. The patient is in a state which was formerly called one of apoplexy, being insensible, with froth issuing from his mouth.

The pupils are dilated during the fit, and it is very noticeable how intimately associated their condition is with the paroxysm. You may, for example, as occurred to me not long ago, be speaking to a patient, when suddenly he falls in a fit; you immediately raise the eyelid, and find the pupil dilated; in a few seconds the convulsions cease, and at the same time the iris contracts to its normal size.

The convulsion is the most important phenomenon in epilepsy, and when the fit is over the circumstances attending it constitute the main features by which the fact of its occurrence is known. Thus, if the paroxysm be violent, an actual rupture of the tender capillaries in the muscles and skin may take place; and, as Trousseau has observed, a general mottling of the skin may sometimes exist for a day or two afterwards. I remember the case of a young man whom I saw some years ago, with Dr Farr, of this neighbourhood, who, for the first time in his life, had a most violent epileptic paroxysm, and when we saw him shortly afterwards with an almost purpuric condition of the skin, we suspected that he had blood-poisoning, and that probably the fit was the onset of smallpox. As it eventually proved, however, the mottling was due to the violence of the spasms and the injury to the capillaries. If a person have fits in the night, his only knowledge of the occurrence may be the sight of the disturbed bed-clothes. In some instances he might discover some soreness of his limbs, or the presence of some of the evacuations. I might mention, as a circumstance worth remembering, and one no doubt intimately connected with the immediate cause of the fit, that there are persons who have been the subjects of epilepsy for many years, and have never had an attack except in the night. It is important, therefore, to note the time of the day at which the fit occurs, and the circumstances dependent on it. The occurrence in the night or early morning naturally suggests a connection with the state of the circulation, more especially with the anæmic state of the brain existing in the early hours of the day. One of my patients has never had a fit except at four o'clock a.m., and another in the night only, except when he has slept on Sunday afternoon.

After the attack is over the patient awakes, looks round him like a drunken man, and mumbles some words, as if his faculties had scarcely returned. He allows himself to be put to bed or led anywhere, without any remonstrance. Sometimes one side of the body

remains weak for several hours. The mind is affected in various ways in epilepsy; it frequently becomes, in course of time, enfeebled, and at the time of the paroxysm is often much excited. At the onset of the attack the patient is sometimes furiously maniacal, so that it becomes an important matter to know in what state the brain is in those subject to fits. Indeed, a French physician, Dr Falret, has come to the conclusion that no epileptic is a responsible agent. Sometimes those who have epileptic fits show a remarkable derangement for a short period before the attack, as well as afterwards. I know the case of a lad who, according to the mother's account, is quite mad about the time of the occurrence of the fits. Sometimes the maniacal state constitutes the principal feature of the attack. Thus, a lady, æt. 42, came to me, saying that for the last two years she had been the subject of hysterical attacks, but from her description, and that of her friends, they would be more rightly styled attacks of epileptic mania. She would suddenly become violently convulsed, with her head thrown back; she would clutch and bite at any object near her, and often scream violently. During the whole day in which the attack occurred she was quite unable to control herself. When she came to me she was perfectly calm and quiet in her manner. I sometimes see a rather weak-minded epileptic young lady who has attacks of violent nodding of her head, and, at other times, sudden outbursts of passion. Also a child, æt. 13, the subject of "strong fits" with convulsions; she has sometimes violent attacks of mania; and these in all probability replace the fits.

The newspapers constantly record such cases as the following:

"At Worship Street, William Bustin, æt. 27, described as a carpenter, was charged with having assaulted his wife with intent to do her some grievous bodily harm. The prisoner was further charged with attempting to commit suicide. On the 18th of December, between four and five o'clock in the morning, he suddenly jumped up in bed, and, without saying a word, struck the woman a heavy blow on the head with an earthen vessel. She endeavoured to get out of the room, but the prisoner seized her, threw her down, and beat her about the head and body. Her screams brought some lodgers in the house to her assistance, and eventually she succeeded in effecting her escape. On being taken into custody the prisoner asked if she were dead, and, being replied to in the negative, said he was sorry for it. At this time he was bleeding from a wound in the throat, apparently inflicted by himself with a pocket-knife which was found in the room. Though a severe one, it was not of a depth sufficient to sever the great arteries. The prisoner was removed to the German Hospital, where he has since remained.

Besides the injury in question, he had to be treated for a succession of epileptic fits. The prisoner, in answer to the magistrate, said that he knew nothing of the assault. The fit came on, and he was quite irresponsible for what he did. In early life he had had three falls, and now whenever he went to an unusual height he invariably fell. He was fully committted for trial."

I think there can scarcely be a doubt that, as a rule, the mental condition of confirmed epileptics is low. In the course of time the mind becomes impaired or obtuse, with a loss of memory. The epileptic attacks and the mental impairment may stand in the relation of cause and effect, or be associated only as symptoms of an antecedent derangement. Thus, I might say that the same cause which produces epilepsy tends to produce imbecility; but I also believe that epilepsy occurring from some violent exciting cause in a previously healthy brain will, if continued, affect the integrity of the brain structure. On the other hand, there are well-marked organic changes in the brain, which lead to impairment of the mind at the same time that they induce fits. I believe ten per cent. of all those mentally affected are at the same time epileptic. It is for this reason that a permanent paralysis may be sometimes observed in epileptics; it is, however, attributable directly to the organic change in the brain, and is not a part of the paroxysmal disorder.

The mental state may, therefore, be regarded under three distinct aspects—the temporary derangement preceding the fit, the dulness and tendency to dementia as a consequence of it, and the peculiar mental condition which often permanently belongs to the epileptic. It may be, however, that this third state is often nothing more than a prolongation of the aberration which accompanies or precedes the more regular paroxysm; or it may, indeed, take the place of the true epileptic discharge. The epilepsy then is said to be masked, and the case is one of "epilepsie larvée." Very often, in young people, the mind is observed to be very active and acute, prone to be visionary and to strong religious emotions. The visions which they see probably arise at the time when the grey matter is in an extraordinary state of tension before the so-called discharge occurs. A very good example of this is published in the 'Guy's Gazette,' by Mr Ashby, of a young man who was brought in here from the street:

Case.—F. G. P—, æt. 34, was admitted at Guy's in August, 1874, under Dr Taylor. He was found lying in the streets, near Billingsgate, and was brought in a comatose condition to the hospital. His pupils were contracted, and insensible to light, and he could not be roused. A few hours after, he was sick and more sensible, but confused. On the following day he was well enough to give an

account of himself. He said that his mother, though never an inmate of an asylum, was latterly strange in her manner at times, and looked upon as not quite right. One of her brothers and one of his own brothers were also strange. He had been subject to fits all his life, but they had been more severe during the last two years. He is a tutor by profession, and has followed his employment successfully. About two years prior to one of his fits he distinctly saw a number of soldiers with rifles, and commanded by officers, drawn up to execute him. He could hear their voices, and distinguish the details of their dress. This continued for about an hour before he became unconscious. On five separate occasions before the fits he has had the same delusions. He positively states that no effort of his mind guided by past experience can expel the delusions, and that at the time he is perfectly certain of their reality. After losing his consciousness he often walks about in an apparently rational manner before falling down and becoming convulsed. On the present occasion he was coming up the river from Boulogne, and remembered nothing after passing Gravesend, but appears to have conducted himself rationally until he fell down in the street in Billingsgate. A few months ago he went to Paris, with an idea of perfecting himself in the French language, and supporting himself meanwhile by teaching English. Having the misfortune to lose what means he possessed, he wandered about the city for several days and nights, and the exhaustion which ensued seems to have been the exciting cause of an attack of acute mania. He wrote an account of himself during that period, which is of interest as giving a vivid picture of the reality of the delusions of an excited brain:

"I arrived in Paris the first Sunday in June. Robbed the same evening of the greater portion of my money. Continued walking (occasionally resting on a bench) until Thursday evening, when I gave myself up to the police. On Wednesday afternoon I fancied that persons in the streets were calling after me, every one speaking English. I became very excited, and took refuge in one of the public gardens, where I lay for some considerable time under the shade of the trees. There I imagined a conversation between several persons relative to my intended destruction by some soldiers in the ensuing evening or night. I passed a most fearful night, running from street to street being pursued by omnibuses full of armed men. Towards morning the hallucination gradually dispersed, and left me pretty quiet for an hour or two. I was not permitted to remain in peace for a longer duration than this. Passing down the side of the Seine, I was met by a young soldier, who made a thrust at me with a sword-bayonet. I cleared out of his way, and continued my walk by the river. Now the most frightful scene appeared before my eyes: I was riveted to the spot, I dared not move a limb, and was ordered to immediate execution by hundreds and thousands of voices. The barges on the Seine were filled with spectators and bands of musicians playing funeral marches. One vessel was decked out with all my funeral paraphernalia and the men that were to be my executioners. All the people I had ever known in my life appeared before me. I expected to fall at every moment. The bullets cracked and cracked. I could feel them hit me. At last I felt a hand upon my arm, and turning round perceived a policeman, who asked me to pick up my umbrella. I could not be persuaded for some little time to alter my position, but remained where I was till, if I rightly remember, I nearly fainted, and walked off and sat myself down on the first bench I could find. What passed for two or three hours my memory does not serve me to relate, but I found myself racing through one of the environs pursued by dozens of armed soldiers. My strength must now have entirely forsaken me. I entered a small café, and sat

myself down. There I remained some little time, till at last I was escorted by two officers to the Commissariat of the Police. I suffered a great deal there from the excited mob, which I imagined to be on the side of the office. From this place I was escorted to some other station of the police, and afterwards taken in some conveyance to the Préfecture, where they locked me up in a small chamber for about twenty-four hours, after which I went to St Anne. What I imagined in this chamber surpasses description. I fought nearly the whole time, bathed in perspiration, until I suppose I wore myself out and fainted. At St Anne I was very ill, and put to bed with a straight waistcoat, secured firmly to the bed. There were three other persons in the same room, but I could count no less than from thirty to forty. These men, I believed, had followed me for the purpose of taking me off to a place of execution. I remained delirious for four or five days. (I had not tasted intoxicating drinks of any kind for several days.) At St Anne I believed myself in my uncle's house, and he all the time was bribing them to spare my life. I applied to the doctor for an indulgence from Rome, and this I believed to have arrived, and I was free to return to England. I left St Anne in pretty good health, and with five others was taken to the Asile de Ville Evrard. It is a large place and very beautiful, capable of accommodating two hundred and fifty men and as many women, divided and subdivided to suit the character of the different patients. I was very tranquil all the time, and inhabited the best quarter. I have suffered from these visitations some three or four times. I am frequently lifted and thrown with great weight from one side of the bed to the other. I believe firmly in the possession of evil spirits, the same that are frequently alluded to in the Gospels of our Lord. These disastrous occurrences have almost brought me to ruin.—F. G. P., August 20th, 1874.

A few days after, thinking we were rather too interested in him, the patient took himself off suddenly.

Unconsciousness and Semi-consciousness without Falling.—One of the most remarkable conditions associated with epilepsy is that where neither of the characteristic symptoms—complete loss of consciousness or convulsion—is present. The patient is in the condition which is popularly called "lost;" he is scarcely conscious of acts and conversation going on around him, and yet he may continue walking in a given direction, showing that his movements must still, in a measure, be guided by his senses. He is in a kind of dreamland, and is indeed much in the same state as a somnambulist. This condition, under many varieties of form, is called the *status epilepticus*, although the term is more usually applied to the case where the patient lies for a lengthened period in a kind of trance or stupor, as, for example, in the case of a man lately in the hospital, who, after a succession of fits, lay for hours in a state of lethargy. In the milder forms it is one of great interest from a physiological point of view, and seems to point to the possibility of a semi-conscious state, in which the brain is sufficiently active to control the spinal system and yet not awake enough to excite the feeling of consciousness. In reference to the influence of the brain on the muscles and the necessity of conscious-

ness to preserve their tone, the condition is one full of interest. Any circumstance which renders us for a moment unconscious causes the muscles to relax. If we sleep standing, we fall; if we sleep sitting, our head tumbles on one side and the jaw drops; some have also a paralytic relaxation of the palate, producing the phenomenon of snoring. The explanation of these facts must depend on our views of muscular action. If we think the muscles are kept in a state of tension by nerve force we have only to consider that it momentarily ceases to flow for relaxation to occur; whilst, if we regard the contraction of muscle as due to a discharge of force let loose by the action of its nerve, we can still regard the phenomenon as due to the removal of the governing influence of the brain. According to one theory the brain is powerless to sustain the muscle in contraction; according to the other theory, it is powerless to restrain the latent forces in the elongated muscle. Whatever view we take of the ordinary physiological fact, we must regard the case as remarkable where the patient becomes quite insensible to things around him and yet does not fall. He may, for example, remain motionless until the fit has passed off, or if he is walking in the streets he may go on in his course, sometimes running into danger, or if, in the country, walking over a precipice. He may occasionally, like the somnambulist, avoid obstacles, as if the senses were still guiding him. It is, therefore, not quite correct to say of Lady Macbeth that though her eyes were open "the sense was shut." In the case of a patient whom I know, and in whom marked attacks of epilepsy sometimes occurred, there were occasions in which he lost himself in the most gradual manner; so that when one day he arrived at a friend's door, and was about to knock, a strange feeling came over him, which propelled him to walk on; he paced at least three times round the square before he became quite unconscious, and then he was found lying insensible and convulsed on the pavement. A girl patient, as the mother tells me, will get off her chair and describe a circle round the room before she falls. A medical man who has had a few attacks of an epileptic nature informs me that on three occasions he suffered from loss of memory which lasted two or three days. On one occasion he took his wife with him in the carriage, in order to write down the prescribed medicine immediately on his leaving the house, and to direct him where next to call. If it had not been for her assistance he would not have known in the evening a single occurrence of the day's proceedings. This continued for two days, and then passed off. I apprehend a modification of this condition must be familiar to many persons when they have been in such an abstracted mood or reverie that they have performed many acts

after the manner of an automaton.[1] Workmen have been known to suddenly lose their consciousness, and yet continue any peculiar movement in which they have been engaged. A carpenter, for example, will stand for some time unconscious, hammering or sawing in the air. I have seen a case reported lately of a sailor who would have a slight fit, and remain in any position he might at the moment be placed, as pulling a rope, &c. Another man would walk through the streets of London in a perfectly unconscious state, and on one occasion was found counting the rails around St. Paul's Church Yard. I have now a patient under my care who for two years has been subject to fits. Whilst sitting in his chair his wife sees him turn pale, and he then becomes quite unconscious; his wife leads him up to bed, or anywhere she chooses, when he goes to sleep and remains dull for two or three days. The condition of these people seems very like what is often witnessed in a slight concussion, where, for example, a man will be thrown from his horse on to his head, get up, remount, and ride home, but will completely forget every circumstance since the moment of the fall.

A lady consulted me on account of her daughter, æt. 13, first describing in a letter the following strange attacks:—"She enjoyed good health until two and a half years ago, when, whilst at breakfast, she got up from the table to put a basin on the sideboard; instead of doing so, however, she went in an opposite direction, and, after taking a turn in a circular direction, she put down the basin on another table. She was soon herself again, and answered when spoken to. About a year afterwards whilst looking over a house, she was missing for a few minutes, and then presently came walking towards us in an unconscious state; she was very pale, and her nose like alabaster. She presently vomited, and was soon herself again. Our medical man said it was her stomach.

[1] It is probable that that state of brain which in its highest degree is associated with the epileptic paroxysm exists in every modification, not only in the disease known as epilepsy, but under all circumstances where the brain may be impaired by deficient circulation or other causes affecting its nutrition. A gentleman informs me that he had an attack of typhoid fever during the time of the American war. During convalescence he was made conversant with all particulars of it, and became so interested that he believed he himself was an actor in it. It was not for some time that he discovered the "muddle" he was in, and that he could not be a London merchant and an American soldier at the same time. The interesting point, however, is that the story has left the same indelible traces on his memory as the actual facts of his existence, and on reviewing the past the American war comes in its place in his personal history as strongly as any of the events which are founded on fact. He thinks that when he grows old he may believe the fiction to be true.

Some months after this, whilst sitting on the beach at Eastbourne, she complained she could not see properly; she looked very strange, made a slight noise, and twitched a little. She was taken home, when she was sick."

I shall presently speak of epilepsy arising from local disease, where the convulsions are unilateral; but this is by no means always the case, as a local lesion may cause attacks where there is a sudden and general discharge (as it is called), as in ordinary epilepsy.

For instance, a gentleman, æt. 21, a highly intelligent and cultured man, has had three or four fits, in which he fell suddenly on the floor without any warning, and had general convulsions. He has a large scar and depression over the right eyebrow, where the bone is deficient and the brain may be seen pulsating. The injury arose from the bursting of a cannon nine years ago, causing a fracture of the skull and injury to the brain. Some bone and cerebral matter were removed at the time. He has suffered no pain since the accident, but has entirely lost his smell. His taste remains, except for flavours. The sensation of the nose is perfect, and he still sneezes. There might be a question as to the injury being the cause of the fits, as he had nervous symptoms when a child, and has a brother the subject of fits. It is curious, in a case of this kind, to observe the movements of the brain; there is, first, a movement synchronous with the heart, then another with the breathing, and, besides these, various undulations of another kind may be observed, and which are supposed to be related to the varying activity of the organ; at least this is the opinion of those who have watched the exposed brain during sleeping and waking moments.

Falling without Loss of Consciousness.—I have already spoken of this strange affection under the heading of Spinal Cord Diseases both because it might be conjectured that the motor centres outside the brain proper were alone at fault, and also because it has been known to occur in persons who subsequently suffered from a real paraplegia; but I allude to it again in this place because the question of the attack being possibly of an epileptiform nature has sometimes arisen. In epilepsy it is clear that the function of the brain for a moment ceases and the patient falls; if the spinal cord be intact a convulsion follows. If the spinal cord were in the same way to lose its functionising power or activity the patient would simply fall. In most cases this sudden cessation of activity points to a commencing change in the medullary matter, whereby an upsetting of the equilibrium is produced. Thus, a patient of mine who died of a myelitis after many months in bed, had no sym-

ptoms of paraplegia until he suddenly fell in the street. Another patient, confined to his bed with well-marked rhythmical paralysis from lateral sclerosis, said that his very first symptoms of the disease occurred whilst he was on the deck of his ship (he was a sailor), when he fell down, and being quite unable to rise, was carried down to his cabin. He regained the use of his legs after a little while, and soon after the present symptoms began.

I know a patient now suffering from locomotor ataxy who, before the symptoms were marked, fell down in the street, and Buzzard says he has known a similar case. A gentleman now the subject of bulbar paralysis tells me that eight years ago he suddenly fell paralysed, and did not recover the use of his limbs for some days. Pierret mentions cases of myelitis where the more marked symptoms were preceded by a sudden falling and speedy recovery. We occasionally, however, meet with instances of this sudden falling where the cause is obscure. Two of such cases I have already mentioned under the heading of Spinal Affections.

Sometimes with very obscure histories of sudden falling it is difficult to locate the cause either in the brain or spinal cord, as in the following case:

Mr. H. G—, æt. 50. Two years ago he was in a railway collision. He was not struck, but he received a shock, and to this he attributes his subsequent symptoms. Two years after the occurrence, whilst in his office, on rising to speak to a friend he fell down, but did not lose his consciousness. He got up and walked to a chair. Soon afterwards, whilst shaving, the razor dropped out of his hand. He has had several attacks of this momentary loss of power. Often at these times he has a sensation like a galvanic current passing up his back. Sometimes in the night he has awoke and found loss of sensation in the left arm and leg.

On examination, no objective nerve symptoms existed, his only symptom being deafness of the left ear. The reflexes were all natural. His medical man considered his complaint to be a form of epilepsy.

You will be prepared to learn, from what I have already said, that the epileptic attacks in different individuals do not always present the same phenomena. There is the case in which the patient experiences nothing but a simple loss of consciousness, that in which there is a slight convulsion, and, again, that which I have described as the grand attack. Whether the case of convulsion without loss of consciousness can strictly be called epilepsy is questionable. The premonitory warning, again, is sometimes absent and sometimes present. It may occur as a sensation styled the aura, which, beginning at the surface, creeps up to the head, when consciousness departs; or it may occur in the various other ways described. A little girl, æt. 7, is subject to fits, having one nearly every day. They are of two kinds: in one she screams,

and in the other she falls convulsed. The former lasts but a short time. Then, again, the period of the day in which the fit takes place varies, sometimes occurring only after the patient has retired to rest. The intervals between the attacks also vary much, consisting of days, weeks, or months. I am now seeing a lady who was a confirmed epileptic for nine years, during the first five of which she consulted numerous medical men, and took all the usual medicines. Receiving no benefit, she desisted from treatment for two years, when they gradually became less severe and left her. They were absent for seven years, when again, two years ago, they reappeared, and now she has a fit about once a week, and always at night time. This is a very common occurrence, and shows how states of circulation affect the brain. In some cases the fit always occurs towards the morning, as in a young lady who has had epilepsy for seven years. She experiences a strange feeling in the right arm, leg, and face, and then becomes insensible. She sleeps heavily all night, and after being called in the morning sometimes goes to sleep again. She then wakes up with this strange feeling, becomes unconscious, and again sleeps for several hours. There are also other classes of cases which entirely preclude the idea of epilepsy being an organic disease situated in one spot of the brain. For instance, I know several cases of ladies who, being subject to slight fits whilst they were child-bearing, have entirely lost them at a later period of life. Then there are those remarkable cases of epileptic fits occurring only once in a person's life. Such have been described as being occasionally fatal, but I have never seen a death under these circumstances, although I expected its occurrence in many of them. A short time ago I was summoned to Mitcham to see a gentleman about forty-five years of age, who had been seized with a fit. He had driven home as usual, and appeared in perfect health until the evening, when he fell in a convulsive fit. He had several attacks, and when I saw him he was in the lethargic state which commonly succeeds the paroxysm. He had no more, and rapidly recovered. Every possible cause was gone over by the medical men and his friends, but no light was thrown upon the case. A somewhat similar case I saw a few months ago in the person of a remarkably fine young man; the same in whom the convulsions were so strong as to rupture the capillaries and induce a purpuric appearance, which suggested the advent of an exanthem. In this case the fits were of the most violent kind, and could be attributed to no cause. Sometimes a severe shock or mental emotion will induce a fit. A young man who had been somewhat irregular in his accounts was called into the room of his superior to receive a reprimand; he fell down on

the floor in a fit as if he had been shot, and, remaining in an insensible condition, medical advice was sought. He recovered, but continued in a remarkably apathetic condition for some days. He had never had a fit previous to this occurrence, nor has he had one since.

I have now seen several cases of this kind, so that it would seem that the same causes which determine hysteria in the female will occasionally and exceptionally produce epilepsy in the male. It has always been a belief of mankind that passion will make a man convulsed and foam at the mouth. At least we have reason to think so if we find it recorded by the great observer of human nature. Thus, when Iago works Othello into such a passionate rage that he falls insensible, Cassio asks what is the matter, and Iago replies, "My lord is fallen into an epilepsy. This is his second fit; he had one yesterday. The lethargy must have its quiet course; if not, he foams at mouth, and by and by breaks out to savage madness."

Exciting causes of this kind do not often induce a fit in a confirmed epileptic, but occasionally we are told of examples of it. Thus, an engine-fitter who has had the disease gradually increasing upon him cannot now go into his workshop without experiencing an attack. Intemperance may be the cause of temporary epileptiform attacks; excessive smoking also.

Diagnosis.—In a well-marked case of epilepsy the diagnosis is easy, owing to the insensibility and unconsciousness of the patient. If he show any signs of feeling or voluntary power there is a supposition of the fits being feigned. If he fall so as to injure himself there can be no doubt of course of the reality of the seizure; but, on the other hand, the avoidance of danger does not mark the patient as an impostor, for sufficient warning of its approach is sometimes given to the real epileptic. The most difficult diagnosis is that between epilepsy and hysteria; indeed, the symptoms in a particular instance may partake so much of the nature of both diseases that we are forced to employ the term hysterical epilepsy. And this compound condition is by no means confined to women; I have seen several instances of it in men. I know a gentleman who for many years has been subject to fits, and they partake quite as much of an hysterical as an epileptic nature. In a severe hysterical fit it is, however, important to be sure that the patient is not epileptic. This may be told by the want of utter insensibility, by the long continuance of the paroxysm, by the contraction of the eyelids, and the resistance used to their being raised; the contraction of the pupil, the choking, throwing the arms about, or screaming. In fact the hysterical patient is very noisy, whilst the other is quiet. If we are told that a patient has a fit, the cir-

cumstances under which it has occurred may often form a guide as to its nature; for example, if a woman have a fit whilst alone in her house or room, and fall into danger, there can be little doubt about its reality; but if, on the other hand, the fit never occurs except the patient be in company, there is a strong suspicion of its hysteric character.

In hystero-epilepsy the phenomena also are peculiar, and ought to be distinguished from those of pure epilepsy.

CASE.—Miss L—, æt. 11, was sent to me for fits, in which she was said to be violently convulsed, and that they were brought on by excitement. Whilst in my study she had an attack. I immediately placed her on a couch, when she stretched herself out, her limbs became rigid, and her head was thrown back with her mouth open. Her eyes were turned up, and the pupils were dilated. Every now and then she would jump up, throw her arms about, and fall back into a state of rigidity. At the end of five minutes she gave a scream and came to. The phenomena were unlike those of epilepsy, for the chest was not fixed, and there was no lividity, whilst it was the limbs which were rigid, being affected by tonic spasm. Instead of the jaw being clenched it fell open. The heart was quiet. She was, however, quite insensible, and it may be remarked that the pupils were dilated. She had never had any of the common symptoms of hysteria; she sometimes acted strangely, as, for instance, going through an imaginary performance of letter writing.

The diagnosis also between an epileptic fit and a fainting fit has constantly to be attempted by the medical man. Children who are subject to the "petit mal" are said by their parents to be liable to fainting. It should be remembered, before forming a conclusion as to the more serious nature of the attack, that there are persons of a nervous temperament who will faint at the sight of blood or the slightest feeling of pain, or on the relation of an unpleasant story; also if they remain long in an impure atmosphere, or stand with their back to the fire. As an example I may mention a little girl in whose case epilepsy was feared, as she so often fell down whilst dressing and whilst standing at church. She is at the present time quite well.

I have already said that when a well-marked cause exists for the fits, as renal disease, the term epileptiform fit or eclampsia is used; but as regards the character of the fit itself, it cannot be distinguished from true epilepsy, although the following circumstances may be noticed. In uræmia there is no aura, the attacks do not come on suddenly, and there is usually a prolonged coma or lethargy following, which is not so marked in epilepsy. It is an interesting fact, however, that, the theories of uræmia being so unsatifactory, other explanations are sought for the symptoms, and that these partake very much of the nature of those theories which obtain in epilepsy. Thus, in fatal Bright's disease, where uræmic

symptoms have been present, the brain is usually pale and œdematous, and this condition is considered by some sufficient to account for the phenomena. Blood effusions, however, are sometimes found.

When fits arise from organic disease of the brain there are generally some other cerebral symptoms to denote the cause, and it is remarkable that in many of those cases where there has been a local disease of the surface, giving rise to violent paroxysms of convulsions, the coma has been often absent, and thus the disease has not fallen strictly into the category of epileptic complaints. Many years ago Dr Bright was led to make the observation that in those cases where consciousness had not altogether departed during the fit there would be discovered a local disease of the brain.

There are many other conditions somewhat resembling the epileptic state. Thus, patients who have strange feelings in their heads constantly fear that they may be the subjects of fits, and there is such a thing as *epileptic vertigo* and a giddiness coming on in paroxysms as a precursor of a more serious malady. We must recognise, however, a simple vertigo, which constitutes the sole malady from which the patient suffers. A French physician has found the cause of one form of giddiness to be in the internal ear, and of this I shall presently speak. Then there is a giddiness connected with organic disease of the brain and a rigid state of the blood-vessels, and a functional variety in connection with indigestion and its accompaniments. I have observed a very striking difference in one respect which sometimes obtains between the dyspeptic vertigo and that arising from real cerebral disease. In the latter the patient, when he feels the sensation coming over him, immediately stops if walking, or if standing lies down, whilst in the former the person feels well whilst walking or in the upright position, but immediately he stoops the giddiness comes on. The dyspeptic person lays his head on his pillow at night, and immediately the "room goes round with him;" he jumps up, and the vertigo passes off; this again and again occurs until it is only by the most cautious and gradual descent he is enabled to compose himself to sleep.

As regards the *nature or pathology of epilepsy* I can say nothing very positive, although no disease, owing to its very striking nature, has received more attention in the attempt to unravel its mysteries. Many have placed the seat of the disease in various parts of the brain, as in its centre or in the medulla oblongata, but I think full consideration of the subject must show that the brain as a whole is affected; it is true that epileptiform fits may accompany local tumours in the brain, but such tumours must be regarded only as exciting the paroxyms. The conditions which produce fits are those

which imply that the brain as a whole is involved, as, for instance, when the blood is poisoned by urea, alcohol, or other matters. Then, again, the want of blood, as in hæmorrhage, will produce an epileptiform fit. I have now had three patients with remarkably slow pulse, anæmia, and epileptiform attacks. They have been told that their fits are due to their slow circulation, but inasmuch as I have never seen a pulse as slow as 28, 30, and 32, which was the number in these cases, without a nerve cause, I should hesitate in accepting this explanation. I have one patient where the slowing of the heart is clearly of nervous origin, for it is only during the epileptic attacks that his pulse is as low as 40. At other times it is normal. The decision of such a question is not always an easy one, for if we refer the loss of consciousness to a sudden diminution of blood in the brain, the case is similar to that of syncope. For example, a thin impoverished lady comes to me saying she is subject to fits. These consist in a sudden loss of consciousness on first rising in the morning, suggesting a simple anæmic cause for it.

I might also refer to the case of the young man I mentioned, where sudden fear was sufficient to provoke the paroxysm. Again, the fact of convulsions being excited by a distant irritant tends to corroborate the idea that the seat of epilepsy is not in one small spot in the cerebro-spinal centres. A few years ago an American visited Europe for the purpose of having his testes removed in the hopes of finding a cure for his epilepsy, for he had heard it stated that epilepsy had its seat in the genital organs. The operation was performed, but with no good result. Dr Marshall Hall had a notion that the disease was caused by a spasm of the glottis, and therefore that tracheotomy would prevent the occurrence of the fits. The warranty of his great name favoured the performance of the operation in a few cases, but there was no success. Then, again, the post-mortem appearances of the brains of epileptics display but very slight changes, although the organ may be found wasted as a whole or the membranes thickened. Lastly, if we consider the nature of the paroxysm, we shall be led to the conviction that the fit is due to a commotion of the brain as a whole.

It is a circumstance worthy of remark that an epileptic fit can be closely imitated. An eminent French physician was thus purposely deceived by a medical student, and mistook a feigned attack for the real disease. This result is attained by the person making use of his voluntary powers, or putting his cerebral hemispheres into action in order to excite the ganglia below which rule over the limbs and muscles of the body. He can thus produce a paroxysm resembling that of a true fit; nay, more, he might, if on the stage of a theatre, work himself up to such a pitch of excitement that the

mind would almost lose its balance, and a corresponding exhaustion ensue. We have only, then, to suppose the cineritious surface of the brain to be unduly excited in order to conceive how it might induce a corresponding action in the ganglia below (which rule over the limbs), whilst, itself being overwrought, all mental processes would cease. As the older writers expressed it, there is coma associated with excitement of the spinal cord. Now, if the upper portion of the latter be none other than the central ganglia of the brain, we believe that the doctrine may be received as correct. These ganglia must be therefore healthy, and not structurally diseased, whilst, at the same time, the function of the surface, which is associated with the intellectual processes, is lowered in tone.

When in a case of epilepsy the mind fails until imbecility results, a structural change is often found on the surface of the brain; and it is well known that epilepsy is often an accompaniment of the general paralysis of the insane. It so happens also, that if epilepsy, or a disease approaching to it in character, does present any positive post-mortem appearances, they are nearly always of one kind—an adhesion of a portion of dura mater to the surface of the brain, arising from injury to the skull, syphilis or other disease. I say in cases which may be called true epilepsy, judging, not only from the symptoms, but from the general history and duration of the complaint, very little definite change is discovered in the brain; but in cases of shorter duration and fatal, indicative of positive disease, the change is generally found to involve the surface. Why a condition which is permanent should excite occasional disturbances of the organ, does not constitute a difficulty peculiar to epilepsy; for there is no more difficulty in supposing that the whole cineritious surface of the brain should be occasionally set in action by a local excitement in the organ itself, than it should be affected by some altogether unknown cause at a distance. Moreover, there are certain peculiarities about these fatal cases which (although they are not representatives of true epilepsy), yet tend to corroborate the idea that the first disturbing causes of epilepsy originate in the cineritious structure; for in some of those where consciousness is not altogether absent a local disease is found, showing that irritation of one spot is sufficient to produce the fit. Now, in these instances, one side of the body is often more affected than the other, indicating that instead of the disturbance being propagated throughout the surface, it is confined to one part of it, and thus the ganglion on one side immediately beneath that part is especially stimulated to action.

I think, therefore, that in cases where such local disease exists

the frequent occurrence of the fits, the consciousness sometimes remaining, and the temporary hemiplegia being more marked, all tend to show that the symptoms are produced by local irritation of the surface acting on the ganglia below. In the truer forms of epilepsy, also, I cannot but think that the morbid processes are the same, only the whole cineritious surface is disturbed at once, as well as both pairs of ganglia beneath. All the phenomena of the disease confirm this view, as well as the conditions which usually produce eclampsia, such as those resulting from blood-poisoning or mental shock. In all these cases it may be that the immediate cause for the phenomena arises from a temporary change in the calibre of the blood-vessels. The opinion of Dr Radcliffe has always been in favour of convulsive movements being due to a lowering or diminution of nervous power, rather than to an excessive action, and he would illustrate this by the epileptic seizure which is often a result of severe hæmorrhage. The difficulty in such explanation in the case of an ordinary fit is that, while one portion of the nervous centres is apparently for the time dead, another is in full activity, and yet the amount of blood in both would be the same. It might be said that the cerebral hemispheres, as already explained, have a restraining force over the ganglia below, so that immediately the function of the former is in abeyance that of the latter comes into play, but I have no facts to support such an opinion. It may be true that, thus unrestrained by the brain proper, the spinal system is more excitable on the application of stimuli, but I am not aware that it would under these circumstances spontaneously let loose its inherent forces. If this were so we should have a true spinal epilepsy. I would therefore, rather believe that these ganglia, which communicate directly with the medulla, are excited by the deranged condition of the hemispheres above them, the latter undergoing such changes in their cineritious structure that a true mental alienation is produced, ending shortly in insensibility. The exact condition in which that grey matter may be is a question, but at present we may adopt in part the theory of Brown-Séquard, that loss of consciousness is due to a contraction of the vessels of the brain, brought about by irritation of the sympathetic nerve; but whether this be due immediately, as this physiologist thinks, to the subsequent circulation of black blood after this contraction has ceased, must at present be regarded as doubtful.

The theory of an explosion of nerve force is more or less in accord with that which was propounded many years ago by Dr Todd, and is held in the main, I believe, by Hughlings Jackson. The former physician was one of the first who investigated nervous

diseases by a scientific method, and he was enabled, therefore, to throw much light on the pathology of epilepsy, so as to unravel its various phenomena of loss of consciousness, convulsion, and the maniacal state. He regarded it as a disease of the cerebrum, and, owing to the clinical fact of convulsion being caused by loss of blood, was inclined to believe that an anæmia was the precursor of a fit. He also performed experiments in order to discover the effects of irritating the convolutions. With this object, he thrust fine bradawls into the brains of rabbits, and passed through them currents from an electro-magnetic machine; in this way he obtained various movements of the limbs, face, and eyes. He therefore concluded that in epilepsy there is an undue development of nerve force, and that when this had reached a certain measure of intensity it manifested itself in an epileptic paroxysm. Just as a Leyden jar charged with electricity up to a certain state of tension gets rid of it by "a disruptive discharge," so the brain gets rid of its nerve force by discharge through the system during an epileptic convulsion. This view is essentially the same, I believe, as held by Dr H. Jackson, who speaks of the brain of epileptics being in a state of *unstable equilibrium*. There is some lack of power to retain nerve force—an upsetting of the balance between tension and resistance. The idea seems to be that there is a sudden discharge of nerve force from the brain which sets the whole muscular system in commotion, and at the same time this emptying of the brain leaves the patient for the moment unconscious, followed for some time afterwards by an enfeeblement of both mind and body. The great activity of thought also, and the remarkable subjective phenomena to which some epileptics are subject, support the view of the high state of tension in which the brain is supposed to be prior to the attack. I have already alluded to this theory of epilepsy in relation to the action of nerve on muscle, and stated that there are many objections to it, such as were enforced by my late colleague, Dr T. Dickson. He would not admit that an organ could perform more than a certain amount of work, and, so far from the brain evincing any such tendency to over-functionise in epilepsy, it showed an impairment of function. He thought, as did Mr Hinton, that the true motor forces lay in the muscles themselves, and therefore, although in the epileptic attack there might be a discharge, that this left the brain in a state of impairment, which produced the unconsciousness, and at the same time allowed the spinal and muscular systems to come into play, just as similar phenomena are produced if the head of an animal be cut off. Ferrier's experiments would be explained on this theory by the withdrawal of a localised force, a not altogether satisfactory argument, seeing that

the effect of destruction of a convolution is not the same as that of its electrisation. This accords with Dr Radcliffe's view, that muscular motion is a power in the muscle suddenly let loose, and not a nerve force finding its development or place of storage in the muscle. Whatever view be taken, the brain must be regarded as much impaired after the seizure, as the state of mind is quite sufficient to show.

Nearly all the explanations of the cause of epilepsy are quite in accordance with the fact of convulsions being associated with anæmia, and therefore we see the origin of the theory now increasing in favour, that epilepsy is due to a sudden contraction of the small blood-vessels depriving for a moment the brain of its blood. The arguments favouring this view are, that bloodletting to the verge of death in man and the lower animals will cause convulsive attacks, and, on the other hand, that extreme congestion will not; also that if a patient be seen at the very onset of the attack his face will be pale, and therefore in all probability there is an anæmia of the brain corresponding with his outward appearance. A very striking experiment in confirmation of these views has of late been made with the very powerful antispasmodic, nitrite of amyl. If, as is well known, the vapour of this be breathed, a flushing of the face, fulness of the blood-vessels, and mental confusion occur. This suggested its trial in epilepsy, and the result was very remarkable. The pallor passed from the face, and the fit was immediately arrested. Of course, it can only be tried in an asylum, where several known epileptics can be watched, as in the cases reported by Dr Crichton Browne. We might also allude to the frequent occurrence of fits in the night or early morning as corroborative proof of their association with anæmia rather than congestion, for the brain is more bloodless in the sleeping than the waking state. Although all these arguments exist in favour of this view of the pathology of epilepsy, considerable difficulties still remain in explaining the cause of convulsions under apparently widely different circumstances. Either a number of conditions may by direct excitation or reflex action produce contraction of the vessels, or convulsive movements may be due to other causes. Thus, tumours of the brain, blows on the head, sudden fright, poisoning by urea and a number of other substances, will produce convulsions.

The conclusion, however, which must be arrived at is that epilepsy is not a disease in the strict sense of the word, and that the symptoms must be regarded as physiological phenomena rather than pathological. If a person have only a few fits during a long life, and in the intervals be able to follow the ordinary pursuits of business, he cannot have a diseased brain. The organ is, in fact,

healthy; it is producing, as usual, its nerve force, when from some slight derangement an explosion takes place. If tumours exist, it is not to them we look for the production of the phenomena, they are only the exciting cause for the symptoms which have their origin in the healthy portions of the brain.

As regards the *treatment of epilepsy*, it must be considered entirely empirical. The term rational can scarcely be introduced even in the minor questions of diet, air, &c. I have certainly known patients reduce their amount of food and drink, especially in the article of meat, with a corresponding diminution in the number and severity of the fits; but, on the other hand, I know other cases where a generous diet has been equally necessitated. Epilepsy is one of those cases where particular drugs may be of service, and beyond their administration little can be done. If any old woman had the possession of a herb or a salt which could antagonise the disease, her knowledge would be worth more than that of the whole College of Physicians. I am happy to say that this does not apply to many other diseases, where the knowledge you have acquired of their nature will serve you far more than all the medicines in the Pharmacopœia. The remedies, then, are empirical; those that have hitherto been most in vogue are the metallic tonics. It is remarkable that such classes of drugs seem to have more efficiency in morbid states of the nervous system than those which have a more direct physiological effect. In the whole range of nervous affections you will find this to be the case. In my own experience the only remedies of this kind which I have seen useful have been belladonna and nux vomica—drugs having different physiological actions. I have had cases where both remedies have been apparently beneficial. The metals have been used with a certain amount of success from time immemorial, such as arsenic, silver, iron, and zinc. Some years ago I used all these remedies largely amongst the out-patients, and should certainly give the preference to zinc; I know now more than one case of epilepsy where the patient is always better on the resumption of this remedy. If you suspect any local cause in the brain, you may adopt other measures; thus, I have seen a case apparently cured by mercury. Those which were benefited by iodide of potassium had, no doubt, a syphilitic origin. Turpentine is also one of the old remedies.

It was whilst I was examining the effects of the various remedies that I discovered the very superior value of the bromide of potassium. I was at that time trying this remedy against the iodide in bronchocele and some other disorders, and being in the habit of often using the iodide in epilepsy, I substituted the bromide for it. I was at first under the impression that it was acting as an absorbent,

and was picking out for its operations those cases where the disease had a syphilitic or local origin; but when the cures came to be numerous, the explanation would not apply, and it was evident that a very valuable specific remedy had been obtained. Various writers had certainly mentioned the drug with a host of others, but only to again lay it on the shelf with them. I was not aware at that time that Sir C. Locock had recommended its use, for it does not appear that his observations had been especially brought before the profession, much less confirmed by others. As far as I know it was only when Sir C. Locock was President of the Royal Med. and Chir. Soc., on the occasion of Dr Sieveking reading a paper on epilepsy, that he alluded to it in the following remarks, which I quote from the 'Lancet' of May, 1857 :—" Some years since he had read in the 'British and Foreign Medical Review' an account of some experiments performed by a German on himself with bromide of potassium. The experimenter had found that when he took ten grains of the preparation three times a day for fourteen days it produced temporary impotency, the virile powers returning after leaving off the medicine. He (Dr Locock) determined to try this remedy in cases of hysteria in young women unaccompanied by epilepsy. He had found it of the greatest service in doses of from five to ten grains three times a day. In a case of hysterical epilepsy which had occurred every month for nine years, and had resisted every kind of treatment, he had administered the bromide of potassium. He commenced this treatment about fourteen months since. For three months he gave ten grains of the potassium three times a day. He then reduced the amount, and the patient had no return since the commencement of the potassium. Out of fourteen or fifteen cases treated by this medicine only one had failed." It was in the early part of 1860 that I commenced to use it; in the following year about a dozen cases were published in the 'Medical Times and Gazette,' being the first series of cases systematically described (that I can find) in which the remedy had been found eminently successful. It was thus evident that the bromide was not simply supplanting the iodide in the cure of some special form of the complaint, but that the drug had some remarkable influence over the pure and simple form of epilepsy. This has now been confirmed by others, and even by those who had previously merely administered the bromide, as they had done many other remedies, without sufficient trial, and had discarded it. Of course, like every other remedy, its success has been overrated; hence the disappointment which naturally accompanied the reaction of opinion, more especially when it was employed for almost every disease in the nosology. As regards drugs, then, I should say that the bromide and zinc are the most

important; but you will have no lack of opportunity of trying the effects of remedies, for epileptics often insist on being physicked year after year when no good result is obtained by treatment.

The bromide has of late been given in very large doses, as 20 or 30 grs. several times a day, and often in combination with the bromide of ammonium. The large doses are apt to produce an acnous eruption, which may sometimes be prevented by combining arsenic with the bromide. It is a great question whether this remedy which has so powerful an influence in checking the fits is really curative; whether indeed it has a permanent effect on the brain to render it less unstable. Whether or not, it is of great service in keeping the disease in check, and so mitigating the force of the fits which are often so detrimental to the patient. Although this is the rule we sometimes meet with patients who express themselves as being greatly relieved after an explosive fit has taken place and feel worse if it has been prevented, as if some injurious force within them were struggling to get free; this view is confirmed in their minds when they find lesser fits are retarded, and then one violent paroxysm occur apparently equal in strength to all the suppressed ones put together. For another reason also the prevention of the fit has been discouraged, as for example in the case of a young lady who had a temporary neuralgic pain in her head preceding the fit; after taking the bromide for some time an influence was obtained over the disease, sufficient to prevent the full development of the paroxysm, but not the premonitory painful sensations. Thus the pain which had usually preceded the fit would come on as before, but, no insensibility following, would last about five hours before it abated. This was so intense that she begged that she might have the fit, and thus work off the attack at once. I have also known other epileptics who say they would rather have the fits than undergo the unpleasant sensations which from time to time seem to be substituted for them. I believe, however, that these are exceptional cases. The difficulty of giving an opinion as to the absolute *curative* value of the bromides is owing to the impossibility of watching a patient for years. I know the case of a man who after treatment had no fit for eight years, and of a woman who had had none for eleven years; and a lady having had severe fits has now nothing more than occasional strange feelings in her arm. But it would be difficult to trace these results to any particular drug. A very important question arises as to the ill effect of long-continued doses of bromide. I myself believe it tends to impoverish the whole body, to weaken the mind, and to produce much nervous depression. I see epileptics in this condition, which departs quickly on the disuse of the remedy.

I ought to mention the occasional value of counter-irritants to the back of the neck and of setons. I well remember two cases of men who some years ago attended at the hospital, and whilst the seton was open the fits were absent; when this dried up the fits returned. Also the case of a young lady who has been suffering for years from frequent epileptic seizures, and has had a seton in the back of her neck. After its first introduction she went three months without a fit, then she had two, and went another three months without any attack; after that four months.

Case.—Mr A. S— consulted me in November, 1877, on account of epilepsy. He had taken various medicines, but with only temporary relief, and at the same time his mental vigour declined, so that he was obliged to give up a very good Government appointment and ask for a pension. In May, 1879, I recommended a seton at the back of the neck. He had no fit for two months, and in June, 1880, when more than a year had elapsed, he had had none, and felt better. In October I saw him, and he was still free. Some time afterwards he still had the seton in, and I have not heard of him since.

I will now allude to another very valuable remedy. I have already mentioned the case of a man whose life we saved by bleeding. I do not know that it is a remedy against the disease, but that it acts in the most beneficial manner if the paroxysm is long-continued I have no doubt. In the case I referred to the man had had a succession of fits, had swallowed nothing for some hours, and must shortly have died from congestion of the lungs, had not the lancet relieved his circulation, and almost immediately restored him to consciousness. I think it very probable that in those cases in former times which were considered apoplectic, and in which recovery rapidly took place after bleeding, epilepsy was the real disease. I am convinced that I have seen several such, and therefore think they cannot be uncommon. A man, for example, is seized with a fit; you are called to him, and find him comatose, with stertor and apparent paralysis of one side; you consider it to be a case of apoplexy, and recommend bleeding; he soon afterwards recovers his consciousness, and after a few hours the weakness of the limb has passed, and the patient is comparatively well. Whatever the diagnosis, the remedy has succeeded, and thus, in a severe fit of epilepsy which becomes protracted, I have no hesitation at all in recommending you to open a vein. It might appear strange, after declaring that an epileptiform fit may be induced by loss of blood, immediately to recommend venesection as a remedy, but it does not follow that the theory and the treament are antagonistic, for whatever may be the immediate cause of the seizure the result is a spasm of the chest, which produces congestion of the lungs, and this is best relieved by liberating the blood from the overcharged venous system.

I must not omit to mention the remarkable circumstance of our capability of arresting the attack by acting on the spot whence the aura proceeds, as by tying a bandage around the limb. If the attacks were due directly to an irritation reflected from one spot, then the removal of this cause would stop the fit, as in the case of the child I mentioned, whose father assured me that the application of laudanum to a sore spot on the face would arrest or mitigate the paroxysm. But when the sensation on the surface is altogether subjective a great difficulty in the explanation arises; unless we are content with supposing that a distinct portion of the brain must be more especially involved in order for the sensation to be felt in one part of the body rather than another, and that therefore some external application to that part may cause a corresponding reflection backwards, and arrest the process that had already commenced. Or it may be that we stop the muscular vibrations or undulations which are taking place in the limb. Quite lately Dr Alexander, of Liverpool, has been ligaturing the vertebral arteries, apparently with some success.

Occasional Arrest of the Disease by various Causes.—We must not overlook the fact, in considering the nature of epilepsy and the circumstances which may induce it, that very trivial causes may sometimes arrest it. Thus the possibility of staying the attack by a ligature round the arm ought to corroborate the opinion that an epileptic seizure, frightful as it seems, is only a slight departure from a healthy natural state. Dr Buzzard says he has arrested the disease by using a blister to the part where the aura has commenced. I know a gentleman who has fits associated with an aura in the left arm; he wears a strap around it, and immediately he feels the attack approaching he pulls the strap tight, and on several occasions has warded off the fit. He is not anxious, however, always to do this; for, although he may arrest the violence of the convulsion, he feels more affected in his mind. A lady has fits about once a month, and always in bed. They begin by a jumping in the right arm. She puts a heavy bag on the limb to stop the movements, and she thinks that she sometimes arrests the fits. Patients themselves know that they sometimes have a power over the disease, and say they can prevent the paroxysms. A young man who has had a slight fit informs me that as he is walking along he feels a paroxysm approaching by a strange sensation in his arm; he then steps out quickly and manages to throw it off. A girl also tells me that when she feels a fit coming on she can sometimes prevent it by getting up from her seat and occupying herself with something in the room.

Then, again, it is worthy of notice how the epileptic state is

arrested by, or is incompatible with, other morbid conditions. A young man came into the hospital for epilepsy, of which he had on an average a fit every day. He caught typhus fever, and during a whole month he never had an attack. As soon as he had quite recovered they returned. A girl also came into the hospital for fits, of which she had one every day. She took erysipelas, and for a fortnight, whilst ill with this fresh complaint, never had an attack. I knew the case also of an epileptic young lady who was quite free from her complaint whilst ill with rheumatic fever. Even very slight affections may be sufficient to influence the complaint. Thus, a child who has very frequent epileptic attacks suffered from a decayed tooth, and on two occasions had alveolar abscess, accompanied by some feverishness. During the day or two she was ill no fit occurred. A case of this kind proves to us that there is nothing remarkable in the fact of a seton, whilst open, arresting attacks of epilepsy, even although it be not placed in the neck over the medulla oblongata, the supposed seat, at one time, of the disease. As regards the apparent incompatibility of epilepsy with the febrile state, this may have reference to the condition of the blood-vessels and the circulation through the brain. I occasionally see a young lady whose epilepsy appears to have been cured by an attack of variola. She had, for a very long time, very severe fits, on an average one a fortnight, when, three years ago, she took small-pox. For a whole year afterwards she never had a fit; then one occurred, and another at the end of a second year. She has not had one since this time, and therefore only two since the attack of variola. The father was so much struck with the fact that he asked me if this might not be a clue to the cure of so frightful a malady.

Unilateral and Syphilitic Epilepsy.—I have already said that we designate that form of epileptiform seizure by the name of epilepsy where the disease may continue over any lengthened period with intermissions of comparative health, and where the brain is not diseased, in the ordinary acceptation of the word. In these cases the loss of consciousness is the most important characteristic; the convulsion may be of different degrees of severity, but if at all marked is pretty general. In contra-distinction to these cases are those where loss of consciousness very often does not occur and the convulsion may be local, or always confined to one side, and sometimes associated with an actual weakness of that side. Under these circumstances we are bound to conclude that the disease is not one of simple epilepsy, but a local affection of the brain, which, by occasionally disturbing the hemisphere of that side, produces the hemispasm described. I am now speaking of cases where this

unilateral convulsion is well marked, and the same side invariably affected. For it must be remembered that in ordinary epilepsy, although I say the convulsion is general, we often observe one side more affected than the other. In such cases, however, no rule is followed; for I have noticed that where two fits have rapidly followed one another in the same patient, first one side and then the other was the more convulsed. Even in uræmic attacks, where we consider that the fit is due to a poisoned state of blood which flows equally through the brain, we constantly observe that the convulsions are much more marked on one side than the other. Then, again, the existence of an aura would almost lead us to the belief that in ordinary epilepsy the various parts of the brain are not equally disturbed; for, should every region of the body have its correspondingly associated spot in the brain, it would show that the subjective feeling must be due to an over-preponderating disturbance in some particular locality. For instance, in a mild form of epilepsy the patient may feel a little bewildered, and experience a strange sensation in the arm, which is slightly convulsed; nevertheless, we believe that the brain as a whole is involved. The important clinical fact, however, remains, that should a patient have a fit without loss of consciousness we should at once suspect a local affection of the brain. The argument that local spasms are not necessarily due to a localised lesion, seeing that they occur in connection with such a cause as uræmia, is weakened if the statement of Dr Mahomed be true, that in uræmia small extravasations may be found in the cineritious part of the brain, and that these give rise to the convulsions. I may say in corroboration of this possibility that I lately had the case of a child suffering from uræmic convulsions after scarlatina fever, who rose from her bed partially hemiplegic and aphasic.

Any departure from the usual symptoms of a true epileptic attack should excite our suspicion as to its nature, and suggest some special exciting cause for it. In the "petit mal" or "grand mal" the loss of consciousness exists but for a minute or so, and after the attack the patient slowly recovers, and remains well until the next fit. But in albuminuria and epilepsy arising from a local cause, as syphilis, or in renal and syphilitic eclampsia, as the fits might be called, the paroxysms occur in rapid succession, and coma may exist in the intervals; there may also be convulsion without loss of consciousness, or the attack may be accompanied by paralysis of one side. These constitute a certain class of symptoms which at once suggest to my mind a local cause, as syphilis, even before I obtain the history, more especially if there has been a succession of fits occurring at short intervals, accompanied by a partial hemiplegia.

In these circumstances the disease may be considered due to a syphiloma between the membranes of the brain, and if this be situated in one hemisphere, as is usually the case, the irritation causes the convulsion to be unilateral or predominant on one side, and to be often followed by a partial paralysis of that side. At the same time, as only one hemisphere is involved, the consciousness sometimes remains. I had observed this peculiarity on several occasions before I was aware that Dr Bright had called attention to the circumstance in the first volume of 'Guy's Reports,' in reference to a case which, in all probability, was syphilitic. The case was that of Philip D—, admitted under Dr Bright's care July 1, 1835. He had syphilitic scars upon him, and was admitted for fits. During these attacks the right arm was convulsed, and remained afterwards weak, whilst the man appeared to be sensible during the whole of the paroxysm. Dr Bright gave it as his opinion that these fits were due to "some local disorganisation affecting the membranes and cineritious portion of the brain on the left side, and probably influencing the deep-seated parts about the posterior portion of the corpus striatum;" and the post-mortem showed what was, no doubt, syphilitic deposit on this side. Dr Bright says, in reference to the case, "My reason for supposing that the epileptic attacks in this case depended rather on a local affection than on a more general state of cerebral circulation or excitement, was *the degree of consciousness which was observed to be retained during the fits;* for although we meet with great variety in this respect, yet in two cases which have occurred to me the fact of the patient generally remaining conscious has been a remarkable feature, while in each, the injury on which the fits depended was of a local rather than a constitutional or general character. The epileptic character seemed to point to the membranes and surface of the brain as the parts most affected. For of this connection I have pretty well satisfied myself by an extensive induction of facts."

Bright in his well-known 'Medical Reports,' had already made similar observations. He gives a case of fatal epilepsy, with drawings of the skull which was much thickened and carious on the surface. The dura mater was adherent over the middle of the left hemisphere, and the material uniting it to the brain was of cheesy consistence.

Case.—The patient, æt. 37, was admitted into the Clinical Ward, Nov. 7th, 1827, for epileptic fits. These occurred at irregular intervals, and were accompanied by paralysis of greater or less duration of the right side. On admission he complained of constant headache, and was subject to a tremor of the right leg, occurring daily and continuing for irregular periods, as an hour or longer. The tremor began in the foot, running up the leg to the thigh, and occasionally

extending to the body and head, when he was deprived of the power of speech, but was aware of what was passing at the time. He also closed the lid of the left eye involuntarily and unconsciously. His right leg he dragged when walking. The fits became afterwards more frequent and intense, so that he lost his consciousness. The following plan was then tried. When the tremors were coming on a tourniquet which was held ready was applied to the lower part of the thigh, with the effect of immediately arresting the fit. This was successful for three successive attacks, but on the next occasion he found the same sensation commencing in the arm, which, after continuing for a quarter of an hour, terminated in a fit. He then procured a ligature for the arm, and on the following day, after the aura had commenced in the leg and he had arrested it by the tourniquet, it went to the arm. This he stopped in like manner, and continued to do so on several occasions, when the method began to fail, and the fits returned as bad as ever. He left Guy's after this, and subsequently went into St. George's, where he died.

Dr Bright also gives the case of a man who fell from a cart on his head, and subsequently had fits. These began as an aura in the left leg, passing up through the body until it reached the head, when he lost recollection and fell convulsed. He also had a pain and "twitching" in the leg, and complained that the foot of that side was in a constant state of perspiration. After death the dura mater was found much thickened at the posterior part of the falx, and closely adherent to the posterior lobes, especially the left, so that when removed it tore away the cineritious substance.

He then makes the following remarks:

"As far as I have been able to infer from my own observation, I should say that the organic causes of epilepsy connected immediately with the brain are more frequently such as affect its surface than such as are deep-seated in its substance. Slow change producing a thickened condition of the membranes will not infrequently be found attendant upon epileptic attacks. Tumours pressing on the surface, or amalgamated with the cineritious substance, will also be found in cases of epilepsy. It is an idea entertained by Dr Foville that the cineritious is the more active part of the brain generally, with regard to all its functions, and that the medullary part is more particularly employed in the conveyance of the motions and sensations, or whatever else may be acted upon or produced in the cineritious part. And supposing for a moment this to be the case, we might expect that lesion of the cineritious substance would produce disordered action in that part, and that such action might be transferred to the distant parts of the body, producing disordered and involuntary motions; whereas if the great injury were done in the substance of the brain, the means of communication with the active part being cut off, paralysis might result, more or less mingled with convulsion, in proportion as the cineritious substance is more or less involved."

I have already told you how disease of the corpus striatum or of the motor fibres within it produces hemiglegia, and that an irritation of this body causes convulsions of the opposite side; consequently an effusion of blood as well as a tumour, abscess, or aneurysm in its neighbourhood may be the cause of hemispasm; but as a rule it is a stimulation of this body through the surface of the brain which excites the action, unless, indeed, as some now suppose, irritation of the convolutions, as from injury, may directly produce convulsive movements. Now, in the absence of such evident causes and of such a severe form of disease as tumour, we should rather suspect a chronic disease like syphilis, and the more so when we learn that its favourite seat is in that spot which is most likely to produce the attack. The syphilitic deposit is most frequently situated in the Sylvian fissure, in connection with the middle cerebral artery, so that we find on examination a large hard gummatous mass uniting the dura mater firmly to the brain, the surface of which is more or less involved in the disease. The convolutions affected, being those around the corpus striatum (the superior termination of the motor column), would of necessity be always ready, when their equilibrium was disturbed, to set the whole motor tract in action. The result would be convulsive seizure of the opposite side of the body; and if the disturbance were confined to the one hemisphere there would be no necessary loss of consciousness. Now, in the course of time other phenomena occur in these cases, either by the direct implication of the Sylvian artery, whereby the blood supply is cut off and destructive changes ensue, or by a slower alteration in the tissue from a true syphilitic disease of the arterioles.

In these circumstances the corpus striatum or the fibres passing through it become involved, and a partial hemiplegia results. Remember, then, that unilateral epilepsy, especially if combined with some weakness of the side, should make us suspect a local lesion of the brain, and more especially if there is no loss of consciousness. Now, of all local affections syphilitic disease would be most likely to induce such an attack, and for the reasons before named. The further investigation of the case would in all probability confirm the diagnosis. Dr H. Jackson has made an analysis of these cases, and shown that special regions and muscles of the body are affected according as particular convolutions are involved. In one case it may be the face, in another the hand, thumb, or one particular finger, which is most convulsed. He has also observed that these convulsive twitchings may precede for a long time the regular paroxysm. This seems to support the conclusions drawn from the experiments of Ferrier on the localisation

of the functions of the brain, as he produced exactly the same movements of which I have been speaking, by exciting particular convolutions on the surface of the organ. For example, if in the epileptic attacks the hand and arm were most convulsed, we should suppose that the superior frontal convolution of the opposite side was affected; if the leg were convulsed, the neighbouring convolution; if the face and eyelids, then the middle frontal convolution; if the mouth and tongue, the lower frontal convolution near the Sylvian fissure. Dr Jackson speaks of the fingers and thumb as the parts which are generally first affected in hemiplegic convulsion, and alludes to them as being the portions of the locomotive organs which are most highly developed or differentiated; afterwards the face and tongue would be affected, and finally the foot. In all cases the convulsions progress in regular series.

The character and site, therefore, of the spasm would at once suggest a local lesion of the hemispheres, but that which so often leads to the suspicion of syphilis is the addition of a number of other symptoms indicating that other portions of the cerebral structure are probably implicated, as they have no connection with the presence of a circumscribed mass of disease, as a tumour. These symptoms are both of a physical and mental nature; the latter shown by a strangeness of manner, obtuseness, and other mental vagaries, the former by various local paralyses, as of the different cranial nerves. These paralyses are so varied that no small localised disease could account for them, and therefore we have recourse to the opinion that there is a large patch of morbid material on the surface, such as we meet with in syphilis. Then, again, as indicative of this, the bone may be affected, and there will be the additional symptoms of a lump on the head, with pain and tenderness.

Another fact I have especially noticed in epilepsy having a local origin, which is, that the fits occur sometimes so frequently and in such rapid succession that one paroxysm has scarcely ceased before another has begun, and so lead to death, an event very rarely seen in true epilepsy. I believe Dr Jackson has said that the epileptic cry is also wanting in these cases. Of course, in making a diagnosis of a local disease of the brain from the symptoms mentioned, we are probably assisted by the fact that the syphilitic inflammation of the membranes occupies the site of the middle meningeal artery, and therefore of the motor region of the brain. Observations are still wanting as to the character of the phenomena displayed when other portions of the brain are involved. But in all cases special nerves may be implicated which may at once suggest the nature and seat of the lesion. For example, a woman

had been several times in the hospital, under the physicians and surgeons, for complaints of a syphilitic nature, which during the last year of her life had been more defined, and limited to the cranium, such as ptosis of the left eye, deafness of the right ear, some affection of the optic nerve, and afterwards of the portio dura. Subsequently pain in the head and neck came on, with dysphagia, followed by weakness of the arms, and finally the respiration was affected. After death the whole of the base of the brain was found covered with a thick layer of gummatous and connective tissue, binding together the arteries and nerves, but no distinct tumour was present.

If I am right in what I have gathered from Dr H. Jackson's writings, he does not seem to frame any broad distinction between ordinary epilepsy and that dependent on a local lesion, as he speaks of cases where there is loss of consciousness and where there is none, and also where there is general spasm and hemi-spasm in the same category. If the discharging lesion affects the higher centres there is loss of consciousness, but if it affects only the subordinate centres there may be none. No doubt this is true, but this variety, after all, depends upon rough pathological differences and the clinical distinctions between them are, I think, most important. It seems to me of essential clinical importance to distinguish between an ordinary epilepsy, in which, from some unknown cause, the brain is occasionally thrown into unstable equilibrium, exciting paroxysms which may occur at long intervals and not interfere much with the welfare of the patient, and an epilepsy dependent on local causes which will before long be complicated with permanent nerve symptoms and lead soon to a fatal result. I have rarely examined the body of a person who has died of simple epilepsy, whilst my post-mortem experience has been large amongst those who have had fits arising from a local disease. It is for this reason that I have thought it desirable to consider unilateral epilepsy by itself.

Since we have recognised the existence of epilepsy arising from a local affection such as is produced by a syphilitic inflammation of the membranes, we have no difficulty in discovering amongst the records of the past many similar instances, although their pathology was not then known. For example, in 'Morgagni's Morbid Anatomy,' we read of the case of a woman who had had venereal disease, and suffered from delirium and pains in her head, in whom the membranes and brain were found adherent to one another. Also of another woman who had syphilitic tumours on the head, and was the subject of epilepsy, in whom after death the bone was found destroyed at one part, the brain covered with a membrane as thick

as pasteboard, and the cortical substance beneath it as firm as the texture of liver. Morgagni attributed the scirrhous state of the brain which he found in some epileptics to syphilis. Guy's Museum contains a preparation showing a portion of brain with the membranes firmly adherent. The part affected is the anterior surface of the right hemisphere; around it are several granulations which were called fungoid, but which appear to be inflammatory. It came from Elizabeth S—, æt. 50, a night nurse in Charity Ward, in the year 1828. For two years she had been subject to pains in the head and to fits of epilepsy. In one of these, which occurred a few days before death, she fell into the fire; from this time she had repeated fits of tremor and loss of speech, but continued sensible. The post-mortem examination showed the surface of the right hemisphere to be firmly adherent to the dura mater. The other organs were healthy, with the exception of there being two firm tubercles in the liver (syphilitic).

As the earliest cases in practice make the greatest impression upon us, I will relate briefly one which came under my care at the time when syphilitic diseases of the brain were not generally recognised, which is more than twenty years ago.

Case.—Robert C—, æt. 36, admitted into Job Ward under Dr Wilks, Sept. 1, 1858, reported by E. B. Truman (now of Nottingham). He was a carpenter, living at Bermondsey, but had been a soldier, and in India. He said he was invalided on account of rheumatism of the head and limbs. Two months before admission, whilst walking in the street, he had a fit, which was described by a person who was near him. He did not foam at the mouth, nor bite his tongue, but he clenched his left arm, and turned almost black in the face, the left side being drawn up. Just previous to this attack he felt a tingling sensation in the foot, which passed up the leg, thigh, and body, until it reached his head, when he lost consciousness; he also felt his heart flutter as the aura passed up. On recovering, the left arm and leg felt numb, and he could not use them perfectly. Since this attack hs has had about a dozen fits. After the first two or three he bit his tongue and foamed at the mouth, but never lost his consciousness.

On admission, he complained of pains in all parts of him, and soon had fits in the manner described; the leg moved up and down, and then the arm. These members were permanently weak, or partially paralysed. His wife subsequently came to the hospital and confirmed the account of the friend in the main points, She also said that sometimes he screamed out in the fits, and was for a time like a madman. His wife came to sit up with him, thinking he would shortly die, as he had now become quite paralysed on the left side, and was scarcely conscious. Sensation was perfect. On his next visit, after a few days, Dr Wilks made a more careful examination of the case. He found the left os femoris very much enlarged, and also the right clavicle. The patient was not conscious enough to give any history of himself. He was ordered 5 grs. of iodide of potassium, and this was increased to 10 grs. in four days. He at once began to mend, the fits ceased, the limbs grew stronger, his mental powers returned, and at the end of the month he left his bed and walked about the ward. In a few more days he

went out of the hospital convalescent, with only the slightest possible dragging of the left foot.

The cases of syphilitic epilepsy are so common that any number may be found in our Records. As before said, they are noticeable by a number of special symptoms not observed in simple epilepsy. Thus, I have seen the case of a man suddenly losing the use of his right side, and then quickly recovering it, which, I believe, was due to a local syphilitic disease causing a sudden discharge from the corpus striatum or its neighbourhood.

CASE.—J. P—, a young man in whom a good history of syphilis was wanting, began to feel strange in his head, desponding and unfit for business. He then had fits. After taking the iodide for some time the fits ceased. About a month after this he was taken very ill, with feverish symptoms, retching, and other cerebral troubles. He again recovered, when he found himself getting weak, staggering in his walk, talking slowly, and feeling quite confused. He again took iodide, and was better. This was some months after his first symptoms. He returned to work, but was again seized with fits, and at the same time became almost maniacal. Took his medicine again, and became calmer, but was peculiar in his manner, and said he had strange feelings come over him. Whilst talking to him he experienced an odd sensation over the forehead, and a feeling of heat; at the same time the pupil of the left eye became very much dilated. He took to the iodide again, and went to work, breaking out in pustules, probably due to the remedy. He then again became ill, with pains in all his limbs, strange sensation in his right arm, and attacks of quick and irregular breathing. At another time he had a strange sensation in the left toe, which passed up the leg to his side. He was under my care for two years, and then got well, during this time either having epileptic fits or those curious modifications of them, accompanied by mental troubles ranging from a mere bewildered feeling to actual mania.

CASE.—James H—, æt. 37, admitted April 15th, 1871. He was a soldier, married, with three healthy children; he had had a venereal sore ten years before, but gave very little history of any constitutional disease. He was well until seven months ago, when he was suddenly seized with a fit. He first vomited, and then was convulsed. At the same time he had pain in the head, which continued after the fit was over. Since this time he has had a fit about once a fortnight, and his health has suffered. He has also felt confused, and his memory has failed him.

On admission, he is ill and weak enough to keep his bed. His left arm and leg are partially paralysed, that is, he has much less power in them than in the opposite limbs. His great complaint is pain in the head, extending across the forehead and towards the right side. The right pupil is small and irregular from old inflammation. The left tibia is enlarged and uneven on the surface, and here he experiences nocturnal pains. He states that before a fit comes on the pains in the head are worse, and that in several of the fits he has not lost his consciousness, but has tolerably distinct knowledge of what is going on around him, and has even spoken; that he knows he is convulsed, and that it is his left side principally affected. After the fit the left arm and leg remain weak.

He was ordered Liq. Hyd. Perchlorid. 3j, with Potass. Iodid. gr. x, three times a day. After a few days he began to improve, had no more fits, lost the pains

in his head, and began to recover the use of his limbs. Occasionally had attacks of dizziness, but they never reached the stage of a fit. June 9th, left convalescent.

Case.—Mr M—, æt. 25. He had had syphilis, but the constitutional symptoms were slight and soon passed off. About a year afterwards he began to be what he called nervous, and subsequently had two fits of an epileptic nature. These left him very weak so that he could scarcely walk, his gait being somewhat like that of ataxia. He felt confused and unable to follow his business, and had pains in all his limbs. He was ordered Liq. Hyd. Perchlorid. with Potass. Iodid., and gradually improved. He lost his pains, and was able to walk about. He then had simple tonics given him, and the improvement continued for six months, when severe brain symptoms suddenly came on. I found him sitting in a chair in a lethargic state. He could be roused out of this to a partial extent, and made to stand on his legs, when he managed to stagger across the room. He complained of great pain in the head, and also in the left hip and leg. He had double vision, slight ptosis of right eye, and some numbness of the face. He was ordered a scruple of the iodide every four hours, and began to improve; at the expiration of a month he was much in his usual state, being rather weak in the legs, having slight thickness of speech, and his mind being scarcely capable of conducting business. He then went to Brighton, became stouter and stronger, and it was thought that he was nearly well, when he was one day suddenly seized with a fit, and soon afterwards it was observed that his skin was yellow. In a few days he was completely jaundiced. He returned home, and soon many of the old paralytic symptoms made their appearance. His left arm and leg seemed weaker than the right, and he had partial ptosis of the right eyelid; his mind was quite confused. He took the iodide again for three weeks, and all the urgent symptoms abated. This was about a year after the first brain symptoms. He had grown stout, and looked well; walked with a slight dragging of the left leg; his speech occasionally thick, and the right lid inclined to droop. He expressed himself as feeling well, and was about to return to business. He continued thus for another year, when I was informed that he had two more epileptic fits. After this he gradually recovered, and now, at the end of five years, he presents no special features by which one could recognise the source of his long illness. He is still rather feeble in mind and body, but able to transact business for a few hours daily.

Epilepsy from Hereditary Syphilis

Case.—A lad, æt. 14, with well-marked syphilitic teeth and other characteristics of hereditary syphilis, was brought to the hospital suffering from the most terrible form of epilepsy. He was covered with scars from having fallen into the fire, and cut himself in various places. He had fits almost daily for last two years, in which he uttered a cry, clenched his hands, and was convulsed pretty equally on the two sides of the body. He was obliged to keep his bed, where he lay in a kind of idiotic state, scarcely knowing what was said to him, and the saliva dribbling from his mouth.

I apprehend that the iodide of potassium is quite powerless in removing those tough yellow masses of deposit which we find in the liver, in the brain, and in other organs, as the result of syphilis. It is the softer and more translucent deposit which can be absorbed

by remedies, and if the whole of the adventitious material is of this nature I believe that all effects of the disease can be got rid of. But in all probability a change takes place in the syphiloma, whereby a portion becomes tough, yellow, and hard, and it is over this that medicine has no power. We find, therefore, that iodide will remove the symptoms up to a certain point, and then altogether fails; this is because all removable matter is absorbed, whilst that which cannot be touched remains.

Syphilitic Mania or Insanity.—I have spoken of *mental derangement* in connection with simple epilepsy, and now I should tell you that it may also exist when this disease has a local origin, not only during the temporary occurrence of an epileptic seizure, but also as a permanent condition. How it is that a tumour in the substance of the brain, or lying at the base, should produce mental derangement, is not very evident, but undoubtedly such may be the case. Where, then, there is a syphilitic tumour, there are two conditions operating in favour of a general cerebral disturbance, which may produce mental derangement; the permanent presence of the new growth, and the commotion which takes place during the probable fits. Besides these causes, however, it is thought that the syphilitic process may affect the brain as a whole, and so give rise to insanity which is directly of syphilitic origin. Wille, who first observed that patients labouring under syphilis might become insane, attributed the mental state to a blood condition or meningitis. Dr Batty Tuke has shown the blood-vessels throughout the brain to have undergone in such instances a truly syphilitic form of disease, a syphilitic arteritis,[1] in which the coats have been thickened, and distinct adventitious nodules formed in their walls, sections of vessels showing rings of new material around them. The cerebral substance in the neighbourhood of these vessels had undergone degenerative changes, and the grey matter cells were altered and amyloid bodies were present. I have seen several cases where patients suffering from syphilitic disease of the brain have had maniacal attacks, and had to be put under restraint, but in these persons there has been good evidence of gummatous deposit within the cranium, as they had suffered from fits, from hemiplegia, from paralysis of various cranial nerves, from aphasia, and a number of other symptoms indicative of severe lesion of the brain. In these circumstances we cannot be surprised that mental disturbance is superadded. What I apprehend Dr Tuke and others who erect syphilitic insanity into a species to maintain, is—that the syphilitic process may primarily and purely attack the vessels and those structures which are more intimately connected with the in-

[1] See further description under "Syphilitic Meningitis" (p. 177).

tellectual functions, so that a maniacal condition results, which is curable by the usual specific remedies. More lately Dr Mickle has published cases of syphilitic insanity where the arteries were found thickened with irregular nodules upon them, the cells of the grey matter were undergoing degeneration, and there were various degrees of meningitis in different parts of the cortex. These changes, however, are not very unlike what have been observed in general paralysis, and since in many of these cases of syphilitic insanity, the symptoms are very similar to those of the latter disease, it might be suggested that certain pathological changes leading to mental disturbance may be produced by syphilis, alcohol, injuries and other causes.

Epileptiform Attacks due to other Organic Causes, such as Injury to Head.—It seems that any permanent local disease in, or on, the brain is sufficient to disturb the equilibrium of the organ, and so produce occasional fits. Syphilis is one of the most common of these, but tumours and abscesses may be the source of irritation, and probably, next to syphilis, cicatrices and adhesions, resulting from former injuries, are the most usual local causes for epilepsy. Several such instances may be found reported in our post-mortem records, as for example, the case of a sailor of drunken habits who was brought here in a fit, and had a succession of them until he died. On post-mortem examination there was found a firm adhesion between the dura mater and anterior lobes of the brain; in the cellular tissue which united them was some exudation of an ochrey colour, which extended slightly into the substance of the grey matter. There could be no doubt that this condition resulted from the organisation of blood in the pia mater, which had been caused at some former period by a contrecoup, owing to a fall on the back of the head. One day a man was brought in dead, having had a fit in the streets. It was found that he had been subject to fits for two or three years. A scar was seen on the forehead, and the brain was adherent to the membranes underneath, besides being wasted. Dr Church described the case of a girl of weak intellect, who was subject to epileptic fits, and had rigidity of the right arm. The brain on the left side over the Sylvian fissure was wasted and indurated by a cicatrix-like depression. This was composed of hard connective tissue, and some neighbouring convolutions were quite destroyed; the brain otherwise was healthy. Where epileptic fits follow an injury to the head, the bone becomes thickened, and a fresh point of interest is started in the question of operation. In the syphilitic form, iodide of course is the remedy, and in those cases where an injury has been the source of the hypertrophied bone, the same remedy may sometimes be useful

In one or two cases of fits and other symptoms of cerebral disturbance, after an injury, I have seen the continued use of mercury very useful, either in the form of the perchloride or the grey powder. The effect was too marked to allow a doubt of its efficacy.

Epilepsy from Injury. Cured

Case.—Mr M—, came to me with the following history. He was in a railway accident, and struck the left side of his head against the carriage, near the anterior superior angle of the parietal bone. There was a scalp wound which soon healed, but it was followed by much pain in the part and tenderness on touching it. When I saw him the part was very tender and somewhat swollen. Perchloride of mercury and iodide of potassium were ordered. About a week afterwards he had a very heavy look and hesitated in his speech. He said that at times he had strange feelings come over him, and almost lost himself. After taking the medicine some time, all these symptoms departed and the headache ceased. After seven months, the strange feelings returned down his right arm and leg, and the injured part was slightly swollen, and very tender when the bone was pressed. He was again ordered the medicine and the symptoms again passed away. After the lapse of some months, and a year after the accident, he suddenly lost himself. He was again treated and was again relieved, and when I saw him last, three years afterwards, he was quite well.

In this case the bone was evidently inflamed, and, considering the epileptiform symptoms, the brain or membranes must have been also involved. It is an interesting question to ask whether irritation of the dura mater alone might have been sufficient to produce the phenomena by reflex action, although the injury being over the motor area, the cortical substance might have been injured at the time of the accident.

Where medicine has failed in relieving, and the bone has been found thickened or diseased, the propriety of *trephining* comes to be considered. It is now many years since this was suggested, the idea evidently being that the pressure of the bone on the brain caused the epileptic attacks. This was gained from the experience of the surgeon, who could relate wonderful recoveries after the removal of depressed bone from injury. From what we know now, however, we can clearly see why the operation failed, as it in nowise relieved the part which was the seat of irritation. It is the inflammation of the dura mater and its adhesion to the brain which causes the fits, and no operation is ever performed with the object of tearing this membrane from the convolutions. Where any success did follow, it might be explained by giving more scope to the growth of granulations, and so relieving pressure. It has so happened, however, that in the favorable cases which have come under my own notice, the bone was undergoing necrosis, and that therefore on removing this a source of irritation was got rid of, and in this way the brain was relieved. One of the earliest recorded cases at Guy's of trephining for epilepsy was by Mr Morgan in 1835, and

the piece of bone which he removed you will find on the shelves of the museum.

CASE.—A man of middle age was thrown from a horse upon his head six years before his admission to the hospital. From this time he became an altered man; he was irritable, his memory failed him, and he had at times fits in which he was maniacal, and partly lost the use of the right arm. Over the superior posterior angle of the parietal bone, on the left side, a lump was felt at the spot where he had received the injury. He was trephined, and it is stated that his mental condition was much improved. The bone was thickened and scabrous on the inner surface.

The following is a very interesting case, and is the last which has been under my care.

CASE.—A man was brought into the hospital in a fit, and, when he recovered, stated that four months previously he had received a severe blow on the head, which stunned him; he had not been well since, having more or less pain. During the last two weeks he had had severe headache, and on the day of admission two fits. When the attacks were over, it was observed that a slight convulsive movement still continued, especially in the leg and arm. Subsequently it was found that the left side was getting almost powerless. It was pretty clear that he was suffering from a local irritation of the surface of the brain, where a lump existed near the vertex on the right side; but, nevertheless, at the suggestion of a colleague, I gave him iodide of potassium. The fits continued with the hemispasm, and therefore I met Mr Cooper Forster in consultation, with regard to the propriety of an operation. He considered it feasible, and thereupon the patient was removed to a surgical ward. The trephine was used, and a portion of bone was excised, which was very thick and scabrous on the surface. The fits immediately ceased, and the limbs grew stronger. In a few days, unfortunately, he got erysipelas, when some suppuration with sloughing of the scalp occurred. Subsequently he was sent back to my ward with a large surface of bone exposed, which was undergoing necrosis. He had one or two slight fits after this, and then left his bed, being tolerably well and able to walk about. He was to come in again at a future time to have the dead bone removed.

In the following case, where the bone had undergone necrosis, its removal probably prevented the fits by withdrawing a source of irritation.

CASE.—The patient denied ever having had syphilis, and said he had never received an injury, but several months before his admission an abscess formed over the left side of his head. As this did not heal he went to a medical man, who probed it, and this threw him into a fit of convulsions, and left him with partial paralysis of the right arm and leg. When admitted, he had constant pain in the head, and partial paralysis of the right side. There were several sinuses on the scalp leading to necrosed bone. On the following day he had a severe epileptic fit, in which the right arm and leg were convulsed, and also, it was said, the left side of the face. Fresh fits occurred in constant succession, threatening his life, when Mr Bryant was called to see him. He immediately trephined over the inflamed bone, and removed a circle from an adherent and granulating dura mater. The fits ceased immediately, and the man expressed himself as feeling

well. He then said that he was never unconscious during the fits. During the next two months he had no fit, the headache ceased, and the limbs grew strong; several pieces of necrosed bone were removed. The fits then recurred, and soon after he died with symptoms of pyæmia. The diseased bone was found adherent to the dura mater, with purulent matter beneath, and on the opposite side of the membrane a very small portion of the brain was found involved. The organs contained syphilitic deposit.

One of the most remarkable cases illustrating the effects of trephining was lately published in the 'Journal of Mental Science.' It is so very interesting that I will give you the outline of it.

Insanity cured by Trephining

Case.—A man, æt. 24, had a mass of coal fall on his head, just above the left eyelid, causing a fracture of the skull. He lay insensible for four days, and then recovered his consciousness. Some weeks afterwards his wife and friends observed an alteration in his habits and whole nature. He had been formerly cheerful, merry and sociable, but was now irritable and moody to his fellow labourers; when at home, he sat by the fire and was always cross. He afterwards became violent, threatened his wife, and subsequently had fits. He finally became maniacal, and was taken to the Ayr District Asylum, to be put under Dr Skae. After having been watched for two months, and his disease confirmed, being morose, suspicious, &c., it was determined to trephine his skull. This was done, some depressed bone was removed, and he immediately began to improve. He was pleased to see his wife, all his old affection for her revived, he became cheerful, active, and industrious, and was shortly discharged cured. Four years afterwards, when seen by Dr Skae, he was perfectly well.

Epilepsy originating from an Injury in a Remote Part of the Body.—If a convulsive attack have an eccentric cause, as often occurs in children, the term epileptiform is not the expression we use for it; as a rule, we seldom adopt the term epilepsy unless we suppose the disturbance to be primary and central. Notwithstanding this, we not unfrequently meet with cases where a permanently contracted or weakened limb appears to be the starting-point of a true seizure, although, of course, we must admit that the brain must be thrown out of a state of equilibrium to allow of the attack. In such cases there has been a history of a local injury and subsequent fits; an association of events which cannot but suggest their intimate relation. In saying this, I know I am disregarding the opinion of so high an authority as Dr Hughlings Jackson, having had an opportunity of consulting with him on a case in point. For example, a gentleman went to sleep with his arm hanging over a chair; he afterwards suffered from numbness; then, in a few months, spasms in the arm came on. Subsequently he was seized with a fit in which the whole arm was convulsed. In this case Dr Jackson believed the disease to be central, and the story of pressure on the arm to have no connection with it. The whole history, however, was so systematic that even

if each fit were immediately due to a central cause I see no difficulty in supposing that the latter might have resulted from a neuritis ascending from the arm.

I have been told of the case of a man who injured his finger, and some weeks afterwards had a numbness in it, then twitching, and subsequently convulsive movements, which gradually extended up the arm. Finally, the twitching sensation, passing up the limb, reached his head, and then he became unconscious. He after this had epileptic fits, with an aura in the arm.

I remember two or three instances where, with a permanently contracted arm or leg, epilepsy has also existed, and the part convulsed has been the weakened limb. In most of these cases a central cause has existed to produce both the paralytic condition and the fits; but I am now referring to instances where the affection of the limb was supposed to have been due to a local disease or injury.

The following is the kind of case which suggests a local injury as productive of the fits; but whether by a simple reflex action or by a neuritis gradually extending upwards it may be difficult to say.

CASE.—Alfred S—, æt. 25, a clerk, admited into the hospital under Dr Wilks. No history of hereditary or acquired disease. Fifteen years ago he had a fall from a tree, and was much injured about the body; he had the right hip broken and left forearm. He was laid up for some months, and the left arm became stiff and weak.

He was well up to fifteen months ago, when, some days after travelling to London on a very cold day, he was seized, whilst lying in bed, with a cramping pain about the region of the seventh cervical vertebra. He attempted to get out of bed, when a pain went down his back like an electric shock. He managed to get into bed again after much trouble, and lay there until the morning, when he rose quite well. At breakfast he was stooping down, when he became faint, and fell under the fire-place. He did not lose his senses. He then finished his breakfast, and went about his work. During the day he found he was losing power in the left hand, every finger being affected, and he kept constantly dropping a small bag which he was carrying; by the middle of the day he had lost all power over his hand, and he noticed also that his left leg seemed to drag, so that he constantly stumbled, and he thinks his face was slightly drawn to one side. He was thus completely laid up for nine weeks. He gradually improved under the use of bromide of potassium, and returned to business. About five weeks after this his affected arm became suddenly drawn up, and he fell off his stool. The doctor who then saw him said he had had an epileptic fit. After this there was slight improvement in his arm and leg; he did not have another fit for four months, then one after two months, then they occurred more frequently, until lately he has had three in one day.

On admission he did not look ill, his countenance was bright, and he was able to walk about, but dragged the left leg slightly; the left arm was contracted and flexed, with little power of movement. The pelvis had a large bony mass growing

from the seat of injury. Soon after admission he had a fit which was of a severe epileptic character; the convulsion was general, but the left arm was the most agitated; on moving the arm the convulsions seemed to be increased. Complete coma, pupils dilated. In the evening he had another fit. Ordered Potass. Bromid. gr. xv. He had no return for six weeks, when he had another attack, then no more for some weeks, when he left the hospital.

I have now under my care a gentleman, æt. 30, who met with a railway accident five years ago, which severely injured his pelvis and right leg. He was laid up for several months, and his life was despaired of. He had no injury to the head. About a year afterwards he had a fit, and has had three since. Before the fits come on he has a strange feeling in the right arm and leg. At all times he is subject to numbness in those limbs, and on two occasions the toe-nails have come off.

Aural or Labyrinthine Vertigo, Ménière's Disease.—Giddiness is the feeling which we experience when objects seem moving around or away from us, or the strange and momentary sensation which obliges us to remain stationary for a time, or sit down for fear of falling. It is a symptom of many real nervous diseases, but much more commonly denotes gastro-hepatic disorder. Thus with some persons it has been a life-long trouble, and therefore of no real importance, whilst with others it may occur after an indigestible meal, to be as quickly relieved by vomiting. Giddiness does, however, constitute a real and substantive malady, and one for which the patient seeks our advice; unfortunately, too, very often after the most rigid scrutiny no cause can be found for the existence of this solitary symptom. I have alluded to it already as sometimes being the main symptom in epilepsy, and now mention it again as associated with or dependent upon the disturbance of the auditory nerve. Giddiness associated with noises or singing in the ear, "tinnitus aurium," as it is called, is by no means uncommon in persons of a nervous temperament; and in hypochondriacs a clicking and buzzing in the ears constitutes often their chief complaint.

Where disturbance of hearing is associated with cerebral symptoms, there is considerable difficulty in determining whether the affection of the auditory nerve has been the seat of all the other troubles, or whether it be not like them attributable to a common origin. Thus I am often consulted by two ladies of nervous temperament who complain of "swimming," noises in the head, and disturbance of the organ of hearing, in whom I regard all these symptoms as concomitant and springing from one source. I have in my note-book the cases of three old gentlemen who are troubled with giddiness, deafness, and other slight cerebral symptoms, but probably all these have a common origin in a decaying brain

and senile blood-vessels. Then, again, periodic attacks of giddiness and sickness are well known to many persons under the name of bilious attacks. In advanced age, where there there is suspicion that organic changes cause both sickness and vertigo, all movement aggravates the unpleasantness of the symptoms, which pass off when the recumbent posture is resumed. The disease, however, to which I now more particularly refer, is a vertigo supposed to depend directly upon various troubles in the ear, and, if accompanied by fits of a peculiar epileptiform character, upon an actual disease in the labyrinth.

Trousseau gives a very good account of the complaint, and alludes to the writings of Ménière, who was the first to recognise the fact that vertigo and other symptoms, usually referable to congestion of the brain, might be dependent on disease of the labyrinth, and more specially of the semicircular canals. The subject is also referred to by Ramskill in 'Reynolds' System of Medicine.' Toynbee wrote a paper on giddiness in connection with affections of the ear in the first volume of the 'St George's Hospital Reports,' and there is every reason to believe that his observations were quite original. It may be said, indeed, that every one was aware that vertigo or momentary loss of consciousness might be induced by pressure upon the tympanum, but we are indebted to Ménière for clearly raising vertigo, as dependent upon the ear, into a distinct complaint. Toynbee states that pressure upon the labyrinth produces cerebral symptoms; and that pressure upom the membrana tympani, acting through the stapes on the vestibule, will cause a sense of giddiness, an inability to walk staight, loss of distinctness of vision, and a general depression of spirits; also that similar symptoms are caused by exhaustion of the tympanum in cases of occluded Eustachian tube. Blowing forcibly through the Eustachian tube into the tympanic cavity will cause a feeling of light-headedness and swimming. It may be remembered that many persons experience a sense of giddiness, almost to falling, on violently blowing the nose. Toynbee also mentions giddiness and other cerebral symptoms resulting from pressure of wax on the membrana tympani; and, amongst other causes, artificial drum, tumours, and even syringing the ear.

As there are so many disorders in which singing in the ears and noises in the head prevail, these symptoms probably arise from several causes, such as any unequal pressure on the endolymph, or vascular changes in connection with organic disease of the brain, or they may depend on nerve disturbance, as seen in migraine.

In the true auditory vertigo, as described by Ménière and Toynbee, the giddines is often the only cerebral symptom; there is no evi-

dence of any disease of the brain; nor is the deafness found to be due to any external cause, but having come on rather suddenly it must be considered as originating all the other nervous troubles. The vertigo may so distress the patient that, in the course of time, loss of memory, inaptitude for business, and other symptoms of a mental character may ensue. Of numerous cases which I have seen I have no subsequent history as to their termination, nor indeed, as to the exact nature of the disease in the ear. In many the disease has begun in the tympanum, and therefore if the immediate cause of the vertigo be found in the labyrinth, some change has been propagated thereto through the vestibule.

The peculiar interest, however, attaching to the disease is that epileptiform attacks occur which remind us of similar symptoms produced artificially in animals when experiments are made on the internal ear, the animals turning round in different directions according as one or other of the semicircular canals is divided, implying to the physiologist that the direction of sound and corresponding movements depend on the form and position of these canals. Now, it is well known that in some kinds of fits patients have described a circle, or turned half round, or performed other movements similar to those mentioned by Flourens when the semicircular canals of animals are injured. In many of these patients there has been long-standing disease in the ear, accompanied by deafness, giddiness, occasional vomiting, and fits of a peculiar character, so that it was conjectured that the seat of the malady was in the labyrinth. It is thought that the pressure of the endolymph on the auditory nerve acts as a balancing power, and that as the presssure varies with every movement of the head, so our knowledge of position is conveyed to the sensorium. If the canals, therefore, are destroyed, the means of judging of locality is lost. Quite lately a discussion has taken place on the subject at one of the medical societies, and a sufficient number of cases were quoted by different speakers to show the actual existence of a disease in which the principal features were deafness, associated with certain cerebral symptoms. Thus Dr Duffin related the case of a man whose hearing was impaired, but not lost, and who had attacks of vertigo, followed by fainting and vomiting. When he fell he always came down on one side, and this suggested an irritation of the auditory nerve as a cause.

The ear may be affected in many ways by syphilis, so that in the case of a young man who came to me complaining of giddiness and deafness, with a history of this disease, a cure was effected by the iodide of potassium. The same occurred in the person of a friend. He one day walked into my study, or rather staggered in, declaring

that his head was so light and he had such a giddiness that he could not walk in the street, and had in consequence given up practice. He rolled about when he moved, and had a confused expression; he said he had disease of the brain, and that it was "all up" with him. At the same time he had become very deaf with the left ear. I remembered that he had syphilis some years before, and had suffered more recently from a sore tongue, and I therefore suggested the iodide of potassium in large doses. He rapidly lost all his unpleasant symptoms, and was soon at work again.

The worst forms of the complaint under consideration are those where no cause can be assigned for the disease of the ear. Thus, at the present time I am seeing a lady, æt. 35, who states that she took cold after her last confinement, four years ago, and from that time began to be deaf, first in one ear and then in the other, until both were affected. She is not at this moment perfectly deaf, as she can hear loud sounds; but at the same time as her hearing became affected she began to experience giddiness and noises in the head. These she has had ever since, although varying in intensity. She has been treated for "stomach" and "liver" without any result. She has a distressed look; she feels worse on moving or stooping, and when she walks often staggers like a drunken person. Nothing is seen on examination of the ear.

A man, æt. 50, has had deafness for about twelve years, the left ear being the worse; during this time he has had frequent fits of giddiness, accompanied by vomiting, and sometimes falling. The tympanic membranes are pronounced to be healthy. He came to me on account of an aggravation of these symptoms. On waking early in the morning he is seized with trembling, and a feeling of depression. Whilst in the streets he has fallen from giddiness, and often finds himself not walking straight but turning to the left. He has also subjective noises in the ear.

A curious circumstance is related to me by a lady, that she not only feels giddy on moving her head, but when passing impressions are made on her retina by other people moving. She has had a discharge from one ear, and is deaf on that side. She suffers from vertigo and singing in the ears. If she moves her head she feels giddy, and the same occurs when she is in church and all the people stand up. Another lady has for three years been subject to giddiness, more especially when lying down, at which times she feels as if the bed were rolling over her: she is deaf with the left ear. I may state that noises in the head or ear are common enough in persons of nervous temperament.

I should say that our present knowledge obliges us to associate vertigo with deafness and noises in the head, but by no means is it

proved that their prime cause is in the internal ear, and that we are at once to pronounce upon the existence of Ménière's disease.

I am now seeing a patient who has all the symptoms of Ménière's disease, as vertigo, turning on one side and sickness, but she has no apparent affection of the ear whatever.

A servant of a friend was sent to me on account of the following symptoms. For two months she had suffered from a feeling of the bed going round whenever she lay down; this occurred again and again on every fresh attempt until the attack for that night passed off; she afterwards discovered that it was only when she lay on her left side. She was often sick at the same time. Also on stooping to clean her steps the same thing occurred. She had no deafness nor any other trouble of the ear.

It should be remembered that Ménière described not only cases of vertigo resulting from deafness but also cases where patients had an apoplectiform seizure of which deafness was a result. I myself have witnessed several cases of the kind. One gentleman has attacks of vertigo followed by temporary paralysis, aphasia, and deafness. Another gentleman had no affection of his hearing whatever when he suddenly experienced a feeling like the rushing of steam in his right ear, and became perfectly deaf. He has since experienced giddiness in walking.

Dr Bucknill has written a very interesting essay to prove that Dean Swift was a victim to Ménière's disease. Before he was twenty he got cold in his left ear and remained deaf ever after. In his various letters he speaks of being pursued through lifetime by a cruel illness which seized him in fits, and at these times he used feel giddy and was often sick. If he turned his head it made him giddy and he often tottered in his walk. In one of his letters the Dean describes himself as "vertiginosus, inops, surdus."

All the usual nervine remedies are given with varying amounts of success in Ménière's disease. Charcot says if quinine is given in large doses and persisted in for a long time great benefit accrues.

CHOREA

This is a disease characterised by irregular movements or clonic spasms of the voluntary muscles, and occurring mostly in female children before the age of puberty. It occurs in all degrees of severity, from a mere twitching of a particular muscle to an implication of the whole body. In this latter case there is a necessary want of power, and the patient is confined to his bed. There may be a constant motion of the whole body, not from violent spasm, as in epilepsy, but simply from irregular muscular movement,

whereby the most frightful contortions and writhings are produced. Such a horrible example you have just witnessed in the case of a man to whom we administered chloroform. We were obliged to put sideboards to his bed to prevent his falling out; he was constantly throwing his arms about, and dashing his head on the pillow. His mouth was continually being opened and shut, and he consequently ate and spoke with the greatest difficulty. He had to jerk his words out, and make the most dreadful contortions in order to swallow his food. When asleep he was quiet. His mind was clear, and therefore he was able to give a history of his case. Often, however, the mind becomes affected, and the patient is fatuous or maniacal. Thus I had a youth under my care who was quite as ill as this man, but eventually recovered. He lay in bed in constant movement, distorting his face terribly, with an almost total inability to articulate. After sleeping and remaining quiet for a short time he would make most horrible grimaces, throw his arms and legs about in a very violent manner, and twist his body so as to turn completely round in bed. The attempts to eat were most painful to witness: he seized the spoon in his mouth as if he would swallow it, and occasionally, indeed, bit the nurse. I think this was sometimes done intentionally, as a mad person would do. He became emaciated almost to a skeleton, and all the prominent parts of the body were covered with corns and scabs. There were pustules on other parts, and he was covered with scratches of his own making. I think a severe case of chorea of this kind is as dreadful a disease as any which we are called upon to witness, and the case of this lad, which lasted three or four weeks, was certainly the worst that I have ever seen recover. For some time afterwards his mind remained weak. He had rheumatism, then slight chorea, and subsequently a fright, preceding the more severe symptoms. The mental disturbance is so great that a mistake in diagnosis is sometimes made between chorea and insanity. Dr Hills relates in our 'Gazette' that he has had four cases, three children and one old woman, sent to the asylum at Norwich as lunatics, who were merely the subjects of chorea, the certificate showing that the patient in one case suffered from "extreme restlessness, inability to express himself, constant gesticulation, frequently breaking cups and saucers, great irritability, slovenliness, noisiness, insomnia, &c."

In less severe forms the whole body may still be affected, but in a minor degree. The child may be up and able to walk about, although in a very unsteady manner. She cannot walk in a straight line, and if she attempts to carry any weight lets it fall to the ground. This is often one of the earliest symptoms observed by

the parents, who discover that the child is beginning to be very destructive with the crockeryware. These irregular movements, combined with the weakness of the arms, increase until the child (generally a girl) cannot dress or feed herself. She is also constantly making grimaces, and the tongue is thrust out with a jerk and then kept in motion. One side of the body is frequently more affected than the other, and is consequently weaker. This weakness may remain after the movements have ceased, so that the patient is first brought to us with a partial hemiplegia. In some severe case of chorea the whole body may be left in a state of extreme feebleness; in fact, the patient has for the time a kind of general paralysis. I have seen several cases of children who after chorea lay perfectly quiet in bed, with scarcely any power to move their arms, and totally unable to stand.

I believe it was Todd who first drew attention to choreal paralysis, although it has probably always been recognised. He says in his lectures, "the choreic convulsion is often succeeded by a paralytic state of the limbs previously convulsed; the convulsive movements cease, and the limbs remain paralysed; the paralysis is seldom complete, although considerable. When the choreic convulsion has affected one side the paralysis will likewise affect the same side; it will be *hemiplegia*, and will resemble very closely hemiplegia from diseased brain, for which it is very apt to be mistaken by those not aware of the fact."

A very common accompaniment of the disease is a cardiac systolic bruit. This constitutes the most interesting feature in the case, and affords a basis on which can be raised several theories respecting the nature of the disease. I think I am correct in saying that the heart affection was first observed by Bright, and ever since his time the question has been asked as to its nature and connection with chorea. I believe that it might be in part solved by the simple observation of a hundred cases of chorea accompanied by systolic bruit, and the discovery whether the bruit persisted or not as the choreal movements subsided. If it accompanied the disease and departed with it, the bruit could scarcely be regarded as due to an organic change. Those who have regarded it as functional have spoken of an irregular action of the heart, but as this does not in fact occur, they must have intended to imply such an irregular action of the papillary muscles as to allow either of a temporary regurgitation of blood through the mitral orifice, or to interfere in some way with the closure of the valve, and thus produce an abnormal sound. I wish I had some more positive information about the state of the heart and the speech hesitating. The nature of the attack could only be explained by embolism. After two days he was able to raise

in those who have recovered from chorea; but, as a post-mortem fact, I might state that I have never seen a fatal case in which there was not some evidence of a previous endocarditis; that is, the inner surface of the mitral valve was lined by a narrow row of beadlike vegetations. Now, in some of these cases there had been no history of rheumatism, and in some no audible bruit during the life of the patient. In the most striking examples of such cases there was a very distinct history of fright, as in the case of a young girl who was residing near the scene of the Erith gunpowder explosion. She had never had a rheumatic attack, had no symptoms of heart affection, and yet after death the mitral valve exhibited vegetations. There was also the case of a little girl, æt. 7, who was admitted under my care with a most violent attack of chorea. About a fortnight before she had been taken to the Victoria Theatre, where she was much frightened by a sensation scene. All my endeavours to relieve her were fruitless, and she died two weeks after admission in a state of great emaciation. There was no history of rheumatism, and no bruit was audible. After death we found a fringe of small vegetations on the inner surface of the mitral valve. These were firm, and therefore the question naturally arose whether they were pre-existent to the chorea. I have also constantly met with other non-fatal cases where a bruit existed without any history whatever of rheumatism.

These cases would tend to show that the cardiac bruit was organic and a consequence of the chorea. A more usual opinion, however, is, that the order of sequence is rheumatism, cardiac affection, and chorea; and thus a theory is held, which was first put forward by Dr Kirkes, that embolic particles are carried from the heart to the cord, and there set up an irritation which is productive of chorea.

This theory has been accepted and strongly enforced by Dr Hughlings Jackson, who believes that the corpus striatum is the seat of the disturbance caused in the manner described. He would say that the argument that occlusion of the blood-vessels would produce weakness of the limbs tends to support rather than to oppose his theory, since the chorea is often hemiplegic, and followed by actual paralysis. Also, there is the striking fact that patients lying in bed with rheumatic endocarditis may, without any further exciting cause, be seized with chorea. No doubt cases of this kind occur, and so far seem to give the demonstration necessary to prove the correctness of the embolic theory. Thus, a lad, æt. 15, was the subject of rheumatic fever and endocarditis, and had been in bed a month, when he was suddenly seized with a weakness of the right arm, so that he was quite unable to move it; the leg also was weak,

the arm, but in attempting to do so found he had no control to steady it, as it moved about in various directions. Two days after this, when I saw him, there were distinct choreal movements in the right arm, he had twitching in his face, his speech was hesitating, and his words came out in jerks. One could scarcely err in saying that if the first seizure were due to embolism the choreal symptoms must have depended on the same cause.

On the other hand it is argued that if chorea be due to embolism the conditions for producing it should always be present, but there are numbers of cases of chorea coming before us without any history of rheumatism or evidence of endocarditis. It is remarkable, however, and this it is which is thought to be highly confirmative of the embolic theory, that although these conditions are absent vegetations are almost always found on the valves in fatal cases. Notwithstanding this, it is difficult to suppose that in patients who eventually recover, and the majority do recover, that any such serious affection as inflammation of the heart could have existed, or to understand when the mischief in the brain has once happened, why the patient in fatal cases should become daily more violent, and perhaps maniacal; or why, when embolism is as common in adults as in children, chorea should be almost exclusively confined to the latter.

The discovery of a bruit in chorea without the history of a rheumatic attack and vegetations on the valves after death cannot be overlooked in studying the nature of chorea, and therefore it has been surmised by the opponents of the embolic theory that the endocarditis is a consequence of the chorea, either owing to some abnormal condition of the blood or to the papillary muscles participating in the irregular action of the muscular system, and so leading to an inflammatory process. I have already said that it has been conjectured that the irregular action of the muscles might in itself be sufficient to cause the abnormal sound, whatever may be the cause or exact seat of the irritable nerve centre.

That rheumatism and chorea are closely allied, but not in the relation of cause and effect, is seen in such a case as that of the boy lately in Stephen Ward. He came in with a severe attack of chorea. After remaining in bed about three weeks he began to be a little quieter, when he was seized with acute rheumatism, involving all his joints, succeeded quickly by a mitral bruit. In this case the chorea preceded the rheumatism with the cardiac disease, just as in those which result from fright. At the same time it cannot be denied that nervous symptoms much resembling those of chorea not infrequently accompany acute inflammation of the heart. Thus delirium and spasms often constitute the symptoms denoting what is called

metastasis to the heart in rheumatism, and I have myself seen marked choreal movements accompany an acute pericarditis set up in the course of Bright's disease. I wish I were able to solve the question; but I by no means can yet agree with the opinion that chorea is due to a cardiac trouble when I witness the existence of this disease before the rheumatism, and also see it suddenly arise from fright, and yet followed by a cardiac bruit. It is evident that rheumatism, inflammation of the heart and chorea, are closely related, but not that they stand in the relation to one another of cause and effect. There may be some morbid condition common to all, but whether this is more immediately due to an error in the blood or nervous system is not very clear. Our late physician, Dr Addison, used to argue from many facts that rheumatism was a disease primarily of the nervous system.

It is impossible to accept the embolic or any other theory of chorea which entirely ignores the two important facts of it being a result of fright, and a disease especially of childhood, mostly occurring in girls. The latter is a far more prominent fact than the connection of chorea with heart disease.

Dr Dickinson has lately published some cases in which he has found changes in the corpora striata and medulla. These consisted of erosions and hæmorrhages, visible to the naked eye, and sometimes showing evidence of their being long-standing by the atrophy of the tissue and presence of hæmatoidin crystals. These changes occurred in connection with a dilatation of the smaller vessels in the substance of the medulla. His conclusion, therefore, as to the nature of chorea is that it is due to a hyperæmia of the vessels, arising from causes mainly of two kinds, one being rheumatic and the other acting more directly on the nervous system by mechanical or mental shock.

I should very much doubt whether chorea is due to any special disease of the spinal cord or other part of the nervous system, but is not rather, like epilepsy, due to a disturbance of the whole of the centres. That the brain is affected is shown by the occasional maniacal excitement and the more frequent tendency to imbecility. Just as in epilepsy you might imagine a sudden disruption or discharge of nervous force exciting the ganglia below, and temporarily suspending the action of the cerebral hemisphere in which the explosion took place, so in chorea you might regard the irritation as more continuous, rendering the movements therefore constant. Hence, when any extra work is put on the cineritious matter of the hemispheres, as when volition comes into play, the movements are increased. The frequency of fright as a cause would also seem to show that the first shock was mental, or imposed on the cerebrum.

The condition is one in which the nervous centres have become irritable, lost their power, and the will is incapable of directing their action. A strong voluntary effort is capable for a moment of restraining the movements, but time is necessary for the power to be regained. In those cases where the complaint remains chronic, and more especially in those instances where the choreal movement is confined to one part of the body, it ceases to be a disease in the ordnary acceptation of the term; the movement is simply a bad habit. For, as the spinal cord is educated to perform ordinary routine movements, such as take place in walking or in playing a tune, when the mind is otherwise engaged, so the spinal cord may be badly educated, or have become habituated to produce certain strange movements, which require a great effort of the will or training to entirely overcome. In such chronic cases medicine is of little use.

There are a *great variety of forms* of chorea, having reference mostly to the part of the body affected. The strangest cases are those which occur in young women of hysterical habit, and are therefore described very frequently under the head of hysteria; these I shall allude to again. There are also cases which arise from imitation, and often run through a school; and cases of occasional twitchings of the face or jerkings of the leg in walking.

There is a complaint which the Italians call chorée électrique, where there is a sudden and quick contraction of a muscle or set of muscles.

It is thought by some that a stimulus applied to the skin is the mode by which the movements occur, and that there are particular sensitive points of the body which give rise to the paroxysm.

Ordinary chorea occurs mostly in boys and girls of an irritable temperament before the age of puberty; the proportion of girls to boys is three to one; occasionally we meet with it in adults. When occurring in young women it is often associated with early pregnancy. So commonly is this the case that I always make inquiries in this respect when I have a case of chorea in an adult female. In hospital practice it has often been an illegitimate pregnancy, and therefore there may have been moral as well as physical causes which have determined the complaint.

Fidgets.—There is a variety of this complaint which occurs only occasionally, and is a temporary trouble, but appears to be of a truly choreal character. It occurs in persons of a nervous temperament, and does not appear to be common, from the inquiries I heav made amongst many persons concerning it. I allude to what is popularly called the "fidgets." When I had a patient in the hospital thus troubled, I wished to give it the name δυσφορίη, as

this is a classic term, and used both by Hippocrates and Aretæus. These authors, however, used it merely as a symptom of many complaints, as equivalent to "molestia" or disquiet. The attack occurs mostly after dinner, or after lying down in bed at night. It shows itself by the person being quite unable to keep some part of the body quiet, more especially the legs, which he is often obliged to suddenly thrust out. If in bed he is forced to rise, and after walking about the restlessness or fidgetiness in time passes off.

Senile Chorea.—Just as chorea is a disease of infancy so again we meet with it in old people. It is not like paralysis agitans, where the limbs are constantly shaking, but is evidenced by contortions of the limbs and whole body, exactly as seen in children. I have lately had a man of advanced years in hospital whose whole body was in a constant state of movement of this kind. All cases of senile chorea are chronic and little amenable to remedies.

Chorea from direct Injury without Fright

Case.—I have seen three cases of this in boys. One was a lad, æt. 16, who, whilst at play, struck himself against a wall, and three days afterwards had a jerking of the arm which prevented him writing; after this the leg began to twitch; then the face; and, finally, the whole body became a prey to the choreal movements. The right side was most affected.

Case.—A boy, æt. 11, I lately saw at Holloway, with Dr Wight. He was lying in bed throwing himself about, as is seen in a severe case of chorea. The history was that, six days before, whilst away from home, he was playing with other boys, when one of them came behind him, as he was sitting in a chair, and forcibly dragged his head back. He immediately felt very strange, and found his eyesight going. He got up, but could see nothing. A medical man was sought for, who said that a little more strain on his neck would have killed him. Very shortly he began to show strange movements in his body and limbs, which increased until he had all the symptoms of St Vitus's dance, and was brought home. He presented no difference from an ordinary case of chorea, with the exception that he had a pain down his neck and up the back of his head; no mischief could be felt in the head, which was rotated without pain. Every now and then he called out with pain, which he referred to his head, arm, and tongue. When he swallowed he had a defined pain at the back of the tongue, as if the glosso-pharyngeal nerve were irritated. He was ordered chloral and bromide, with ice to the spine. He gradually improved, and in a fortnight left his bed; but the choreal symptoms continued for some time, also the pain in the neck and pain in swallowing. At the end of the month he walked out, but his mind was rather obtuse and he could not fix his attention on anything long.

Since this lecture was first given, Dr Sturges has written a very valuable work on Chorea. I am of necessity satisfied with it since his views as to the nature of the disease are in accord with those which I have always held. He is unable to show the relationship

between chorea, rheumatism and endocarditis, but he cannot admit that the one is dependent on the other, seeing that in the majority of cases recovery takes place without any heart manifestation, and that the cause of the complaint is chiefly fright. He regards chorea as a functional affection in which is displayed a mere exaggeration of those muscular movements which are constantly taking place in the body, and more especially in children of nervous temperament who have not yet learned to govern their movements. These are, therefore, more especially seen in the face, arms, and hands, for a shock or moral cause by removing the controlling power of the brain or higher centres would allow the lower centres to have full play. You will observe that by a great effort of the will the movements can be restrained but not for long, for the patient has an irresistible desire to continue them. This it is which has suggested the theory of an irritation of the motor centres as a necessary explanation of chorea.

Treatment.—It might be thought by the inexperienced that those drugs which exert a physiological action over the nervous system of a controlling nature would be those which would arrest such a complaint as chorea, but, as a matter of fact, this is not the case, so that I have almost given up looking for a remedy in the direction of this class of medicines. I do not despair, however, of finding some drug which might counteract that morbid condition of the nervous system which obtains in very bad cases ; but at present we have none, and our ordinary curative means are of little avail, seeing that they can act only slowly and produce a change long after the time at which the acute form of the disease would prove fatal. In these very severe and bad cases we can only hope to preserve the life of the patient sufficiently long for the most approved tonic remedies to act. For example, in such cases as I mentioned just now of children suffering from acute chorea induced by fright, a fatal termination may occur in a few days, and in these the direct sedatives are naturally suggested. Morphia, as far as I have seen, is useless. I can call to mind two cases where large doses were given, but the effect was only transitory. The same with chloroform; the vapour produces but a temporary tranquilising effect, and our experience of it is not encouraging either in chorea or in the allied disorders, tetanus and hydrophobia. I have no objection to morphia or chloral as occasional medicines to procure sleep, for in this respect they are highly beneficial, but they are not, in the true sense of the term, remedies. I have never seen strychnia of much use in the acute affection ; nor even belladonna or conia. In the less severe cases it is possible that one or two of these medicines may be useful, but I feel convinced that the class

of medicines of which I speak—those which have a physiological action on the nervous system—are far less efficacious than the metallic tonics. It would seem that in order to produce a cure a bracing up or restoration of the original nerve power is necessary, and that the mere subdual of symptoms in no way tends to cure the complaint. When I say this I speak with some little hesitation of the effects of belladonna as I have seen it apparently useful. I remember when at Paris some years ago hearing Trousseau give a lecture on this disease and warmly recommend belladonna; but on another occasion he was declaring that there was no drug in the Pharmacopœia equal to strong coffee, and on a third he was vaunting the new gymnasium at the Hospital for Sick Children as the best therapeutic agent he knew. I mention this to show you that there really is no specific treatment for the disease. I might say that we thought we saw some benefit in one case after the use of cannabis indica, but none whatever in four cases in which we tried the physostigma.

I believe I can tell you something very positive about the treatment of chorea, and I only wish I was enabled to make the same boast in reference to some other diseases. Many years ago, seeing that every medicine in the Pharmacopœia, as well as several others out of it, were said to be equal to the cure of chorea, I determined to watch the disease untrammeled by medicines, and I found that in many cases a speedy recovery took place without the administration of any medicine whatever. The cases which did best were the severe ones, excepting always those which were of the most violent and acute description. The first case which I watched was a little girl who had severe chorea; she was too bad to be able to stand, and was obliged to have sideboards to her bed to prevent her wriggling out of it. This child began to improve in a day or two, and went out well in a month. This is only one example of several of the same kind. I take it that the patient, being subject to constant excitement or improper treatment at her own home, has her disease there perpetuated, whereas when brought to the hospital, being under the influence of strangers who endeavour to make her suppress the movements, and with the additional advantage of good living, she begins to recover. I should say that a weakened condition of the nervous centres and generally perhaps a malnutrition being at the root of the malady, good nourishment and the tonic plan are necessary. After having learned the fact that the tendency of the disease is towards recovery as soon as all the circumstances which formerly surrounded the patient were removed, I soon afterwards learned that the cure is expedited by tonic medicines of the mineral kind, and this is the experience of the majority of the profession.

I have put the treatment before you in this way to prevent your supposing that such remedies as iron or zinc act in any specific manner; they are useful, but operate as nervine tonics. I believe Dr Elliotson many years ago acquired great fame by his success in the treatment of chorea, his remedy, as you know, being the red oxide of iron. We still give it, and it is one of the best of remedies; our children very willingly take half-drachm doses in treacle. An almost equally favourite remedy here is the zinc—in fact, it is the medicine most commonly given, beginning with grain doses, and increasing to as large an amount as a scruple three times daily. A favourite remedy of my late colleague Dr Hughes was rhubarb steeped in port wine: the children were thus well sustained at the same time that the stomach and bowels were improved in condition. Arsenic I also give with good success.

In very chronic cases, such as where children are constantly making wry faces and opening their mouths, and those where a part of the body only is affected, medicines are of little use. In some of these electricity has been sometimes curative; in some cases shower-baths have acted with the best success. One writer has advocated the use of liniments, as of chloroform, to the spine, and more lately cold by means of ice or ether spray has been suggested. Often nothing less than a thorough change of scene will suffice to arrest the habit. If this opportunity do not occur, gymnastic exercises are of use. They not only strengthen the muscles and nerves, but they break the bad habit; they convert, in fact, an irregular movement into a regular one. If the arms are constantly moving, and are then employed in grasping a beam for swinging, a new and altered condition of the whole machinery accrues, and in time the habitual irregular actions are worn out. I am sorry that we have not got a gymnasium here, and therefore all I am able to do is to order my patients a skipping-rope. I believe the only method by which the chorea, which at one time prevailed in religious houses, was sometimes curable, was by making the ladies dance to the notes of music.

TETANUS

This appears to consist in a state of excitement of the spinal cord induced by a morbid irritation of the motor nerves. It may be set up by a wound implicating the peripheral nerves, or by a meningitis involving the roots of the spinal nerves. This overaction of the cord is doubted by Ringer, from experiments made on animals by strychnia and other drugs, in which he finds the cord is less excitable and its reflex action depressed. There is less resistance he thinks in

the cord, and in this way the tetanic state is set up. Tetanus may be idiopathic, and induced either by an affection of the nerves commonly called rheumatic, or by some increased irritation of the cord through the blood, as is seen in the frog tetanised by artificial means. The tetanic affection is first observed in a spasm of the muscles of mastication; the patient says he cannot open his mouth freely. The medical man sees the angle of the mouth drawn up, and if the patient is suffering from injury, especially of the extremities, he immediately suspects the nature of the complaint. The trismus does not last long before the swallowing becomes difficult, the posterior muscles of the neck or the sterno-mastoid rigid, and the head thrown back. The muscles of the chest then beome stiff, and the respiration often somewhat irregular, whilst the muscles of the abdomen become hard, and the diaphragm is also involved in the spasm. It will be seen, then, that the muscles of respiration and those associated with them are those which are mainly affected. The patient often has severe pain at the epigastrium, and this may constitute his most distressing symptom; it is due apparently to the spasm of the diaphragm. When the paroxysm comes on, the whole body is convulsed, the limbs become rigid, and the muscles of the back so contracted that the body is bent backwards in a curve. As it passes off the muscles of the limbs resume their flaccidity, but the recti abdominis and the muscles of the chest and neck remain rigid. Should the patient eventually get well, this rigidity may remain for weeks during convalescence, and even whilst he is walking about the abdomen may be as hard as a board, and the sterno-mastoid equally rigid. The absence of spasms in the legs, except during the paroxysms, is important to notice, as distinguishing tetanus from poisoning by strychnia. It was made an essential diagnostic feature in the case of Palmer, who was tried for killing his friend Cook, the plea for the defence being that the death was due to tetanus. In his case the limbs were permanently rigid, whilst the lockjaw was but slight.

The idiopathic form of tetanus is not generally so severe as the traumatic; it is more chronic and more amenable to cure; the paroxysms are not so prolonged nor so violent.

The cure of tetanus by remedies seems to be exceptional. Ordinary sedatives, as opium and chloroform, are valueless; they may be given in sufficiently large doses to throw the patient into a state of stupor, but they do not otherwise counteract the disease. Chloral, however, continued in perseveringly, is reported to have been the means of curing some patients, and indeed every remedy may boast of its cures—such as quinine in large doses or ice to the spine. The last-used remedy does, however, seem to have produced some

good results, and is now on its trial—the Calabar bean or physostigma venenosum. The alcoholic extract contains the active principle, and experimenters say that it depresses or annihilates the irratibility of the spinal cord, so that the reflex excitability is actually lost; in large doses it arrests the action of the heart and contracts the pupil. It has therefore an opposite physiological action to atropine. I had a case of tetanus in the clinical ward of a supposed idiopathic form, which got well under this remedy given in very large doses. The paroxysms certainly appeared stayed after it was taken.

The mode by which tetanus is fatal is not always very clear. It may sometimes be only too evident, as in a case where I happened to be an eyewitness of its ending. The patient had some food put into his mouth by the nurse, he took a deep breath, and his chest never again collapsed until death had released it of the spasm. In other cases we are satisfied in thinking that the violent paroxysms are sufficient to exhaust the system. But we occasionally see instances where the symptoms are slight, and yet the patient sinks rapidly from nervous depression. I have seen a gentleman with no other symptom than trismus die in his chair, and not long ago I saw in consultation with Mr Quain a lady patient, from whose eyelid he had removed a very small tumour, who shortly after had trismus and difficulty of swallowing. She expressed herself as feeling extremely ill, and feared she should not recover. She never had any spasm except in the face, and died on the third day. This is the usual time for the termination of the disease, but I have seen cases in the hospital fatal within twenty-four hours, and without any very severe symptoms. The condition which we call tetanus clearly causes some great depression of the nervous centres.

Morbid Anatomy.—Owing to the improvements in our modes of histological examination a great many observations have of late been made on the spinal cord in tetanus and other nervous diseases. Drs Lockhart Clarke, Clifford Allbutt, Coats, and others have described changes in the interior of the medulla which have resembled very much those found by Dickinson in chorea and diabetes ; that is, great distension of the blood-vessels with a slight granular change around them or even hæmorrhages ; and sometimes cavities are formed. In the case of a child who died of tetanus after a burn, Dr Carrington found marked changes in the spinal cord. The cervical enlargement was flattened, and on section a cavity was seen extending through its entire length on the right side and encroaching on the grey matter. In the lumbar enlargement there was a similar but smaller cavity on the left side. The cavities

appeared to be lined with a delicate membrane and contained a brown matter. The dorsal cord was healthy. The condition appeared to be one of great hyperæmia of the cord with extravasation of blood and extensive softening in the grey matter both of the cervical and lumbar enlargements.

INTERMITTENT TETANY OR TETANILLA

In considering the spasmodic affections we must not overlook the disease known as intermittent tetany. Like many other conditions which have only of late received a name, it has long been recognised and described, but was waiting for a distinct appellation to bring it formally before the profession. In the 'Guy's Hospital Reports,' Dr Moxon relates a case of tetany, and alludes to the description of the disease and the cases given by Trousseau. Dr Broadbent also has stated that he is quite familiar with the class of cases known by this name. It seems to occur more especially in children and in women after their confinements. In the former it might often be overlooked under the guise of convulsions, although, if carefully studied, the symptoms would seem to be peculiar, inasmuch as they are paroxysmal, and the spasms are of a tonic kind. The old term, idiopathic muscular spasm of the extremities, conveyed an idea of the affection, and was, no doubt, used to indicate what is now styled "tetany," or "tetanilla." It is a disease characterised by tonic contractions, more especially of the legs and arms, occurring at intervals. The thumbs are drawn in, and the fingers are sometimes flexed, although as often rigidly extended in the form of a cone; the foot is stretched out, and the toes flexed towards the sole. The case, therefore, is unlike one of true tetanus, where the jaws with the respiratory muscles are affected, and the extremities free, except during the paroxysmal attacks. Dr Abercrombie states that the spasm persists during sleep.

The following cases have been published in the 'Reports:'

Case.—John Thomas K—, æt. 3. He had always had good health, except during the time of occurrence of infantile disorders. On March 17th, whilst having his face washed, he complained of pain in his feet, and asked to have his boots taken off. As soon as this was done his feet were found to be contracted. He was brought to the hospital in the afternoon, when three grains of grey powder were ordered. The spasm gradually passed off, and he continued better till the following Monday, when his legs were again suddenly contracted. The spasm evidently caused him a good deal of pain, as he screamed loudly; it lasted about ten minutes, and then subsided, but his feet did not regain their natural position afterwards. The spasms occurred several times during that day, and became less severe on the next. On the 23rd the child had a severe spasm, in which the hands were also affected; the fingers remained extended afterwards, and he was taken into the ward under Dr Wilks.

On admission both legs were seen to be affected, the feet being drawn into the same position as in talipes varus, the calf of the leg being very hard; the legs were flexed on themselves, and the thighs on the abdomen. The muscles of the arm were less affected, the fingers being extended and brought together in a conical form. The child was constantly calling out in consequence of the pain caused by the cramp, and was continually moving from side to side in the bed in order to procure relief. The legs were rubbed, but with no apparent benefit, and so cold-water bandages were applied. These evidently afforded ease, as he immediately became tranquilised. He was also ordered ten grains of hydrate of chloral three times a day. On the following day, March 24th, the spasms were not so severe, and had only occurred in paroxysms three or four times in the twenty-four hours. On the 25th the spasms were gradually passing off. No effect was produced by pressing on the femoral artery. On the 27th there were no spasms, but the feet remained contracted. After this the spasms gradually wore off, and he left the hospital.

As this is a disease which subsides spontaneously, and in this very case the paroxysms had already, on more than one occasion, rapidly abated, little can be said of the merits of the remedies employed.

The next case affords a good example of this very remarkable spasmodic affection. No surprise can be felt at the serious view which the medical man took of it, nor that he was unable to declare that the symptoms were not due to a cerebro-spinal meningitis. There is no reason to suppose that this boy exaggerated his symptoms, although they are of a kind which might be readily simulated; in fact, it is remarkable how many hysteric conditions, such as contracted hand, resemble those of tetany. Dr Roberts (of Manchester), criticising this case, considers that it should have been placed with hysteria.

Case.—Master M—, æt. 16, whilst at school was subject to severe attacks of spasms or cramps all over the body. The doctor who was called in was much alarmed at his condition, fearing he had inflammation of the spinal cord. The lad wrote out a history of his own case as follows, dated March 31st:—"As far as I can remember, I have been subject to cramp for about two years, having it when I first went to school at Clapham, but mamma thinks I had it before that. I have it more in winter than summer. This year the cramp has visited me more severely than ever. I have had it all over me, at all times of the day. In washing my feet, although hot water was used, I always had the cramp in my legs, sometimes very bad. When washing my chest I had the cramps about the chest, shoulders, and neck. I have often had cramps in the veins of my wrist, and often in my neck and chin when gaping, and also in my tongue, so that I could not speak plainly for some time. After skating I always had cramp severely. I often had to stretch out my leg in school or in play-time, and if it came on in my chest or side I had to get up. If I kept my hands and arms quiet for any time numbness would come on, and if I kept quite still they would get quite warm. If I let this go on for long my arms and legs would become perfectly powerless. After trying to move the limbs for a little time the numbness would gradually pass off, and then I felt cold. I often felt as if pins and needles were pricking me after

the numbness had gone off. I always had numbness in chapel, unless I used to move my arms frequently, in which case it did not get bad, but by moving the fingers went off very soon. One day, having kept my arms in one position for some time, prayers being over, I tried to move my hands and arms from the ledge for the books. After a little I dragged my arms to the edge of the ledge, and they then fell like heavy weights on my knees. One day I was obliged to get a boy in the washing-room to put my socks on me, because I could not bend my leg without getting cramp. I often kept my leg in one position, generally straight out, for some time when I had the cramp. At times I did not see perfectly with my eyes. After sitting down for a short time latterly, when I got up I could not walk very straight. On February 28th I felt very queer all day; at night I took two pills. Next day I got up as usual, but, as on the morning before, my legs were stiff, and in walking I hardly lifted them from the ground, and I felt worse than the day before. I went down to breakfast, but could not eat. Drank a little coffee, which, after leaving the room, I vomited, and felt so queer that the master came, who sent for a doctor and ordered me to bed. The doctor gave me some medicine to take four times a day, which took away the feverishness and kept me in a perspiration. On the third day I got up, but did not go to school for a week. After this illness I had no more cramp, and I think it was all the medicine which did it. I felt weak, and in walking my feet sometimes bent outwards. After this illness I could not do my work well. One day, after lying down, I got up and found my arms and hands powerless through numbness, and could not move them for about a minute and a half afterwards. Had not numbness nearly so much since my illness. All that I feel now is that I want keeping up and strengthening. As I think this is all that is necessary to be told about myself I will come to a close."

The doctor who was called in during this attack was Mr Tayloe, who found him suffering from acute spasm of the limbs with numbness of the tongue and imperfect utterance. He seemed slightly paralysed all over the body, he could not stand, his hands were almost useless, with the fingers flexed on the palm, and sensation seemed everywhere blunted. His speech was slow and indistinct. Mr Tayloe gave him twenty grains of bromide of potassium with five grains of iodide three times a day for two weeks, when the symptoms disappeared, leaving a suspicious debility in the limbs.

On March 31st, when I saw him, he appeared quite well, and was a strong, robust-looking lad. He was not nervous or hysterical looking, and there was nothing about him indicating any malpractice, or that he had in any way fabricated his symptoms.

(*Reported by Mr C. Knott*)

Case.—William H—, æt. 18, a draper, admitted under Dr Wilks, March 22nd, 1872, and left April 25th. About last Christmas he suffered from severe neuralgic pains in the head, and on one occasion his hands became clenched for about half an hour. He remained well until the day previous to admission, when he suffered much from headache, but this passed off in the evening. In the night he was attacked again by severe pain in the head and legs. Afterwards his arms became affected. He put them in hot water with slight relief. Getting worse, he was sent to the hospital on the supposition that he had rheumatic fever.

On admission he was seen to be a healthy-looking and well-grown lad; he complained of severe pains in all his limbs, more especially in the arms. These were placed across his chest and spasmodically contracted. The muscles were rigid

and the thumbs drawn to the palms of the hands. There was a severe aching pain down the arms, increased on movement. Sometimes there were paroxysms of cramps, when he called out with pain.

On examination of the body the abdominal muscles were observed also to be slightly rigid, and it seemed that he scarcely used his abdominal muscles or diaphragm during respiration. Legs unaffected. There was considerable pyrexia, the temp. being 100·9°, resp. 24, pulse 94. On seeing him some time afterwards it was found that the spasm persisted, although there were paroxysmal attacks, when there was violent cramp attended by much pain. The case was regarded as one of idiopathic spasm or tetanilla, although with the presence of febrile symptoms there was a question whether a meningitis ought not rather to have been diagnosed, and, if so, that portion of the cervical cord should have been affected which included the origin of the phrenic nerves. Ordered fifteen grains of chloral three times a day. In the evening he was asleep and quiet. Temp. 101·6°.

23rd.—Much the same. Temp. 100°, and somewhat higher at night. Herpes coming out on the face.

24th.—Tetanic symptoms passing off. Two symmetrical patches of herpes on both sides of the mouth, in course of superior and inferior maxillary nerves.

25th.—In the morning pretty well; in evening return of paroxysm.

27th.—Continued improvement. Pains passing off. Pins and needles in arms and hands. Perspires very much. Feverish symptoms abating.

April 2nd.—Slight cramps in the legs, lasting about half an hour. Left his bed. When walking complained of stiffness in his knees, and this continued for some time. Left on 25th, able to walk well.

An epidemic of tetany occurred a short time ago in France. At a girls' school at Gentilly the pupils began to have spasms of the muscles of the extremities, coming on in paroxysms. They were evidenced by the fingers being straightened and stretched out, which with the thumb formed a cone. All the children had the complaint, and finally the governess, who tried to suppress it in the girls, had it too. The Medical Commissioner regarded the complaint as moral and emotional, and due to involuntary imitation. He styled it a *neurosis contagieuse*.

At a boys' school in the same town there was nothing like it.

The contagious nature of these nervous complaints is very remarkable. Those best known were the different dances in the religious houses, mentioned by Hecker in his 'Epidemics of the Middle Ages;' but many other very curious ones are quoted by the author, as, for example, from Zimmermann, where a nun began to mew like a cat, and shortly afterwards all the other nuns mewed. The surrounding neighbourhood was annoyed by this daily cat concert, which did not cease until they were threatened with a whipping. There is also the case where a nun in a German nunnery fell to biting all her companions. In the course of a short time all the nuns of this convent began biting each other. The news soon spread, and the biting mania extended, and even reached as far as Rome.

HYDROPHOBIA

This disease in England usually arises from the bite of an infected dog inflicted some time before its onset, the average period being two or three weeks; sometimes even the incubation is longer, and, it is said, may last for years. A case was lately reported arising from the scratch of a cat. There is no evidence of its being communicated from man to man. The symptoms of the disease are first manifested by the patient beginning to feel feverish, to have headache, to become agitated or restless, with loss of appetite; and should the remembrance of the bite come before him all this nervous distress is apt to be intensified. These early symptoms, indeed, so much resemble what fear alone will produce that a difficulty is often created in the determination of the real nature of the case. After these premonitory symptoms a choking in the throat comes on; this again is so constant a concomitant of violent emotion that a difficulty in diagnosis may even still exist. If, however, you have ever seen a case of hydrophobia you will generally recognise at once the features of the genuine disease. You will be struck with the expression of the patient indicative of dread or horror; he will be sitting up in bed or in his chair with a frightened look, as if he dreaded your approach; he may, indeed, have the distinctive features of the disease upon him, so that if you feel his pulse you may set him into a convulsion, or by breathing near him produce a paroxysm of sobbing, choking, or spasm. If a glass of water be offered him, he will become violently excited, throw up his arms, or put his hands to his throat. If prevailed upon to take it, he may seize the glass and try and gulp down a draught, but it will probably bring on a most frightful paroxysm. Pouring water from one vessel to another will also excite it. Sometimes the patient becomes maniacal and attempts to bite the attendants around him. All this time there is a difficulty or oppression of breathing and mucus collects in the fauces. The patient dies from asphyxia or exhaustion in two or three days.

The disease is comparatively rare, so that I have only seen three cases during thirty-five years' experience at Guy's Hospital; and in one of the largest hospitals in London there had been no case recorded until quite lately, so that one of the surgeons, now deceased, doubted the existence of such a special disease as hydrophobia, and regarded it merely as a kind of tetanoid hysteria. He was wrong, inasmuch as he was arguing in the absence of knowledge, but it is very remarkable how the symptoms due to hysteria or nervous emotion do resemble those of hydrophobia. So much is this the

case that I have known the instance of a gentleman who died with all the symptoms of this disease shortly after the bite of a dog, but who was so excited and apprehensive from the occurrence that the medical men regarded the case for some time as one merely of hysteria.

Only this week I have been told by Dr Fancourt Barnes of a case of a man, who came to St Thomas's Hospital with all the simulated symptoms of hydrophobia. The patient was a strong, powerful looking butcher, who came to the hospital one evening in a great fright and barking like a dog. He had just been bitten through the lip, causing a large wound also in the cheek. He went into the surgery and walked up and down holding out his arms in a theatrical manner, and was evidently in a state of extreme terror and excitement. On being questioned about himself he at first made only inarticulate sounds, and afterwards explained his case. On being offered water he took a little and sipped it with reluctance. Whilst the wound was being dressed he struggled most violently, and kept using incoherent expressions. He then left, throwing his arms about and barking like a dog. On the next day he came again to the hospital; he was then tranquil, but said he had pains all over him and felt excessively frightened. He was seen a few days afterwards, when he was well and calm enough to go and ask for a summons against the owner of the dog. The dog was proved not to be mad but was ferocious. There is a popular notion that a person bitten by a mad dog barks, and therefore this may put you on your guard against a fictitious case. It is remarkable that the attack of an animal does produce an extreme nervous depression or collapse, so that persons die from the effects of it without sufficient injury to a vital part to account for their death. I have known two instances where the shock has not been recovered from for many weeks. Livingstone described his powerlessness when attacked by a lion, and the death of sheep by "worrying" of dogs is probably through shock.

A man, æt. 43, came to me exceedingly nervous and in a constant tremor. I suspected alcoholism, but he declared he was a temperate man. He said he had pains darting through his body, especially if anything touched his hands or feet. If he took up a pin or needle a sensation would dart through his brain. This had been going on for three weeks, and he said it was in consequence of a dog having bitten him in the calf of the leg. This extreme nervous sensitiveness was still present a fortnight afterwards, and then I lost sight of him.

Drs Coats and Clifford Allbutt have found changes in the cord in connection with the blood-vessels. Around the vessels there

was a collection of cells or leucocytes; there were also some similar changes in the brain.

Case.—Geo. R—, æt. 13, admitted under Dr Rees, on Monday, Jan. 16th. On Dec. 18th, twenty-nine days before, he was bitten by a dog, on returning from school, on the upper lip. The dog was under treatment for rabies, but had got loose. It subsequently bit a girl and was then killed. The boy was taken to a surgeon's, and within a quarter of an hour the edges of the wound were pared and then brought together by pins. In nine days these were removed, when the wound was healed. On the day before he had two attacks of rigors. The boy was subsequently in his usual health, except that the mother thinks sharper and quicker than before.

On January 12th, *Thursday*, he complained of headache and lassitude; afterwards of stiffness of face, commencing on right side and then passing to left. On *following day* more stiffness and headache. On *Saturday* had lost his appetite, went out shopping with his mother, and was very restless all night. On *Sunday* he felt difficulty in swallowing, and had a spasm of the throat when trying to drink some tea. Tried to drink several times since but could not. On *Monday* at noon he was admitted. He had an anxious or frightened expression; his intellect was clear and he answered questions intelligently, though unwillingly, as talking produced spasms of the muscles of the neck. When placed in bed he had a convulsive attack, which seemed to be due to the draught of air made by the blanket when thrown over him. A scar was observed on the lip, but it was quite sound and no pain was felt in it. The breathing was irregular and sighing; pulse irregular, 92—98. When a glass of wine was brought to him he declared that he could not take it, but when pressed to do so he raised the cup with a determined air, and threw a little into his mouth. It brought on a most terrible convulsion and violent spasm of the muscles of the neck. He then threw himself back in the bed exhausted and panting. After two hours he was asked to try again, when the very thought almost brought on a convulsion; he, however, very bravely by great exertion got a little wine in his mouth, when immediately a spasmodic attack came on. His pulse varied in a few minutes from 88 to 102. At six o'clock he tried again a spoonful of wine, but convulsions followed as before. At eight o'clock he started up in bed with a feeling of choking and pain at epigastrium, and called out for water and a spoon. This he thrust into his mouth with a determined effort, but immediately spat the water out, saying he could not swallow it. At ten o'clock it was thought advisable to try chloroform, but the inhalation brought on a spasm, and he threw himself out of bed. At midnight he lay trembling all over, and asked the gentlemen near his bed to breathe away from him as his throat was stuffed up.

On Tuesday morning at three he had been having constantly recurring spasms; his head was thrown back, mouth open, eyeballs protruded, and he had been occasionally crying out, throwing his arms about or beating his chest.

At five o'clock he was rolling about in bed, in constant agitation. The slightest touch threw him into convulsions, and on one occasion he jumped out of bed, crawled on the floor, and got under the bed. He then became wildly delirious, spitting and retching mucus tinged with blood, and at six o'clock he was so violent that he had to be restrained in bed, screaming, shouting, and spitting. At seven o'clock he was less violent, became weaker, and his movements were more like those of chorea. At eight he was much exhausted and his muscles were getting flaccid; he could then swallow a little; the pulse then faltered and his extremities

got cold, and at half past eight on Tuesday morning, the day after admission, he died.

The *post-mortem* examination showed nothing more than redness of the fauces and back of the tongue. The brain and spinal cord seemed quite healthy.

Case.—Amelia A—, æt. 8, admitted under Dr Taylor, on Sept. 14th. On May 1st, she was bitten on the cheek by a dog, which had also attacked other people, and was consequently killed. She was immediately brought to the hospital, where the wound was thoroughly cauterised with nitrate of silver, and subsequently treated with ointments. She left quite well on May 29th. She did not seem at all alarmed about the bite and remained well. A short time before her second admission she complained of the face aching and a pustule appeared, with some inflammatory redness. The day before admission the child could not eat her dinner and had great difficulty in swallowing some tea. When her mother attempted to wash her she appeared terrified, and had some short respiratory movements.

On admission she had a wild-looking, flushed face; cicatrix, of pink colour and shining; she was very irritable, tossing herself about and screaming, and said she had pain at the epigastrium, which came on at intervals. On the near approach of anybody she started, and the respiration became hurried and gasping; when offered milk she shrank from it in terror and with a spasmodic inspiratory action. She was ordered injection of ¼ gr. of morphia. She tried to eat, but it gave her much pain, and when attempting to drink she was seized with the same spasmodic movements. More intense spasms were induced by a breath of air blowing upon her. During the day she allowed the sister and nurse to touch her, but was terrified at the approach of any one else. Trembling of the whole body was produced when she took a porringer in her hands, and on raising it to her lips her head was jerked away and the vessel dropped. In the evening she was extremely restless, first sitting up and then lying down, closing the eyes for sleep and again starting up, groaning or shrieking, complaining of thirst, but if milk was brought her hiding her face in her pillow. She also complained of the draughts occasioned by the movements of the bed-clothes. A quarter of a grain of morphia was injected. She passed a sleepless night and took neither food nor drink.

On the following day she was much in the same state, but would get up; she was extremely restless and excited, clutching at her mother, stamping her feet, groaning and crying, wiping the viscid saliva from her mouth, and begging those in the room not to blow upon her; she had less spasm than on the previous day, but more terror and restlessness.

On Sept. 16th, at one o'clock in the morning, she was still standing and crouching on the bed; at four o'clock made several unsuccessful attempts to drink; at nine o'clock she lay down much exhausted. She then began to wander, and became semi-unconscious with constant chorea-like movements of the limbs and spasmodic respiration. She died at six, seventy-six hours after the first decided symptom.

The *post-mortem* examination was very carefully made by Dr Goodhart, and no trace of any morbid appearance could be found in the brain, cord, or any other part of the body.

HYSTERIA

This term is used very widely and vaguely by some, and in a very restricted manner by others. A too narrow definition would make

it inapplicable to many cases which should be called by this name, and a too wide one would not only be meaningless, but harmful, by including many instances of nervous disorders having totally different characters. It can only be by a discussion of various examples of the affection that we can obtain a tolerably correct idea of what we intend by the term. When we use the expression hysteria, we mean a nervous disorder, in which the nervous system is deranged without the existence of any organic disease. It is a disorder occurring in those who possess a more than usually impressionable constitution, in those in whom there is not that equilibrium between the nervous and other parts of the organisation which we find in the most perfect frames. When I say the nervous system, I speak of it as a whole; for not only may there be perversions of the functions of the body, but the whole mental and moral character is often changed. There are some persons, with a not very susceptible nervous system, who, from mere want of force of character, are a constant prey to every unpleasant circumstance which may operate upon them, whilst there are others of a far more highly organised constitution who, by superior mental vigour, are able to withstand the effect of impressions which would otherwise cause an intolerable disturbance. Therefore the condition of system which tends to produce what we call hysteria is common to the human race. I look upon it as merely the extreme development of an instability to which nearly all men and women are liable. There are few men who will not own to their "good days" and their "bad days," referring to those times when the mastery of their will is so great that no obstacles in their path can fail to be overcome by it, and then to those occasions when they are borne down or almost driven to despair by the most trifling misfortunes. Their will is then less powerful, and you will find that a want of will is one of the most marked features in hysteria. An endless variety of definitions have been attempted according to the opinions held by physicians as to its nature, and therefore I shall not add to their number. One of the latest authors speaks of it as an increased irritability of the nervous system; but this can scarcely apply to hysterical paralysis. You will find, however, that an expression denoting that the higher nerve centres are in abeyance, leaving the spinal system uncontrolled, will cover as many cases as any other definition which you can frame.

It follows from what I have said that I do not consider the disease peculiar to women, and therefore, of necessity, uterine; but owing to woman's organisation, the complaint is far more common in the female sex. A current opinion once existed that hysteria was due

immediately to a disordered condition of the uterus—an idea dating back to the time of Aristotle, who spoke of the womb travelling through the body, and so giving rise to the hundred ailments to which hysterical women are liable. Some modern writers have not yet surrendered the opinion, and have even gone so far as to declare that the hysterical fit is none other than a counterfeit of the sexual act. Knowing how intimately a woman's constitution is bound up with all that relates to the more special functions of her sex, and how, therefore, of necessity all violent impressions made on her nervous system would in very many cases have reference to these peculiarities, we can feel no surprise that uterine troubles and hysteria are often intimately associated. Some authors place the seat of the disease in the ovaries, and declare that the diagnosis of hysteria consists in a tenderness of the lower region of the abdomen over these organs. I cannot admit this, although it is true that a tenderness over one or the other ovary is not at all uncommon in nervous and hysterical women. The ovarian theory has again come into vogue under the auspices of Charcot. He says that the "aura" of the hystero-epileptic attack proceeds from one ovary or the other, and that the fit may be arrested by pressing on the ovary, as other fits may be sometimes prevented by placing a ligature around the limb. He says these patients have "ovarian hyperæsthesia," or "ovarialgia." Then, again, ulceration or other disorder of the womb is sufficient in some patients to cause a disturbance of the whole nervous system. I have seen two cases of violent hysteria following peritonitis. But after allowing this, we must renounce the doctrine of hysteria as a uterine disorder, and still maintain that it is owing to constitutional peculiarities, and sometimes to circumstances of an altogether temporary or accidental kind.

In the lectures lately published by Sir J. Paget I see that he holds this view. He says: "In the defective ovarian and uterine functions of certain patients some see the centre and chief substance of the whole disease; a very mischievous fallacy. Of course the sexual organs appear generally in fault to those who are rarely consulted for the diseases of any other part: but in general practice they are, in a large majority of cases, as healthy as any other parts are, or not more disturbed. The close and multiform relation of the sexual organs with the mind and with all parts of the nervous system are enough to make the disorders of these organs dominant in a disorderly nervous constitution, but their relation to 'hysteria' or to neuro-mimesis, though more intense, is only the same in kind as that of an injured joint or an irritable stomach. All in their degrees may be disturbers of a too perturbable nervous system; and

equally on any one of them the turbulence of a nervous centre may be directed with undivided force."

Look around amongst your own friends and acquaintances, and consider their different organisations. Two patients have the same complaint or meet with a similar accident. The one will aid the doctor in every possible way to promote his recovery; he would, if need be, rouse himself from his bed, and say, as Ligarius did to Brutus—

> "By all the gods that Romans bow before,
> I here discard my sickness;"

whilst the other will nurse his complaint, and even speak of it when every trace of it has gone. Such a reflection as this will give you some insight into nervous affections. Indeed, the great occupation of medical men throughout the day in the investigation of their cases is to put the true interpretation on the symptom of pain—whether it refer to an organic disease, or whether it be a mere functional disorder, and, if the latter, whether it it be of the kind denominated hysterical. I do not mean that such an analysis is to prove the presence of hysteria or not, and that all pains which have no organic seat are hysterical, or that in hysteria no real pains exist, for this a mistake too often made, and one which I cannot too strongly warn you against.

The so-called fit of hysterics is due to a violent perturbation of the whole nervous system; an emotion upsets the equilibrium, and we witness the phenomena of laughing, crying, choking, &c, This may be easily produced in a highly impressionable person, whilst a more powerful cause is necessary in the stronger-nerved and stronger-minded. If a man have undergone great bodily fatigue, and his mind have been at the same time harassed, so that exhaustion of his nervous system results, he may be thrown into a state very like that of an hysterical woman. I have more than once seen a man under these circumstances give way to his feelings and play the part of a woman. It was reported that a well-known member of Parliament of strong and sturdy frame became hysterical as he stood over the grave of his friend Cobden. Some months ago I received an urgent message to visit a gentleman a short distance from town; when I arrived at his house he was sitting in his parlour and not looking ill. I expressed some little vexation at being summoned so hastily. He said he was now much better, and commenced explaining to me the reason of the summons, when he began to cry; presently the crying reached the stage of sobbing; this became louder and louder and more violent until it changed into a laugh, which he was totally unable to suppress, and I became

a witness of the most marked attack of hysterics that I had ever seen in either sex. He presently fell back in his chair quite exhausted. He was a man thirty years of age, with a large black beard, and had as manly an appearance as you would wish to see. His wife then told me that he had been speculating, that he was a ruined man, and would have to leave his house and family. He had returned home that evening shortly before I was sent for, and the thought of the prospect before him was more than he could bear; hence the cause of the attack. Whilst she was relating this he grew calm, and then commenced to talk to me, saying how foolish he was, but could not refrain from referring to the circumstances of his misfortune. He had not proceeded far when he was again overcome; another laugh commenced, and then he broke out into such a loud and involuntary fit of laughter that the noise could be heard throughout the whole house. It only ended with his utter exhaustion, when I left the place. I saw him a few days afterwards, and he was pretty well. This gentleman simply had an hysterical attack from a violent emotion; but sometimes we meet with hysterics in men in the more chronic and ordinary form. About three years ago I had a young man in the hospital for several months, in whom existed all the symptoms of hysteria in woman—such as headache, pleurodynia, palpitation, choking sensation in the throat, and, on several occasions, fits, for which the dresser was called to him; these fits were exactly of the hysteric kind. We also meet with hemi-anæsthesia in men. I mention these cases to prove to you, as they do to me, that hysteria is certainly not necessarily a uterine disorder.

It is somewhat remarkable that in states of emotion both laughing and crying should occur together, and that such apparently opposite states of feeling should be manifested outwardly by very similar movements of the chest. It is thus sometimes very difficult in hysterical women to know which emotion is most in force. But perhaps the two kinds of feeling are not so opposed, for some might say with Jessica, "I am never merry when I hear sweet music."

> "There's not a string attuned to mirth
> But finds its chord in melancholy."

I may state that my great authority on hysteria has always been the celebrated Sydenham, for I consider that his epistle on this subject contains more correct knowledge than most of the treatises which have been subsequently written. This acute observer believed that it might exist in both sexes. The following is an extract from his writings:

"Very few women, which sex is the half of grown people, are quite free from every assault of the disease, excepting those who are accustomed to labour and live hardly; yea, many men that live

sedentary lives and are wont to study hard are afflicted with the same disease. It must be confessed that women are much more inclined to this disease than men, not because the womb is more faulty than any other region of the body, but for reasons to be shown hereafter. The origin and antecedent cause of this ataxy is a weak constitution of the said spirits, whether it be natural or adventitious, for which reason they are easily dissipated upon any occasion, and their system soon broke. Wherefore this disease seizes many more women than men, because kind nature has bestowed on them a more delicate and fine habit of body, having designed them only for an easy life, and to perform the tender offices of love; but she gave to men robust bodies, that they might be able to delve and manure the earth, to kill wild beasts for food, and the like."

Hysteria, then, occurs more frequently in women, but is not dependent necessarily upon any uterine disorder. In three well-known cases of my own, where the patients were bed-ridden for years, and subsequently recovered the use of their limbs, there was not the slightest irregularity of the uterine functions. When, however, you remember that all mankind is destined for some work or employment, and that women are debarred from performing the tasks which Sydenham prescribes for men, whilst there may be no opportunity of their undertaking the offices which more especially belong to them, such as the rearing of children, domestic avocations, and the like, then you will comprehend that nature having no outlet for the superfluous energies, the whole system becomes disordered, and those hysteric symptoms ensue, which we may regard as the exponents of a wish unexpressed or a want unfulfilled. In this case every organ of the body may suffer, and, amongst the rest, the uterus. The latter may erroneously be seized upon as the seat of trouble, and, being assiduously treated by the medical man, the nervous disorder may become more deeply rooted, and, the real cause being overlooked, a subjective ailment be converted into a real one. I have seen so many instances of this that I can speak very confidently as to its truth.

If the nervous system be unduly excited a perturbation of the whole system must ensue. Now the superfluous forces thus produced would be got rid of by a person of energy in some occupation, and thus we find that where such nervous forces are operating to the discomfort of the patient, a want of mental vigour is often the cause. The hysterical condition not only varies with the degree of susceptibility of the nervous system, but is intimately connected with the powers of mind. Indeed, if you placed the strong-minded and the weak-minded at the ends of the scale, you

would be separating at the same time in great part the hysterical from the converse. At the one extremity there would be the person who would fall a prey to every untoward circumstance, and be the victim to any one who chose to play upon his fancy; at the other end would be an Alexander the Great, or Napoleon I, who would subject all mankind to their rule. Look at a case practically; a young woman has a pain in her leg; she wishes to be up and doing, get well as soon as she can, and forget her ailment. Another of a different temperament is pleased with the sympathy of kind friends, dwells upon her trouble, talks about it, so that she probably exaggerates her suffering, and does not admit that she is recovering. Such an example is daily occurring to us in those cases where we say, "the patient does not make the best of it." A third would not only exaggerate her troubles but would fail to admit that she was well when the complaint had entirely left her. Now, if a woman, states she has a pain when it does not exist, we are in possession of a case which exhibits one form of hysteria, and we arrive at a still further stage by supposing the case of a patient who might have been suffering from a visible malady, such as a swelling in the leg, and who had actually recovered, and yet perpetuated the condition by means of a ligature. We should then have a fictitious disease, and witness another variety of hysteria which is not uncommon. From the simple exaggeration of a symptom to the artificial production of disease there is but one degree.

You see how the love of sympathy, or that desire which many possess of taking a prominent place in the hearts of kind friends, will prompt many a woman to pretend to be ill when she has no ailment whatever, and, in a further stage of this morbid state, to actually manufacture a disease. We thus see not only every real disorder simulated, but various other remarkable conditions produced. If the pretended complaint resemble a real one, we have often a considerable difficulty in distinguishing the genuine from the counterfeit, but in many cases the mere oddity of the disorder serves to mark it. The strangest vagaries of human nature which we perhaps ever witness are those which occur in young females in the early stages of womanhood; the whole nervous system, including the mental and moral nature, becomes so perverted that no circumstance of the most extraordinary kind may not then happen. The girl may not only present in her physical nature all the strangest maladies that can be conceived, but there may occur such aberrations of the mental and moral feelings that every one except the medical attendant would attribute her acts to wickedness rather than madness. Under such circumstances the behaviour is like that of one "possessed of a devil," for the acts are not those of

an ordinary criminal who has an object in his wicked deeds, but are often purposeless, or for the simple love of mischief. Thus I have heard medical men generally unravel those marvellous ghost stories which we are constantly reading in our newspapers by the discovery of a young girl in connection with them. When you see a paragraph headed "extraordinary occurrence," and you read how every night loud rapping is heard in some part of the house, or how the rooms are being constantly set on fire, or how all the sheets in the house are torn by rats, you may be quite sure that there is a young girl on the premises.

The following are examples of what we are constantly reading in newspapers. You will notice in both cases the prisoners declared they had no motive for their acts.

ATTEMPTED MURDER.—At Shipton-on-Stour, Warwickshire, on Wednesday, Mary Robinson, a domestic servant, was charged with setting fire to the house of Mr W. Harris, of Tysoe. From the evidence of Mrs Harris it appeared that the house had been on fire no fewer than ten times in six weeks, and attempts had been made to burn the baby and three children to death. The first fire occurred on the 15th of January, when a bed and an arm-chair were nearly destroyed. On the 5th of February the cradle, in which was a baby three weeks old, was found to be on fire, but before the child was rescued one of its ears was severely burnt. The damask drapery of one of the bedrooms was discovered on fire on the following day, and on the 22nd of February Mrs Harris left the child in the cradle for a few minutes, and on her return the cradle was on fire, and a piece of live coal was found up the sleeve of the child's nightdress. The child's arm was severely burnt. On the following day a bed in which there were three children was found in flames. The children were with difficulty rescued, and although a medical man was called in, one of them did not regain consciousness for some time. On the 26th of February a bed in which the baby was sleeping was found to be on fire, although its parents had left the room only a few minutes before. On this occasion the baby was nearly suffocated. The same day there were three more fires in the house, and on the baby being picked up out of the cradle a piece of burning coal was found in the cradle blanket. The inmates of the house were unable to discover the culprit, and could in no way account for the fire-raising. They put the matter in the hands of the police, to whom the prisoner confessed her guilt, but she could give no motive for the crimes. She had been in Mr Harris's service for fifteen months. She was committed to take her trial at the next Warwick Assizes on three separate charges of attempted murder.

CHARGE OF ARSON.—At Rochester, yesterday, Jane Ashmore, a domestic servant, was charged, on remand, with having set fire to her master's premises on three separate occasions. Mr Beveridge, a builder, of New Brompton, said that the prisoner was a general servant, and had been in his employ since she was thirteen years of age. On the night of the 27th ult., whilst sitting in his sitting-room, he noticed smoke coming through the flooring, and on rushing downstairs he found the place on fire. The flames were subdued, but not before considerable damage had been done. On the following evening the place was again found to be on fire in the same place, and the building was further damaged. The next night, about half past nine o'clock, the witness was alarmed by a third fire, and

some minutes elapsed before the flames could be got under. The prisoner afterwards confessed to having caused the fires, but refused to say why she had done so. She was committed for trial at the Maidstone Assizes.

When a few years ago the whole country was shocked by the news of the murder of a little boy in the middle of the night whilst surrounded by members of his own family, the event was enveloped in the darkest mystery, seeing that the crime was of so extraordinary a character, and was wanting in all those objects for its commission which are usual in similar deeds. No adult, certainly no man in his senses, commits a crime except to attain some end; and therefore the very purposelessness of the act (except, perhaps, for revenge) convinced me that it was perpetrated by a young woman. I felt quite sure in my own mind as to the real criminal, who even afterwards, on her own confession, was considered by many incapable of such a deed. The public press then learned what medical men had long known as to the extraordinary vagaries which may occur in the female sex at a particular period of life; and although it is not pleasant to refer to a crime almost forgotten, yet, as it points a moral, I will read how a daily paper commented upon the case, and afforded an explanation of the dreadful occurrence to its readers:—"Hard physiologists and shrewd observers give an answer that will shock the tender mind. From twelve or fourteen to eighteen or twenty is that period of life at which the tide of natural affection runs the lowest, leaving the body and intellect unfettered and unweakened in the work of development, and leaving the heart itself open for the strong passions and overwhelming preferences that will then seize it. Youth, it must be confessed, does not feel much, and, sad to say, it is the softer sex especially which is said to go through a period of almost utter heartlessness. Girls, it is said, are harder and more selfish till the master passion takes them. In the want of active employment there is that peculiar brooding, imaginative, inventive tendency found in many young girls. In these cases the dream seems to grow and become an inner life unchecked by social feeling and by outward occupation, till a mere idea, equally causeless and wicked fills the soul and masters the very act." I mention this case not because the young lady was hysterical, but because the causes which prompted to the deed are the same which lead to the commoner though less frightful vagaries; indeed, in some instances, the feigning to be ill is combined with actual wrongdoing, as seen in a case which was published some years ago under the name of the "Female Jesuit."

It seems as if there existed an utter want of that control by which the lower passions are kept in abeyance, and that in conse-

quence deception or duplicity becomes one of the characteristics of hysteria. Thus it is most difficult in unravelling a case of hysteria to know what is a real disorder and what is actually induced. Most extraordinary cases have been related where girls have made rashes and sores on themselves; besides swallowing blood and worms, in order to evoke astonishment or commiseration when these are brought up again by vomiting. Dr Addison used to say an hysterical woman deceives, but she cannot help deceiving. A short time ago a young girl was brought to me by her uncle and aunt for advice under most distressing circumstances. Being an orphan they had brought her up in their house, and they had no reason to regard her otherwise than as a good and well-conducted girl. About a year previously they began to be annoyed by the receipt of anonymous letters, which reflected on their character and on the inmates of the house. Every means were put on foot to discover the author of these epistles, and finally the police were engaged in the investigation. After a long while the source was traced, and the young lady found to be the culprit. There appeared to be no object in her trick, as she had everything to lose by annoying her guardians; but she had an uncontrollable impulse to set the house by the ears.

Another very common proclivity of young hysterical girls is to leave the parental home without any apparent object; after having aroused great alarm in the family circle, they are found on a visit in some distant part of the country.

It may not be without interest to note the frequent association of moral obliquity in these hysterical subjects where there is a marked disturbance of the brain with paralysis, and to inquire whether the two abnormal states may not own the same cause. If the complete hemianæsthesia so often met with in hysterical subjects be due to the cessation of the operation of one side of the cerebrum, it may be fairly open to conjecture whether the moral and intellectual nature be not in the same way maimed. The opinion has often been held that the two sides of the brain must be working harmoniously to produce a healthy action of the mental processes, and the older phrenologists discoursed very much on this subject. If this be so we have no difficulty in finding the cause for the remarkable mental and moral obliquities observed in many hysterical women. If, for example, they have paralysis of a limb or of one side of the body, then one side of the brain or a part of it is in temporary abeyance. Now every physician has observed the fact that one of the greatest difficulties which he has had in determining the value of treatment by "metals" and other means has been owing often to the evident want of integrity of the patient. Dr Westphal,

being anxious to repeat Charcot's experiments on "metallotherapie," tried them on several girls suffering from anæsthesia. He confirmed Charcot's statements, but, in discussing the question of their reliability, adds that all the cases which he experimented upon had come in contact with the criminal law. In the two or three cases of hemianæsthesia in men which I have seen the moral character has always been low. The question is whether the obliquity of body and mind have not the same physical cause.

I have already said that it is difficult to give a definition of hysteria, much less to state strictly its pathology. I think, however, as bearing upon the proper method of cure, we may comment upon the fact, of which there can be little doubt, that the nervous centres are constantly producing forces which are correlated to the other forces in nature, and that as in one case there may be an absence of sufficient energy generated, so in another there may be an excess requiring an outlet. Thus, the assertion that work is a necessity of man's nature, and that every being should have an object to fulfil, is merely stating a physiological doctrine. If the brain centres be compared to so many galvanic batteries always at work, we can understand how, with half a million of women in the country unmated, a large amount of superfluous force is either running to waste or doing mischief either to the producers of it or to others. If the energies are not used for the more direct purposes for which they are intended, they may find a very appropriate outlet in good actions towards the poor and helpless, or even in assisting the parish clergyman in his duties, no matter whether the aid afforded be of a substantial or a frivolous kind. Better than doing nothing and becoming a prey to one's own feelings is riding, walking, or performing the routine of fashionable life. If none of these measures be adopted, the fire produced within will gradually consume the vitals, and the force thus generated, if not escaping, will disturb the whole organisation of the body. Examples of this you may see in our wards amongst hysterical women—one with a pain in the epigastrium, another with a palpitation, a third with constant sickness, and on seeking to ascertain what organ is diseased you find none; the machinery is good, but it is working irregularly; it is an engine with the fly-wheel gone, or one deficiently supplied with steam, or perhaps over-abundantly supplied; and, having no work to keep it in regular action, it is thrown into disorder. Those persons who are fulfilling their legitimate objects in life are like so many locomotives drawing their trains hither and thither with a regular and fixed purpose; those, however, whose existence is one of idleness, are not like the disused engines, but rather remind one of a number of locomotives running here and there without guidance, without a

destination, injuring all with whom they come in contact, but above all themselves.

If women are not fulfilling the objects which are more especially allotted to them they should have a pursuit. Granting this, you can understand the case of a young lady who, although long bedridden, and beset with so many ailments and doctors that her life was despaired of, yet speedily recovered when, on the marriage of her elder sister, she became manageress of her father's house. The menial duties imposed upon the inmates of monasteries and nunneries are the means by which the "nerves" are kept under, but even then human nature will sometimes exhibit its mastery. Without offering an opinion upon the merits of mortifying the flesh as these people do, we cannot forget that they are still human beings, and therefore you need not be surprised to hear that I have lately seen both a priest and a nun whose bodily troubles would I believe all have been dissipated if they had led the life of other mortals. There cannot be a doubt that fasting or living low for several weeks renders the body especially liable to disturbing influences and the mind ready to receive any extraordinary impressions. In spite of all measures taken to preserve the nervous system from excitement, and to employ all the energies, it is a fact that some of the most extraordinary nervous complaints to which human kind is liable have broken out in religious houses. It was in them that St Vitus's dance and St John's dance, &c., spread until these disorders became epidemic. This reminds me how contagious are complaints of this kind, and how women can exercise a self-control or not, just as the fashion sways them. This was remarked on in a magazine I was lately reading with respect to fainting. "Ladies do not faint nowadays—at least but rarely. If one can trust a certain mass of evidence, oral and written, syncope at the end of the last century, and up to the thirty-fifth year of this, was a habit with ladies. A story without a swoon was impossible until lately. Let us thank heaven comfortably that our mothers, wives, and daughters have given up the evil habit of becoming cataleptic at the occurrence of anything in the least surprising."

As in hysteria the whole nervous system is deranged, so every part of the body may suffer, and the function of every organ be disturbed, as well as the nerves themselves disordered, in all possible manners. Let us examine some of these irregularities.

The body and mind may be affected as a whole whereby both may become completely paralysed, or the one universally convulsed and the other thrown into maniacal excitement.

There may be every possible modification of sensibility, such as hyperæsthesia or anæsthesia of various regions, or actual neuralgic

pains situated more especially in the chest, back, head, face, or the uterus and ovaries. The special senses may also be perverted and the muscular system affected by paralysis, spasms, contractions, and tremors. The organic system of nerves may also be involved, as shown by such troubles in organs as vomiting, constipation, flatulence, dysphagia, perspirations, &c.

Paralysis is a very common hysterical symptom, affecting more especially the lower limbs. A leg cannot be moved, or both legs are the subject of paraplegia. As, in such cases, the cause is want of nervous energy, so you will easily understand that rousing the will is often sufficient to put fresh vigour into the system and dismiss the complaint. A sudden alarm has often cured the patient who has been considered hopelessly paralysed, and this gives us an insight into the correct treatment to be pursued. I have already on more than one occasion shown you the importance of the moral treatment of hysteria. A young lady has a complaint of an imaginary kind, you visit her daily, and treat it as if it were a reality; the consequence is that it is perpetuated, and you have assisted towards the result, but if you understand the real seat of the complaint, and attack that, you will cure your patient. Having had under my care cases of paraplegia of years' duration, most assiduously treated by medicine, and at length cured here by moral means, I cannot speak too highly of the method. These cases are seldom difficult to diagnose, since in a real paraplegia the patient grows thin, bed sores appear, paralysis of the bladder and rectum may be present, and the patient feels ill; whilst in the case of hysterical paraplegia the patient remains plump, there is no trouble with the bladder, or if any, it is retention of urine; the abdomen is tympanitic, and the bowels confined. The physiognomy of the patient and her surroundings sufficiently indicate the nature of the case. She has taken to her bed as if for the remainder of her days, and all is arranged accordingly; the stitching, the embroidery, the religious books are placed within easy reach, and she generally receives more sympathy from the clergyman and the lady visitors than do cases of real illness. The fact is that there are no painful and loathsome circumstances attending the case, and, from the conversation of the patient and industry with her hands, it is regarded as an "interesting" one.

I was but lately witness to a scene which forcibly brought before me the picture of Iphigenia being prepared as a sacrifice to the gods. I was asked to see a young lady who was said to be in the last stage of consumption. I found her recumbent in bed with a parent on each side caressing her; she had her arms crossed over her body with a crucifix hanging round her neck. On a table at

her side were placed elegantly-bound religious books interspersed with vases of flowers, and in a corner of the room was a table adorned with another crucifix and candles, where she had been accustomed to make her oblations. On an attempt to examine her I was warned off by the parents, who feared that the touch of my stethoscope or a breath of air on her chest might hasten the departure of her spirit, which they were momentarily looking for. Under the greatest difficulties I managed to put my ear over her lungs and feel her abdomen, and the conclusion I came to was that there was little or nothing the matter with her. On our retiring to another room, I was beginning mildly to express my opinion when I was at once met with a rebuff. I had then nothing more to do than plainly state what I thought as to the nature of the case and the only plan of treatment to be adopted. This was to remove the girl entirely from the parents' influence, whose constant sympathy was aggravating if not producing her ailments. They were horrified at the suggestion, declared it would be her immediate death, that they would in no way follow my advice, and they candidly informed me that I knew nothing about the case. I declined to write a prescription and oblige the poor girl to add to the gallons of physic already swallowed, and so left the victim to her inevitable fate. I did so with much reluctance, but there was no help for it, for the peculiarity of the present case was that I had the sympathising father against me as well as the mother—indeed he was the more foolish of the two.

This is the class of cases of which we see so many examples in the hospital, and where we are so successful in the cure. Some most remarkable examples we have lately had, but they are too numerous to mention. Several cases I have mentioned in the "Reports" of girls who after having being bedridden for years, became perfectly well in a very few weeks. The treatment is by the moral method, one which can scarcely be adopted in private practice, since, in a word, it is to excite to action the dormant will. Sir J. Paget puts the case well when he describes the hysterical state as one where the patient says "I cannot," and where the friends say "You will not," but the doctor says "She cannot will."

Coleridge considered this as a species of insanity. In allusion to his addiction to opium-eating he says: "My case is a species of madness, only that it is a derangement, an utter impotence of volition, and not of the intellectual faculties."

When we have the opportunity of comparing the melancholy results observed in the home of the patient with those gained in public institutions, we cannot but think of some of the disadvantages of the rich. In private practice we see, for example, a young

lady lying in bed, receiving advice from one doctor after another, who style the case one of hysteria, but are able to do very little towards promoting the recovery of the patient. It is next to impossible to get the friends to acquiesce in the plan recommended, for the persuasions of the patient too often overcome the advice of the medical man. I have just witnessed this in the case of a young lady, where after spending hours in dictating the adoption of a rational treatment, I find all my labours frustrated by a spine doctor, who has condemned her to lie for another three months on a horrible apparatus of his own contriving. Should, however, the friends or parents follow the advice of their medical man, and breaking up the charmed circle in which the patient is imprisoned, allow their daughter to be removed to a lodging to be under the guidance of the doctor and nurse alone, this change is not so advantageous in my opinion as that of the hospital. The latter has advantages which no private dwelling can afford. The patient is in a ward with other people, who, she perceives, have real diseases, some growing better and others worse; she finds also the physician adopts a uniform plan of kindness to all, doing his best to cure and relieve, and she herself is put on a perfect equality with the rest; she sees, too, the nurses performing their tasks in a uniform and business-like way, having very little time or ability to speak a sympathising word to any one, and with still less inclination to heed fanciful complaints, ready indeed rather to exhibit their indignation at the display of any imaginary troubles. There is, in fact, no one in the ward who is ready to play the part which is necessary to perpetuate an ideal malady; everything is real around the patient, and thus the whole pervading influence of the place is sometimes in itself sufficient to cause her to forget her self-created troubles, and at once to participate or even assist in the good work which is going on around her. I know it has been said that placing an hysterical patient with other invalids is injudicious, but I have not found this to be the case, and it is certainly to be preferred to keeping her in her solitary room at home.

It sometimes surprises me that medical men, seeing all this, declare their utter helplessness when standing by the bedside of an hysterical patient. They will confess that all means have been tried in vain, that there is no real disease to cure, that it is an imaginary or nervous disorder, where nothing can be done, when all the while it is their own presence in the case which constitutes the very root and foundation of the malady. Let us take the case of a girl who keeps to her bed with an ideal paralysis of the legs, or some similar disorder. She sinks into a morbid state, puts on a second nature, and becomes the centre of a world of her own creating; she is the in-

teresting invalid, and receives in consequence the sympathies of inquiring friends, the care of nurses, the consolation of the clergyman (for she is usually outwardly pious), and, above all, the daily visit of the medical practitioner, who prescribes appropriate physic. This is her perverted life and the scene she enacts. Now and then the physician is called in who gives his opinion that a great deal of the malady is due to hysteria, orders some iron and quinine, and perhaps galvanism, and so the play goes on. The medical man declares that he has tried every means and failed. Should he not see that the whole affair is a drama of the patient's own creation, and she the central figure of the piece? She is to be ill, she is to have her doctor, and enjoy in her morbid way all the interesting surroundings of the invalid. Is he not aware that to cure her he must break into the charmed circle, and to spoil the play he must get rid of some of the performers? And cannot he perceive that, even if he has no influence over others, he might withdraw himself? Here is a young lady who says "I will be ill, and have a doctor to attend me." How can she accomplish this if the latter declines to obey her behests, or, if he accepts the post, how can he, in the name of commonsense, say he cannot break her of her fancy whilst he is a party to it? If he sees clearly the truth of what I have been saying, his duty is, as professional adviser to the family of the patient, to retire, and use his influence to prevent the calling in of another medical man. I have myself seen, in several instances, where such advice has been given, and the parents have said to their child "We will have no more doctors," that recovery has at once ensued. One of the worst cases of hysteria I ever saw was that of a young lady who had been bedridden for three years, during which time she must have swallowed hogsheads of physic, and had her body covered with leeches, blisters without number, besides being well rubbed with tartar emetic ointment; the medical attendant suddenly died, when the father declared that his daughter was ruining him, and that he would have no more doctors; from that time she began to recover, and may now be seen walking about quite well. Of course, if the medical man be wise and judicious, he may adopt various plans to break up the scheme of the young lady who has become the presiding genius, not only of the household, but of the whole family circle for miles around. My complaint is against the conduct of a medical man who pays a daily visit to his patient, sends her physic to be taken every four hours, besides sleeping draughts, prescribes a very particular regimen, consisting of all kinds of delicacies, commencing with rum and milk in the morning, and then says he cannot cure her of an imaginary complaint. Next to giving her physic, when he knows there is nothing the matter with

her, the worst thing is to diet her, for there is nothing so harmful in perpetuating a nervous malady as this. If he would one day say, "No more physic, and as for diet eat and drink what you would like," he would be administering a moral stimulus more efficacious than all the iron and quinine she had ever swallowed.

A young lady keeps her bed for two or three years for an affection of the hip, and is seen by all the leading men in London. One day the clergyman walks in, prays over her, and she gets up and walks. The case is reported in all the religious journals as a miracle, whereupon the doctors all join in declaring that the case was one of hysteria, and that there was nothing the matter with her. Then, I would ask, why was that girl subjected to local treatment and to the infliction of physic every day for years? Why did not the doctors do what the parson did? Of course the utmost acumen is required in order to make a diagnosis in such a case, for it is as cruel to call every female disorder hysterical as it is baneful to treat every malady as real. It is the doctor's daily labour to unravel the meaning of pain, whether it has a tangible seat or not. No rules for diagnosis can be laid down; every case must stand on its merits. I have given you my experience of the value of moral treatment in genuine cases of hysteria, and of the harm often done by other means. I speak without hesitation in this matter, for some of the most remarkable recoveries that ever could have occurred to any medical man have taken place in my ward, in cases which have been hopelessly despaired of when the usual routine was being pursued.

The effect of faith is important to remember. A medical friend informs me that a sister of his injured her foot causing her some pain and necessary lameness. In consequence of this she took to a crutch and said she was perfectly unable to use her foot. She persisted in this belief after repeated assurances that the foot ailed nothing. She was then advised to see Sir J. Paget, and promised that she would put implicit confidence in his opinion, and act in accordance with it. She went to his house, explained her case, and was informed by him that there was nothing the matter with the foot. She thereupon threw down her crutch, walked across the room, and left his house without it.

Diagnosis.—I shall not attempt to enlarge upon the subject of diagnosis, seeing that you must do your best to exclude every possible cause of positive disease before you pronounce the case to be one of hysteria. Mistakes are constantly made and generally from carelessness. Yet even in the hands of the acutest physicians cases are sometimes thought to be hysterical on account of the absence of characteristic symptoms denoting a real disease. Thus

I have seen phthisis, laryngitis, cancer of œsophagus regarded as hysteria, and in diseases of the cerebro-spinal centres this has often occurred during the early progress of the case. I could mention cases of universal cerebritis, tumor, thrombosis, which were so called; also cases of chronic spinal meningitis and various other spinal affections.

Dr Savage informs me of a case which illustrates in a striking manner the importance of forming a correct diagnosis and of applying the appropriate treatment. A young lady, soon after the age of puberty, became nervous and irritable, with dyspeptic symptoms. Very soon she began to vomit after meals, and finally took to her bed. Being very feeble, it was thought that she would sink, especially as all treatment had been unavailing. She had seen the most celebrated doctors and been to various water establishments. Dr Savage then saw her, and found she was passionately fond of music. He conversed with her on the subject, and obtained her promise to endeavour on another occasion to rise from her bed and touch the piano. This she did; she was satisfied with her success, repeated the experiment, and very soon was about again, with the loss of all the symptoms for which medicine had been prescribed in vain.

I had not been long in the profession before I saw that the treatment of hysteria and various other nervous disorders was moral and not by drugs. I took an interest in curing these cases, and having an opportunity of introducing them into the wards of the hospital my success was great.

I find a case reported in the journals, together with some of my remarks, delivered in a clinical lecture nearly twenty years ago.[1]

Hysteria: Patient Bedridden, with Loss of Speech, for a Year

Case.—Elizabeth P—, æt. 22, the daughter of retired tradespeople in Bermondsey. Having gone to the house to visit the father, I was asked to see the daughter who had a spinal complaint, and had been given up by the doctors. About two and a half years previously she had been apprenticed to a dressmaker, after which her health became impaired. She kept growing weaker until she took to her bed, from which when I saw her she had not risen for more than a year. About six months before this her speech had begun to fail, and since that time she had never uttered a word. I found her lying in bed in very good condition, and not wasted like a patient affected with organic disease. When spoken to, she answered merely by a nod, all her correspondence being carried on by means of a slate. She spent her time in executing elaborate embroidery, and her bedridden condition had excited much sympathy in the neighbours and friends. I was told

[1] Abstract of a clinical lecture on a case of loss of speech and paralysis in a hysterical woman. Cure by moral treatment—under the care of Dr Wilks, reported by Mr Makens, 'Med. Times and Gazette,' Sep. 8, 1864.

that her spine was diseased, and that the slightest movement sent her into a fit. However, I had her moved, upon which she threw her head back, closed her eyes, and appeared unconscious. I found that she had a lateral curvature. Without giving further details, I may say at once that I saw it to be a case of hysteria, and promised to cure the girl if she would come to the hospital. This was refused at the time; but after a week or two her friends waited on me and requested me to take charge of her. She came into my ward, accompanied by her slate and pencil, worsted work, and needles, and, being placed in bed, commenced the old plan of operations. I then, in the presence of my clerk, began to talk seriously to her, upon which she closed her eyes and went off in a pretended fit. I, however, continued my conversation, informed her that I was perfectly aware she could talk if she chose, and that if she did not daily improve I should denounce her to the students as an impostor. My clerk took a report of the case, in which it is stated that at first she was lifted out of bed by two nurses to have her bowels relieved, her body being extended stiffly and her legs perfectly rigid. Her slate was taken from her, and then she moved her lips, as if unable to speak. With a great deal of pains and by using threats of galvanism (which she did not like), we got her at the end of a week, to say "yes" and "no" in a whisper. After this her voice returned, and next she began to move her legs. She was then taken out of bed, dressed, and placed in a chair, and was constantly made to move her legs. But when we tried to make her walk she dragged the legs as though they were powerless. She afterwards, however, became capable of standing, and then of walking. She left the hospital, and at the end of three months after leaving home had walked a journey of three miles. She has since entered a shop as book-keeper, and is now well.

"Dr Wilks gave a clinical lecture on this case, from which we have gathered the following:—He considered that the case was a most important one, and that students should thoroughly comprehend the method of cure in this form of hysteria. The patient was scarcely in that position of life which would have necessitated her removal to a hospital, but Dr Wilks strongly urged it on her friends as a means of cure. It will be seen that the girl had been bedridden for nearly two years, and said to be suffering from a spinal affection, which had paralysed her, and prevented her speaking. Dr Wilks said he wished to impress upon students the error of treating such patients as this as cases of disease. This method was too often followed, as it was one which generally met with the approval of every one who was interested in the case, although the real good of the patient was strangely overlooked. Too often cases of this kind were regarded as genuine instances of disease, and treated accordingly by the doctor, instead of being looked upon as mental or moral ailments requiring moral treatment. In private practice the former method was perhaps the best, in one sense, for the medical attendant and both patient and friends were pleased with the latter's assiduity. It was a method, however, which not only did no good, but did positive harm, as it perpetuated the patient's imaginary troubles by having them so constantly kept in her remembrance by the

attention of the doctor. Her condition being one in which, from a low nervous organisation, every unpleasant sensation was fixed, as it were, in her system, all caressing on the part of friends would of necessity tend to render such a morbid state continuous, and thus medical attendance, in the usual acceptation of the term, was positively bad. The method of cure was to rouse the will, and thus rid the body of its thousand morbid feelings; and this should be done by the medical attendant after he has first made a study of the temperament of his patient. Sometimes a harsh expression or a severe scolding would excite the patient's anger and rouse her dormant will, but the hazard of the method was that a dislike might be taken to the doctor both by the patient and her friends, and he would be dismissed to make room for a kinder, but perhaps a less conscientiouss man. Sometimes a solemn lecture to a patient, in which she is informed of the degrading position in which she is placing herself—one in which she is ruining herself both mentally and physically, and where there is no hope for the future—would be of the utmost benefit; and also she might be told that if she promised to make an effort she might make a confidant of her medical adviser, who would not expose her weakness, but assist her in her endeavours in every possible way.

"In the present case Dr Wilks happened to be visiting the house where the patient lay, and she was shown to him as incurably paralysed and speechless. He proposed to her friends to take her to the hospital, explaining to them the great advantages of placing her under other influences than those to which she had been accustomed, and then addressed the patient (who immediately went into a fit, and pretended to be unconscious), that, should she consent, he would endeavour to cure her, unless, indeed, it was her object to be bedridden for life, and never fulfil the functions of other women—a most miserable prospect to have in view. She nodded assent, and soon after was brought to the ward, where Dr Wilks' clinical clerk, Mr Makens, was most thoroughly impressed with the object in view, and, insisting that the patient should always make some daily progress, his success has even been more speedy than Dr Wilks anticipated.

"Dr Wilks said he could not speak too strongly in denunciation of the old fashion, the plan of treating hysteria by physic instead of by moral means, a plan which was known to be useless, and was yet followed as a matter of routine. He had, he said, often reflected with surprise upon a remark made by so intelligent a man as the late Dr James Johnson, who, when called to visit a girl who had been in bed with various hysterical affections for five years, and who had been drenched with gallons of physic, inquired if

every 'stinking thing' in the Pharmacopœia had been given her, and when answered in the affirmative, declared he could do no more. It need, perhaps, be scarcely said that on the death of her kind medical attendant, and on the resolution of her father that he would pay no more doctors' bills, the young lady speedily got better. Dr Wilks once more impressed on the students that it was the doctor's duty to endeavour to cure his patients, but not necessarily to physic them. Just as in one of the other learned professions, if we cannot get justice, we can have plenty of law, so it occurs too frequently, if our patient be incurable, from obstinacy or stupidity, or the nature of her disease, that we still prescribe unlimited physic. The above case might be headed as a cure by kindness, and is a good contrast to mere drug-giving. Such cases are deserving of great pity. This poor wretch has lost two years of by far the best part of human life, and she must always look back to that period with great distress and self-reproach."

The following also was one of my early cases in which I proved the value of moral treatment.

Hysteria: Patient Bedridden, with Loss of Speech, for Four Years

Case.—Eliz. B—, æt. 28, was living at Camberwell. I was requested to see her by Mr Hindle. Her illness had commenced about four and a half years before, with sickness, pain in the chest, &c. While attempting to get out of bed she lost the use of her legs. She had kept her bed ever since, but her symptoms had undergone some changes during this time. Fifteen months ago she lost the use of her hands, and became unable to hold her water; but these symptoms abated. Ten months ago she was seized with pains all over her, and suddenly lost her voice. Thus she had been bedridden for more than four years, was quite unable to move her legs, and for ten months had not spoken. The catamenia were natural. She had seen many medical men; her head had been shaved, various applications to the spine had been used, and the whole pharmacopœia had been ransacked in vain. It did not seem very clear how physic was to rouse her moral nature, but it was quite evident that such treatment made all her ailments more real to her. Like the other patient, she also communicated all her wants by writing on a slate. She occupied herself in fancy needle-work. She was visited by the benevolent ladies of the district, and the clergyman's portrait hung at the side of her bed. Like the other girl, too, she was fond of religious books. I informed her mother that, if the girl was allowed to come to the hospital, I believed I could cure her, and, on April 7th, 1866, she was admitted. She was put into bed; she had no power over her legs, and moving her out of bed produced sickness, and a violent pain through the body, reaching to the tongue. I talked to her, telling her that an effort on her part was necessary for the cure, that she was to be galvanised, and that I should expect some improvement every day. She wrote that she did her best, and was anxious to get well, but that once, on an alarm of fire, she had felt that she could not move, but would be burnt in her bed. My clerk was very assiduous in the daily use of galvanism; and on the 24th she said, "Oh dear, yes." After this she talked slowly, and thus her

speech returned. In the beginning of May she was taken out of bed and dressed; but she was quite incapable of moving her legs. In the middle of the month, however, she moved them slightly, and by the end of May she could stand, leaning on a chair. During the next month she gradually though slowly improved; and in the commencement of July she walked about, pushing a chair before her. Afterwards she gave this up, and in the middle of July, being able to walk out alone, she left the hospital cured. I believe that the galvanism acted on her mind, and was useful by accounting for her favorable progress, without the necessity of attributing her cure to her own volition.

I have said that moral treatment is the method to be adopted in the cure of inveterate hysteria, and that a cure is effected by using all those measures which rouse the dormant volitionary powers. It cannot, however, be too strongly presented to you that the mere absence of treatment by physic is a positive stage towards the cure. You can easily see that if you order medicine to be taken three times a day, and you are constantly asking the patient how she feels after each dose, you are assisting in perpetuating imaginary complaints. The mere neglect of treatment is sometimes sufficient for a cure; the following is an example:

Cure by Neglect

Case.—E. M., a school teacher, was admitted under Dr Wilks, Aug., 1877. During the last three years she had been ailing with headaches, scanty menstruation, backache, sickness, and loss of power and of feeling in the limbs; she had frequent screaming fits, and sometimes mad fits. When admitted she was unable to rise from her bed. She was totally hemianalgesic on the right side, and also hemianæsthetic. She could be pricked with a needle on any part of the right side without feeling it, and the special senses were also impaired. She was tested with gold, silver, copper, zinc, tin, lead, and iron, and various combinations of these metals, but with no permanent good result. She was continuously and daily put through all the more recent methods and treatment, with various medicines, but she left after seven months no better.

After some months the mother of the girl wished me to take her in again, and I did so out of compassion to the mother. As she had gone through the whole system of metallotherapia as well as galvanism, and had taken much medicine, and still showed by her mottled arm how perseveringly she had been "worked at," I determined to return to my old method of treatment,—a method found to be more successful than the more modern one. I determined to leave her alone. I ordered her nothing, and systematically passed by her bed, saying I could not waste any more time upon her whilst so many really sick persons required my attention. I neglected her for a purpose, when after about three weeks I found her sitting up at the side of her bed which she had hitherto kept, and she told me she could walk a little and had some feeling in her right side. I encouraged her, and said she would now make rapid progress. This she did; in a few days she walked about the ward, and soon left the hospital well. Neglect was the means of cure. It was more than she could bear. It had roused her dormant powers, whilst all treatment had encouraged her disorders.

Of course in the treatment of hysteria it is important to ascertain

whether or not there be any local disease which may require our especial consideration, and more especially the existence of any uterine or ovarian disorder. Even should the latter exist and have been the prime mover of the nerve disorder, it will require the utmost discrimination and judgment to decide how far local treatment may be useful or necessary to effect a cure; for whilst on the one hand, any local means which may assuage pain or anxiety of mind is commendable, a continuous course of treatment which directs the patient towards the supposed source of her sufferings is the very best mode of perpetuating her complaint, and dooming her to be a life-long invalid. It may be remembered how comparatively little the nervous system is disturbed in organic disease of the sexual organs, as cancer or fibroid of the uterus, or tumours of the ovaries, compared with its derangements manifested in a thousand ways in the merely perverted conditions of these parts. Besides malpositions, ulcerations, and other complaints of a more or less tangible kind, there are uterine and ovarian sensibilities and irritations occurring in organs which are to all appearances healthy. Thus it is that in so many hysterical women all their morbid sensations and pains are referred to the pelvis. We witness cases where the whole mental and moral nature seems to depend for its various strange manifestations on a local affection which has no tangible existence. In such cases it requires all the skill and judgment of the physician to decide how far he shall treat or altogether ignore the local trouble. It is undoubtedly true that patients may be found lying year after year on their couches where every local measure has been tried in vain. I think it may be very fairly asserted that there is no severe disease affecting the human body that may not be relieved by medicines, and that if in any malady all remedies fail to relieve, there is no disease to cure. The uterine disorder must take its place with the painful breast or hysterical joint of Brodie, and is not to be treated as a real complaint.

The late Dr Ferguson commented very well on a disorder described by Gooch as the "irritable uterus;" a case where the woman complains of a constant pelvic pain incapacitating her for all the duties of life, and making her a confirmed invalid; and all this without any marked structural change in the organ. He had, of course, cases where disorders of the uterus and ovaries existed as ulceration or displacements, but very often these organs were healthy. Whether or not, he had seen cases where every local measure had failed, and the patient had become a confirmed invalid. Dr Ferguson, therefore, believed the complaint to be deeply rooted in the very essence of that complex function termed the generative, which in the most comprehensive sense includes no inconsiderable

portion of the moral as well as the physical development of the female organisation. He goes on to say how the desire for sympathy assumes the most inordinate proportions, and the patient clings to any one who will afford it. In Dr Ferguson's own words, "In many cases these patients remain recumbent for months or years. Her room is the gathering place in which everything is discussed and determined, the choice of habitation, the tether of travel, the cultivation of society; in a word, all freedom of thought and action in the family become pivoted on the conditions of this distressing and formidable disease. Even they who recover from the disease retain many of those habits formed during its acute stages, which in themselves become substantive though secondary evils. Thus there is a risk from the use and abuse of stimulants and sedatives formerly essential. Then the long habit of recumbency diminishes the power of muscular exertion, while the dreamy condition of mind arising out of it gives a false direction to all moral activities. Very few are the same beings after the ingress of this disease as they were before it. As to the treatment of this malady, I adopt the general views and indications given us by Gooch. The theory I have promulgated to account for its complex phenomena I regard merely as an expression by which the disease is affirmed to be of nervous origin, affecting body and mind, and requiring other than mere topical measures. Whenever the local complications are clear and urgent, local means cannot be dispensed with. Unfortunately the passion of fear and the desire of sympathy render these patients as a class dissatisfied with any but such means of cure as they think are commensurate with the magnitude of their malady and worthy of the spirit of martyrdom within them, which makes the most heroic measures the most welcomed. They suffer, and, strange to say, they love to dwell on and promulgate their suffering; hence he that does most locally is most prized and retained, till another promises to do more; when the former idol is cast down and another set up in its place. There is no disease in which moral influence exercises a greater power on the high wrought sensibilities which are its essence; a kind or a harsh word, or casual phrase, will strengthen or cut short the usefulness of the best practitioner."[1]

[1] It is in this form of complaint, more especially where an "irritable uterus" constitutes its great feature, that Dr Weir Mitchell of America has so well enforced a rational moral treatment: that is, to have the patient removed from her home and well-meaning sympathising friends, and have her placed in a lodging to be under the care of a judicious nurse. He then recommends good living, galvanism, and shampooing: the latter improves the vitality and supports nutrition, and removes the undue sensibilities. Dr Playfair has adopted the

The habit induced by the use of stimulants and sedatives mentioned by Dr Ferguson is one of the great evils resulting from the mere treatment of symptoms. One of the most melancholy reflections one can have is to think that a chronic illness, which will end inevitably in a not remote death, may have been promoted by injudicious medical treatment.

Then, besides loss of *motion*, there is perversion of motion, and we witness sometimes, associated with hysteria, some of the strangest movements conceivable. These are not of that irregular kind which we witness in chorea, but are usually of a rhythmical character; thus, instead of the body or arms being constantly writhed about in various directions, they are more slowly or regularly swayed in a given manner. I allude to these movements here because they often occur in hysterical subjects, but they may be met with in all classes of persons, and at all ages. I refer to them again under the name "rhythmical spasms." For example, there was a girl in the clinical ward, two years ago, who sat in a chair, and was constantly bending or bowing forward, as if saluting all those present, and several months elapsed before she got better. In this case, as in all others, the greatest discomfort was produced by the use of any forcible means to restrain the movements; the cause lies in the centres within, and no approach to a cure is produced by attacking the effect. In several other cases the arm is in constant and regular motion, as if acted on by clockwork. This form has received the name of malleation. I remember a case of Dr Barlow's, where the woman had constant quick breathing, and, what is remarkable, every inspiration occurred with a beat of the heart. This continued for weeks. I have lately been visiting a child who has died with this form of hysteria. After having various strange symptoms for some months she took to sitting at the side of the bed, and having some person or object before her which she could continually keep thumping with her fists or head all day long. Any restraint only added to the irritation. Chloroform, opium,

system in some of his patients with the greatest success, and therefore it may be hoped that these hysterical and bedridden patients may no longer be regarded as the opprobrium of the profession, and more especially of the gynæcologists. The only novelty in the method appears to be the shampooing; its value probably mainly consists, like that of galvanism, in diverting the patient's mind to this means of cure, whilst her moral nature is being otherwise acted upon. I should like to take this opportunity of saying, that having seen a little book written thirty years ago by Mr Brudenell Carter, there seems to be a more thorough knowledge of the nature of hysteria and its treatment displayed in it than in any other work with which I am acquainted. He advocates strongly the moral treatment of the disorder, and I can only lament that his opinions and practice have not more thoroughly pervaded the mind of the profession.

conium, and other remedies in large doses, produced only a temporary effect, and she at last died utterly exhausted and wasted almost to a skeleton. There was no disease found in the brain. These movements are highly contagious, and sometimes, like the dances we read of in the middle ages, pervade a whole school.

Spasm and Hystero-Epilepsy.—We meet too, with permanent spasm as an hysteric symptom, seen more especially in the hand, which is firmly clenched, the tendons becoming rigid and the muscles contracted when the hand is forcibly opened. Again, the whole body may be affected after the manner of tetanus. This is more often seen in an acute attack of hysteria, but the lockjaw may remain as a very troublesome and constant symptom. I draw your attention to this fact, for it requires often all our acumen to distinguish a real disease from an hysteric one. Then, also, you may have that remarkable condition known as catalepsy. This in its purity is not very common, although I have seen two cases of it in the hospital. One of my patients would sink into a kind of swoon or deep sleep, during which condition she would stand perfectly still in the middle of the ward, or if in bed, would remain in any position in which you chose to place her. Minor degrees of the cataleptic state are frequently met with, and not uncommonly in the epileptic of both sexes, especially after the occurrence of a fit. During the drowsy stage which follows you will frequently find that the patient's limbs will remain in any posture in which you place them. You will observe, in fact, that the whole nervous system is deranged in hysteria. You will have evidence of irritation of the cerebro-spinal system in the movements I have mentioned, and in the strange mental vagaries; then also of the deadening of the centres, as seen in paraplegia and in the disposition to lethargy. We are sometimes called in to a person lying perfectly insensible, and apparently as if near her end; it is, however, but a mere phase of hysteria. An extreme form of this condition, when continued, is usually styled trance. The whole nervous system may be so lowered in tone that the person lies helpless and insensible, but the functions of life go slowly on. This state may last for a great length of time.

When hysteria is attended by a prolonged convulsive attack we style the disease hysterical epilepsy. This has long been recognised, as well as the fact that the mind may become deranged, so that we then witness a maniacal state associated with it. The peculiarity of the affection is its long duration, for whereas true epilepsy is known by its attacks lasting only a few minutes or less, those of

hystero-epilepsy may endure for as many hours; the patient throws herself into some extraordinary attitude, and may so remain the greater part of a day.

This form of epilepsy has been more especially observed in the subjects of hemianæsthesia, who have been particularly studied by Charcot. He has found them most susceptible to the action of various metals, and has regarded the fits as associated with an irritation of the ovaries. This physician made a study of the various forms of hystero-epilepsy in reference to the attitudes in which the patients placed themselves, and also in reference to their state of mind; their mental emotions corresponding in great measure to their peculiar gestures. These patients also were very susceptible to the "mesmeric" influence, so that they could be easily thrown into a cataleptic state. This was done by making the patient direct her eyes stedfastly on an object or on the finger of the operator; she would soon become anæsthetic, and move as a mere automaton, obeying orders to walk, to sit down, write, sew, &c. If they were subjected to irritation of the skin, such as gripping the breast on both sides, they would fall off into the epileptic state. Generally, however, these attacks would come on spontaneously, the patient having previously exhibited several hysterical phenomena in the shape of dysæsthesia, loss of special senses, spasm, or mental hallucinations. Some very slight cause would induce an attack, in which the head was thrown back, the limbs became rigid, respiration laboured, and the mind distracted. Instead of the spasms speedily passing off, the whole body becomes stiffened as in opisthotonos, and then some peculiar attitude is assumed, which endures for a long time. These attitudes are said to represent various passions of the mind, as fear, anger, or the beatitudes of the martyrs. This stage of the complaint has been called "phase des attitudes passionelles." The region of the ovary is found to be sensitive, and it is said that if pressure be made over this region the fit may be speedily arrested. In consequence a kind of tourniquet has been invented for the patient to wear around her body, and which enables her, on the approach of a fit, to immediately apply the requisite pressure. Nitrite of amyl has been also found useful in cutting short the attacks. The hystero-epileptic attack may be regarded as the extreme form of hysteria; every degree of the affection may be observed between mere emotional disturbance and the case where the whole body is convulsed and the patient raving mad; for in some cases she screams out, tears her hair, fights, or bites. The attitude of the crucifixion is not an uncommon one for hysterical girls to take in a Catholic country.

Case.—Agnes M—, æt. 20, a chamber-maid at an hotel. For a practical joke some object was placed in her bed, and this threw her into a violent fit. Having several fits afterwards, she was sent to the hospital. She appeared, on admittance, perfectly well, but on the following day she had a most violent convulsive paroxysm. She threw her arms out, her head back, ground her teeth, fixed her eyes, and became quite rigid. She lay stretched out with her body in a most distorted position for several hours without taking any food. She subsequently had several other attacks, after which, the fits having ceased for some days, she went out.

Case.—A young woman, æt. 20, was constantly having the most violent attacks of hystero-epilepsy, the aura starting from the uterus and radiating to the ovaries. Dr Marion Sims thereupon extirpated both ovaries, which he found were undergoing a cystic degeneration. She soon recovered from the operation, but the convulsions still continued.

Contraction of the limbs is a not uncommon feature in hysteria. The most obstinate cases are the contractions of the arm. The arm is violently flexed on itself, so that the greatest force is required to overcome the tension of the muscles. During sleep or under the influence of chloroform the muscles relax, and the limb becomes supple. Various mechanical means, such as keeping the limb in splints for several weeks, appear to be quite ineffectual in bringing about a cure. It is interesting to observe that a spasmodic contraction of muscle as well as a complete relaxation may occur under conditions of the nervous system which imply merely an alteration in function. Such temporary contractions are, however, also seen in connection with apoplexy and other organic lesions. They are to be distinguished from "contractures" which are permanent and associated often with degeneration of the spinal cord, or with neuritis.

The following is an example of a functional contraction:

Case.—Emma S—, æt. 13, admitted under Dr Pye-Smith June 23rd, 1879, for contraction of the left arm and leg. She had already been under Dr Moxon in May, 1874, for spastic contraction of the left hand and foot, following hemiplegia four years previously, and was discharged uncured. The report at that time was that she had been frightened at a boy getting in at her window with a mask on; that she fell unconscious on the floor, and had jerking of all her muscles. When she had recovered she was found to be paralysed on the left side, with the mouth drawn. The power never returned in the limbs, but they grew stiff. She became an out-patient at the hospital and was galvanised, but without result. She then went to Ormond Street and had a splint kept on the arm for many months, but this was of no service. When she came in on the last occasion she walked on the side of her foot, and the arm was held stiff down by the side with extension of the fingers. The girl was bright and intelligent. When I took charge of her shortly afterwards, I found her with her left arm as stiff as a piece of wood held down rigidly by her side, and so strongly twisted and supinated round as to make the anterior surface of the forearm look backwards; the wrist was bent, and fingers extended. The foot somewhat contracted, sole looking inwards. If the arm were taken and forcibly bent all the muscles would

relax and the limb become supple, but this was only momentary for it would immediately resume its former rigid condition. Also under the influence of chloroform and during sleep the limb would become flexible and natural. Both forms of galvanism acted on the muscles; under a strong battery current the rigidity ceased. When the arm and leg were placed in water, with the positive pole on the neck and the negative in the bath, the muscles relaxed, as was often the case with a current down the spine. We also used the cold shower bath. All these means were ineffectual in producing a permanent relief, and the patient left in October much the same as on admission.

With regard to the nerves of *sensation*, it may be said that these are in some way invariably altered in hysteria. More commonly there is hyperæsthesia of some of the senses. The patient cannot bear the light, or the least sound troubles her; but more usually it is common sensation which is affected. Thus sometimes no part of the body can be touched without the patient shrinking—I mean the body proper, as the chest and abdomen. Often it is some particular spot, the more usual parts being those which are tender in many persons whose "nerves are low," as the middle dorsal or third lumbar vertebra, the vertex, and the left side. You will find many nervous persons flinch when you touch them in these places. Moreover, there may be some particular spot to which the whole attention of the patient is directed until that place is believed by her to be the seat of actual disease, such as is described in the hysterical breast of Astley Cooper and the hysterical joint of Brodie. It is not always that the patient complains of pain, but often of an exquisite tenderness when the part is touched.

In many hysterical women, especially in that class who become bedridden, there may be no disturbance whatever of the sexual organs, but the sole cause of the suffering and symptoms is to be found in an irritable spine.

Spinal irritation was the term formerly used to denote a very common nervous complaint in which perfect rest was the remedy ordered by the doctor, sometimes supplemented by bandages and apparatus of various kinds to give support to the weak back. The patients have very sensitive spines so that they shrink upon being touched in the back, especially over the neck and the lumbar region. They are necessarily hyperæsthetic to a less degree elsewhere and so shrink when touched on the chest, side or epigastrium; they have also other nerve symptoms, as anorexia and sickness, retention of urine, cold hands and feet. There can be no doubt that this perfect rest resulted finally in an absolute loss of power in the limbs. I have lately seen two ladies between thirty and forty years of age lying in bed with paralysis of the legs of very long duration. Although I have no doubt from the history of

these cases that they had been functional and at one time curable, yet now owing to their absolute disuse a true paralysis exists. Although this spinal affection is functional, it is no less real to the sufferer, and both a physical and moral shock will induce it. A long wearisome journey without food together with mental anguish is sufficient to induce this malady. A short time ago I saw a young lady who received a most violent shock from suddenly hearing of the death of her husband. She took to her bed and lay there for a year until time (the universal restorer) cured her.

Then, again, there is the opposite condition of *anæsthesia*, where, owing generally to some violent commotion of the nervous system, the sensorium is thrown into a lethargic state, and the senses are sealed. I was once called to a girl who had received a great fright, followed by an hysteric attack and a subsequent state of lethargy. During this time she appeared to have lost altogether the sense of touch. The absence of sense of pain whilst that of touch remains I have already referred to; it is very commonly met with in hysteric women. This is called analgesia without anæsthesia. A girl may be stitching, and therefore feel the needle between her fingers, but you may run the needle into her skin without her knowing it.

Nervous shock; anæsthesia.

Case.—Some time ago I was asked to see a girl, æt. 15, in consultation with Mr Fisher, of Deptford. She was excitable, and had lately been much impressed by some powerful sermons at her chapel. One evening, coming home late from school, she said that she had been frightened by a man, and fell into a strange mental condition, on account of which the doctor was sent for. On the following day I also saw her. She was lying in bed, and seemed not to be aware of what was going on around her. In fact, she was almost in a maniacal condition. Her face and hands were constantly affected by choreal movements, which at times became almost tetanic. It was her menstrual period. She afterwards became calmer, and her condition was more like that of patients affected with chorea. When spoken to she appeared to understand, but she spoke with difficulty exactly as in that disease. The most remarkable feature in her case was the perfect anæsthesia which existed. I was able to thrust a needle deeply into the skin without her feeling it in the least. I tested this in many ways, and was convinced that sensation was altogether absent. She remained in much the same condition for a fortnight; at which time she stated that she had been frightened by a man who had accosted her, and that she was then constantly seeing him in the corner of the room. At the end of three weeks I visited her again; she then walked with difficulty, but sensation had quite returned. It seemed that this girl, with her peculiar organisation, had received a shock which, for the time, produced a general paralysis of motion and sensation.

Nervous shock; anæsthesia, &c.

Case.—A few months ago I was called to Surbiton, by Mr Coleman, to see a young lady who was said to be in a trance. Like other members of her family, she was of a nervous temperament; but she had been well until two days before,

when her father died quite unexpectedly from apoplexy. She then had an hysterical attack, in which she threw her arms about, clenched her hands, stared wildly, and talked incoherently. She afterwards became quiet, and was put to bed. She then remained perfectly motionless, and on the third day I saw her. She was lying in bed, like one in a tranquil sleep; her breathing was quiet, and her pulse feeble. Her eyelids were closed; but when they were opened the pupils were seen to be natural. We attempted to make her drink by pouring some fluid into her mouth; she retained it for a time, but presently made a convulsive effort to swallow, and threw her arms up. Her condition approached very nearly to that observed in catalepsy, for her arms would remain in whatever position they were placed. She had lost all sense of feeling; but it was not very clear whether this was a true nervous anæsthesia as in the preceding case, or merely the result of unconsciousness. I at once removed all the alarm felt by her friends, by attributing her condition to a nervous shock. In this opinion I was confirmed by being asked to see a married sister, who had come to the house, and whom I found lying on a sofa with spasmodic chokings in the throat. In a day or two my patient came out of her trance, and then I was hurriedly sent for again, on account of her having lock-jaw. I found her with her teeth firmly clenched, so that no food could be got into the mouth. This was overcome by a little management, and she quickly recovered. It was remarkable that the married sister declared that she did not remember me, and had no recollection of what had occurred on the evening on which I first saw her.

Dr Yandell has an interesting paper in 'Brain' on epidemic convulsions, giving an account of the remarkable nervous states into which certain people, known as Jumpers, Jerkers, and Holy Rollers, were thrown during religious revivals. The tension which the nervous system underwent produced a variety of convulsions and contortions, such as have always been observed under the influence of strong emotion. But he describes how sometimes *sensibility* also was annulled, and says that smelling-bottles applied to the nose produced no effect, nor even letting the fluid ammonia run on the nose. When they fell, encountering stumps of trees, these people felt no pain from the violence.

Hemianæsthesia.—This common phenomenon of hysteria I have already fully dwelt upon under its appropriate head. I allude to the case where the entire half of the body is insensible, and at the same time the special senses are impaired. It is the case also which has given rise to the so-called metallo-therapia, or treatment by the application of metals, various metals having the effect of restoring the sensibility to the skin. The facts seemed to be confirmed both in England and in Germany. The question whether the metals have any special effect on the nervous system, or whether the result is mental, shows that the *modus operandi* is not understood. Dr Hughes Bennett had a case where all the usual means failed to restore sensation, when the finally desired result

was obtained by the application of discs of wood. Dr Inglis, of Edinburgh, obtained the same result by the application of mustard blisters. A reference to other cases which I give will show how a strong mental or moral stimulus was equally curative.

Now, besides the hyperæsthesia or over-sensitiveness, our hysteric patients complain of and suffer *pain*. You must not think, because your patient is hysterical, that she does not feel pain, for assuredly the suffering of many hysteric women is real. There has been, and still is, much controversy as to the seat and cause of these pains. Are they merely subjective, and due, as is hyperæsthesia, to a morbid sensibility of the sensorium, or have they a local seat? and, if the latter, are they situated in the nerve and neuralgic, or in the muscle and myalgic? We have had writers who have contended strongly for one view or the other, but in all probability both are correct. I think, however, as I have already observed, that we are much indebted to those physicians who have directed attention to the frequent existence of myalgic or myosalgic pains. Thus, the pains in the side and in the head so frequently met with are said to be muscular, and more especially the pains which occur in the chest or abdomen. I have now under my care in Mary ward two good cases of the kind. The one is that of a young girl, who lies in bed or sits in a chair, leaning forward, complaining of great pain at the epigastrium. She cannot bear it touched, and says she feels as if a load were oppressing her, which will presently suffocate her. She is sometimes so bad that her mother thinks she will die, but notwithstanding she is well developed, stout, and has apparently no real disease upon her. The other case is that of a woman well known to all students on account of the trouble which she has imposed upon them. Before she came under me she was in charge of one of my colleagues for several months. Her complaint is a most excruciating pain at the left side of the abdomen, which draws her double, and hitherto has not succumbed to the medicines which have been taken in vast quantities. The only relief she has obtained has been from the subcutaneous injections of morphia, which have now been practised for many months. The woman is in good condition, and does not look as if she suffered from any organic disease. On examination of the abdomen, the left side is full, rather rigid, and highly sensitive when touched. She complains, when the paroxysm of pain is on, of a most distressing bearing down and irritability of the bladder. She stated that she had passed blood in her water, and therefore the case was treated as one of calculus of the kidney and ureter. At the present time opinions are divided between this diagnosis and one of hysteria, where the pain would be attributable to a spasm of the abdominal muscles.

My own opinion inclines to the latter view, perhaps being somewhat prejudiced by the fact that the great master Sydenham takes such a case as illustrative of one of the forms of hysteria, and which I will read:—"When this disease seizes one of the kidneys, it plainly represents, by the pain it causes there, a fit of the stone, and not only by that sort of pain and by the place it rages in, but also by violent vomitings which accompany it, and also for that the pain sometimes extends itself through the passage of the ureter; so that it is very hard to know whether these symptoms proceed from the stone or from some hysterick disease, unless perchance some unlucky accident disturbing the patient's mind a little before she was taken ill, or the vomiting up of green matter, shows that the symptoms rather proceed from an hysterick disease than from the stone. Neither is the bladder free from this false symptom, for it not only produces pain there, but it also stops the urine just as if there were a stone, whereas there is none. But this last kind seizing the bladder, happens very seldom, but that which resembles the stone in the kidneys is not so rare."

Besides hysterical pains, we may have disturbances of all the various organs of the body. Palpitation of the heart is very frequent; or the breathing may be affected, and we have a kind of nervous asthma. The larynx may be implicated, so that there is a want of power to articulate, and neuraphonia becomes one of the commonest symptoms of the hysteric condition. At another time the larynx is over-sensitive, and we have that troublesome and most annoying symptom, the hysteric cough. This has been considered by some, however, to be due to a kind of chorea or spasm of the diaphragm. You may recognise it by its loud hollow or barking character, and by the want of expectoration or any evidence of disease in the chest. To give the description in the words of Sydenham, which is both precise and accurate—"Sometimes it (the hysteric disease) seizes the lungs, and the patient coughs almost without intermission, but expectorates nothing; and though this sort of cough does not shake the breast so violently as that which is convulsive, yet the explosions are much more frequent."

We have already seen how Bulbar Paralysis proves the existence of two functions of the larynx, viz. those of respiration and articulation; for whilst in this disease the patient can scarcely speak or cough, showing the little voluntary power he has over the larynx, it still opens during the respiratory process. If the recurrent nerve be pressed on there is complete paralysis, and the larynx closes; the *abductors* become quite powerless. In functional loss of speech, as in hysteria, the larynx remains open, and there is inability to close it. The *adductors* fail to be stimulated. In a case of hysterical

aphonia lately under me no movement whatever could be exerted by the patient.

In other cases we have spasm of the diaphragm or hysteric hiccup. I have seen two such cases lately which lasted a long time, but the complaint at last wore itself out. Hysterical women also sometimes become temporarily blind.

Sickness is one of the most troublesome and obstinate of all hysteric disorders, because the organ having got into the bad habit of discharging its contents upwards can with difficulty be broken of it. It is remarkable that in these cases of daily vomiting the characteristic of the hysteric condition—the plumpness or absence of emaciation—still persists. A furred tongue may have no special signification, as it is often seen in hysteria. One mode by which we diagnose these cases as hysterical is that no medicine is of any avail; in real disease, even in such organic maladies as cancer, our ordinary remedies afford relief, but here the cure must be attempted through the nervous system. I believe the best method is to starve the patient for a while, or to use injections, so as to preserve the stomach in absolute quiet for some days, and then to commence with the smallest quantities of food. Sometimes a loathing of food is the only symptom, and patients die of starvation. This I shall presently allude to again.

The bowels, moreover, are, to use Sydenham's expression, seized upon by hysteria. Thus, prolonged and obstinate constipation is a not uncommon phase of the disease. This and minor maladies are only to be cured by the medical man having his patient well in hand, and by letting her know that he is quite aware of the unimportance of her complaint. The regular plan is for such a patient, like others of the kind, to be taken from doctor to doctor, who write the usual prescriptions, with the usual result. A good example of the influence which can be produced on hysterical patients by physicians and attendants is seen in some of the cures which occur under the direction of one of our "sisters," who introduces herself to her patients with "No nerves in Esther Ward."

As regards the nervous influence on the kidneys in the production of a large amount of water, the fact is one of importance in a diagnostic point of view. Sydenham says: "Among all the symptoms which accompany the disease this is the most proper and almost inseparable, viz. a urine as clear as rock-water, and this hysterick women evacuate plentifully, which, I find by diligent inquiry, is in almost all the pathognomonick sign of this disease, which we call hysterick in women and hypochondriack in men; and I have sometimes observed in men that presently after making water of a citron colour (yea, almost the next moment), being suddenly seized with

some violent perturbation of the mind, they presently void water as clear as crystal, and in great quantity. Three years ago a nobleman sent for me, who seemed to be suffering from an hypochondriack colick. Visiting him one day, I looked upon his urine, which was of a citron colour. He was then merry and cheerful, and said he had a craving appetite; but one coming in at that very moment vexed him so much that suddenly being taken ill he called for a chamber-pot, which he almost filled with urine as clear as crystal."

Besides the excessive flow of urine there is often total suppression or *anuria*. Allowing for cases of frequent deception, it does seem that the secretion may be arrested for several days. When severe vomiting has followed, urea is said to have have been found in the vomited matters.

It is clear that the vaso-motor system of nerves partakes of the same disturbance as the motor and sensory system. In paralysis of a limb we often find the skin cold and livid. This probably is the cause of the tendency to hæmorrhage of the mucous membranes in hysteria, making the diagnosis between hysteria and phthisis often difficult. In hemianæsthesia the vascularity of the skin is constantly changing.

Indeed, if I were to detail all the disturbances to which the body is liable in hysteria I might occupy you for a month, and, to quote Sydenham once more, "Nor is this disease only frequent, but so strangely various, that it resembles almost all diseases poor mortals are inclinable to. For, in whatever part it seats itself, it presently produces such symptoms as belong to it, and unless the physician is very skilful he will be mistaken, and think those symptoms come from some essential distemper of this or that part, and not from any hysterick disease. A day would scarce suffice to reckon up all the symptoms belonging to hysterick diseases, so various are they and so contrary to one another that Proteus had no more shapes nor the cameleon so great variety of colours. And I think Democritus was pretty right (though he mistook the cause of the disease) when he wrote in an 'Epistle to Hippocrates,' 'that the womb was the cause of six hundred miseries and of innumerable calamities.' Nor are they only very various, but so irregular that they cannot be contained under any uniform type, which is usual in other diseases, for they are, as it were, a disorderly heap of phenomena, so that it's very hard to write the history of this disease."

Hysteria in Men.—The only objection I can make to Sydenham's idea of hysteria is that he appears to connect it with hypochondriasis. This may be owing to the long and supposed necessary usage of the term for an affection of women, whilst a corresponding disease of the male he would call hypochondriasis, although he

admits having seen hysteria in men. I should, however, discriminate between the terms and the corresponding maladies, making each sex liable to either, whilst admitting at the same time the greater liability of women to hysteria, and men to hypochondriasis. I have already given cases of hysteria in men under "Epilepsy" and "Hemianæsthesia;" but very often this disease in men approximates in nearly all particulars to that in woman.

I have now a man in the hospital who has fits of a remarkable kind, reminding one of the so-called cases of "convulsionnaires." He has what is sometimes met with in women—a mixture of epilepsy, hysteria and mania combined. The paroxysms, which last for an hour, consist of a succession of fits, in which he struggles violently and gnashes his teeth; then he is for a moment quiet, asks for water, or simply lies with a vacant stare or talks incoherently. The man, a sailor, was admitted with feverish symptoms, and having a large spleen was thought probably to have ague. There was considerable tenderness over this organ, so that pressing over it would induce an attack of convulsions.

The following case might by some be considered more worthy to be classed as one of malingering than of hysteria, but the test of purpose is as difficult to use as in the hysteria of women. No doubt he might by a strong effort of the will have recovered his lost powers, but the will was deficient.

Hysteria (Malingering?)

Case.—Richard M—, æt. 32, admitted Oct. 28th, 1881. By trade a glass-blower. His illness began about three months before with weakness of his limbs, accompanied by trembling; there was also often numbness in the limbs. He then began to experience pain in the head and back, and was often sick. His sight had failed him, and he had become deaf. He had had no disease and had been temperate. On admission he was obliged to lie in bed; he had his eyes closed, and a great expression of suffering on his face; saying he had a severe pain in the head. The tongue was furred, tremulous, and thrust to the right side. The various organs of chest and abdomen were healthy. He was very intelligent, his speech slow and laboured. His pupils were natural; he said he could not see, and had had double vision. The house physician examined the eyes, and declared he had optic neuritis. He could move his limbs, but they trembled when he attempted to do so. There was a want of normal sensibility over many parts of the body. Putting together all the symptoms, it was thought that he probably had a tumour at the base of the brain.

After his admission he constantly complained of his head, had frequent sickness, wetted his bed, and could not lift his hand from his side. Had some difficulty in swallowing, and loathed his food. These symptoms continued until Nov. 17th, when another physician who had diagnosed a tumour in the medulla oblongata took charge of the case. The patient was ordered iodide of potassium and various remedies for the cephalalgia. He remained much in the same state for several weeks, with eyes shut, inability to see, hands shaky, and urine often

passed under him. The tongue was still thrust to one side. The house physician again examined the eyes, and said the neuritis was going on to atrophy. He remained with all these symptoms until the end of December, when Dr Wilks again took charge of the case. There was now strong suspicion of malingering, and the patient was ordered to be more closely watched. It was then found that the sickness was only retching, and on hearing of the high price of "tonga" which had been ordered amongst other remedies for the relief of his headache, he declared that he should like it renewed as it was the only medicine which had done him any good; it was soon found also that he was not blind for he watched the nurse lighting the gas and made remarks about objects in the ward. Mr Higgens was requested to examine him, and he reported that his eyes were healthy. Another plan was now adopted; he was made to get out of bed, but he said he could not stand, which probably was the case, as he was much wasted and the muscles were flabby. He winked his eyes like an hysterical woman, and had a vacant look. After a few days more he was held on his legs, but would not move them forward, saying he should fall; at the same time he put on a considerable amount of resistance to hold himself back and lean against his supporters. On being told that he must walk, he commenced to do so, and in a few days walked down the ward; he also began to recover his sight and to read. In April he was told he must leave the hospital to make room for other patients, in consequence of this he made a great noise during the night and frightened the nurses. He was then promised a ticket for a convalescent home, but as it was not the place he anticipated he again became most noisy and violent, so that he had to be placed in the strong room. On the following day he was questioned about his conduct, and he said he could not help it owing to the disappointment. He was then sent to the workhouse infirmary.

Catalepsy and Somnambulism.—I have already spoken of catalepsy as being associated with hysteria, and I might also say that it is met with in a modified degree in many forms of nervous disease. In its extreme and simple variety it is rare. I have told you that when consciousness is lost the muscles relax, and the person, if previously standing, will fall, and I have also said that there are modified forms of epilepsy in which, although consciousness has departed, yet some influence of the higher centres remains, sufficient to preserve the tension of the muscles and direct their movement. A similar state is also seen in somnambulism, where, although consciousness is lost, the impressions on the senses are sufficiently strong to guide the spinal centres which are still awake. Although the two conditions I name are met with under different circumstances, the phenomena observed in both are much alike. Also in some peculiar forms of epilepsy of the somnambulist type the muscles will sometimes still continue to move after the manner in which they are started, as where a workman continues to use a tool after consciousness is lost. All these states, therefore, seem to show the existence of some influence exerted by the brain over the cord, independent of consciousness. In the cataleptic, consciousness is dormant, the patient apparently does not feel, and will not

move when requested to do so; it is as though all perception and voluntary power were gone; but if a limb be placed in any position there it will remain. If the patient be able to walk he may be led into the middle of the room, and being placed in any posture, he will there stay for any time until released. If the limb be placed in a restrained position it will be kept there for a much longer period than could be accomplished by any voluntary effort. Demented cataleptics will often walk rapidly without any purpose, just as a somnambulist; and many instances of this are seen in lunatic asylums. I was shown a man in Morningside whom they could mould into any position. Whilst he was in bed on his back they could arrange his arms and legs in any posture, and there his limbs would remain. Dr Savage has a case in Bethlem of a young man who will keep his arm stretched out for two hours, and stand on one leg for a great length of time. If made to follow another patient he will continue to do so until he is stopped. It would seem that the spinal system is at work without consciousness, and also that it is operated on through the senses, just as is the case with a person in a reverie, who will walk along an accustomed street, avoiding all obstacles, and yet be so pre-occupied with his own thoughts that he may afterwards have no recollection of the route which he has taken.

Somnambulists will go through various performances and yet have no recollection of what has passed during the state of "noctambulation." If they avoid obstacles in their walk their senses must be acted upon, and through them, by a reflex process, their lower nerve centres also; and in this way their body is guided without consciousness or any activity of the brain. Dr Hammond had the opportunity of closely watching the case of a lady somnambulist, and published the case in the American journals. After getting out of bed, she lighted a candle and walked down stairs, passing him and other persons on the way without noticing them. Her eyes were open, and they did not wink when the hand was waved before them; her face was pale; she did not seem to feel when touched, nor did she move when smelling salts were placed under her nose. She then sat herself down in a chair and wept. On tickling her feet they were withdrawn, but it did not rouse her. Dr Hammond then took her head and violently shook it; she awoke, looked round her, and went off into hysterics. On recovering she had no recollection of anything that had passed, and had not even had a dream.

These pure cases are rare, but the cataleptic and trance-like state is often witnessed as a part of hysteria. I have already alluded to the case of a young lady who was said to be in a trance. After severe hysterical attacks arising from the shock caused by the

sudden death of her father she remained in bed perfectly quiet, never moving or eating. She was lying in this absolutely quiet state, like a dead person, or rather like one in a deep sleep. When an attempt was made to induce her to drink she retained the fluid in her mouth some time, then made a convulsive effort to swallow, and threw up her hands. On placing her arms in any position there they would remain. She had lost all sense of feeling when touched. She recovered in a few days, when I was again sent for, on account of her having lockjaw. This was again overcome by a little management.

Amongst his numerous experiments on hysterical women Charcot has made some remarkable observations in connection with the so-called mesmeric state, hypnotism, *sommeil nerveux*, *lethargie provoquée*, or, as he calls it, *sommation*. He found that the patients had a peculiar susceptibility to galvanism, so that currents passed through the head and elsewhere produced remarkable movements of the limbs. He says: "Hysterical patients thrown into this state of lethargy by the usual means fall into a state of neuro-muscular superexcitability." By means of a point so as to induce pressure on particular muscles, these were made to contract, and thus various expressions of the face were artificially produced, which were immediately photographed in the camera.

Trance.—This is the phase of hysteria above mentioned in which the body remains perfectly motionless, and the mind apparently quite inert, so that the patient lies like an animal hybernating for days together without eating or drinking, and is apparently insensible to all objects around her. In some cases there may be moments of semi-consciousness in which the patient takes a little food, but only in the minutest quantity. It is remarkable how small an amount of nutriment the body can subsist on during this absolute period of repose, especially when the patient is in a warm comfortable bed and all means are used to prevent the loss of heat from the surface of the body. From what I have said, you know the minds of these people are dull and perverse; there is a moral obliquity about most hysterical patients, and therefore you can quite imagine how a girl in this trance-like condition exciting the wonder of her neighbours, ventures to add to their astonishment by taking her very frugal repast in secret, and thus making them believe that she is absolutely living on nothing. If the girl be poor the marvel excites the active and benevolent sympathy of her friends, money is deposited in the cottage coffers, and thus the strongest inducement is held out to the parents to join in the deception, and a case like that of the Welsh fasting girl is easily manufactured. Of course no one who has received a scientific education

could for a moment suppose that animal life and temperature could be preserved without an adequate supply of fuel in the shape of food by the mouth to keep the bodily furnace burning. It is worthy of remark in this case that death occurring so soon after the deprivation of all sustenance must be attributed rather to the want of fluid than of solid food, and therefore probably to a poisoning by the animal secreta.

Ecstasy.—This may be considered a form of hysteria in which, the mind being self-concentrated, the body becomes almost dead to the outward world. In extreme forms it would pass into trance, in which the body is perfectly motionless and the mind itself probably inert, or, if at all active, in the same condition in which we dream, so that on recovery the patient will speak of past occurrences as of a dream-like nature. In ecstasy the mind is most intensely fixed on some subject, generally of a religious kind, and therefore the disease is rarely met with in England amongst our Protestant and leucophlegmatic people, but more frequently amongst the Catholic nations of the south. In these southern countries the frame of mind consisting in self-contemplation and examination is encouraged, and therefore if women of an excitable nature be shut up in a religious house, with all the influence of society cut off, the condition I am speaking of is quite ready for development. It is usually met with in young girls who, fixing their minds upon some religious idea, have become so absorbed in its contemplation that it has penetrated into their very nature and they are dead to the outward world. Since religious fervour, intensity of love, and animal passion are so interwoven, it is very difficult to make an exact analysis of the mental condition of an ecstatic. It would, no doubt, be differently construed by the priest or the doctor, according to his proclivities and professional training. The most remarkable case of this kind described of late years is that of Louise Lateau, who, every Friday morning contemplating the vision of our Saviour in his agony, becomes herself the crucified one, and blood issues from her hands, her feet, and her side, until she manifests in her own body all the stigmata of the Cross. Some medical men have asserted that she is performing no trick, but that in actual reality the blood oozes from her skin; the explanation they afford is that the power of her imagination is great enough, when exerted through her nervous system and concentrated on specialised parts of the body, to throw these into disorder and alter their nutrition in such a way as to produce all the phenomena described. It occurs through expectant attention.

A variety of nervous affection having a religious cause is found in the chorea or dancing mania which prevailed on several occasions as

an epidemic throughout Europe. A modification of it may be seen during our own religious revivals. There are, however, other morbid conditions induced by the same causes, which we are not unfrequently called upon to treat. We see, for example, young persons, especially girls, naturally sensitive, who being debarred from all amusement, from its supposed immoral tendency, find their only change or recreation in the church or chapel on Sunday. Here may be represented to them the wickedness and miseries of this world, which is only a place of probation for another and better; they are encouraged to practise self-examination, and become accordingly a mass of self-consciousness, always engaged in introspection, and a continual prey to their own feelings. The morbid state, reacting on the body, at last necessitates the assistance of the medical man, who has to explain the true physiological principles of life, and that active work is the best rule to follow for health. He sometimes has to preach a sermon himself, and explain that the best Christian course for the young patient to pursue is to do good rather than to talk about it.

Hysterical anorexia.—It is a remarkable circumstance that in hysterical vomiting the patient does not grow thin, showing that the small portion of food which is retained is assimilated by the healthy organs. There is, however, another variety of hysterical stomach in which all desire for food is lost, so that the patient, eating scarcely anything, becomes at last starved. This form of nervous malady has lately received especial notice by Laségue, in the 'Archives Générales,' under the name of *hysterical anorexia*, or *inanition;* and by Sir W. Gull in the 'Transactions of the Clinical Society,' under the name of *apepsia hysterica.* I have witnessed three good examples of it. One was that of a girl, who was the thinnest person I have ever seen. She was little more than a skeleton, and solely because she would not eat. These patients declare that they do not care for food, and so they take less and less until all appetite has gone, and then, indeed, a loathing may come on. The causes are of a nervous kind, either physical or mental. In one case the act was one of deliberate conviction that she could live on next to nothing. The treatment must be for the most part of the moral kind; a coaxing or scolding, according to the patient's temperament; and tonic medicines, not forgetting arsenic, which in some forms of dyspeptic cachexia acts in a most beneficial and remarkable manner.

Case.—A young lady was first seen by me three years before her death. She then complained of pain in the abdomen, constipation, and various other symptoms which I considered to be functional. She ate but little, and was sick. All remedies failed to relieve her, and she was taken to see several medical men, all

of whom regarded the case as nervous. At the end of the year she began to keep her room, and said she could eat nothing. What little she did take made her sick; her bowels were obstinately constipated, and she grew necessarily very thin. All the symptoms became still more aggravated, and she would pass several weeks without a motion. Enemata were then used, and scybala removed. She lay on her back, eating nothing, with the exception of nibbling a biscuit, and drinking wine by drops. The wonder was how life could continue on so scanty a diet. Putting together the constipation, sickness, and inability to eat, a question arose whether the case was purely nervous, or not due to some partial obstruction of the intestine. Accordingly, a surgeon was called in, who seriously proposed a speculative operation of gastrotomy. Nothing, however, was done. She lay in bed, nibbling the biscuit as usual, and her bowels were never again opened naturally, but every few weeks some scybala were removed from the rectum. She died at last rather unexpectedly. After much trouble I obtained permission to make a post-mortem examination. On a most careful search through the body not a particle of disease of any kind was found. The intestine was healthy throughout; and indeed from the necropsy alone it would have been difficult to have discovered the cause of death.

Case.—A lady, æt. 35, whom I visited on account of a gradually increasing illness, the nature of which had baffled the acumen of her medical man, was lying on her sofa in the most extreme stage of emaciation. Her face was quite hollow, so that all the outlines of the skull were plainly marked, every trace of fat had disappeared from beneath the skin, and the muscles were reduced to the smallest possible size. She could only just stand, or with assistance was able to walk into her bedroom. Her limbs appeared to be little more than the bones covered with the skin, and altogether she presented an extreme form of what is sometimes met with in such malignant diseases as cancer of the stomach. It appeared that she had led a very active life amongst the poor, but in a very exclusive religious sect; she had become a teetotaller for moral reasons, and soon afterwards thought she could diminish her diet, so as to provide for others. She accordingly took less and less, until all care for food and appetite was gone, and in this way gradually wasted away and became feebler and feebler. She was quite calm when I talked to her, but showed great perversion of mind, and I subsequently heard that some of her friends had not hesitated to call her "mad." She consented to eat more, but she was too far gone for hope, and she died in a few days.

Nervous and hysterical conditions in boys.—The same class of symptoms which are seen in hysterical girls may also be met with in young boys, and more usually at the time or approach of puberty. The cases occasionally resemble in every feature the extreme forms of hysteria in women, and the patients describe a variety of painful symptoms which exhibit a most depraved condition of the nervous system. Some years ago a boy was in the Clinical ward, who said he was paralysed and unable to move. At times he lay with his eyes shut, declaring that he could neither see nor hear. After having tried all other means, it was proposed on one of these occasions to apply the ferrum candens to his spine, and the method of using the red-hot iron by rubbing it up and down his back was

fully explained to the class. After we had left the bed, and had reached the other end of the ward, a commotion amongst the nurses made us all turn round, when we saw the blind, deaf, and paralysed boy making his escape at the door.

Various emotional conditions also are often met with in boys, promoted by circumstances already named to you.

CASE.—I was asked lately to see a boy, æt. 10 years, who was said by the parents to have croup, and by the medical man laryngismus stridulus, on account of the paroxysmal attacks of suffocation in the throat. The case was considered so bad that the parents thought he had not long to live. When I saw him I found a healthy-looking boy sitting on his mother's lap, who was petting him and lamenting over his approaching end. She never ceased caressing him and calling him a good boy. On examining and talking to him I came to the conclusion that he was a very bad boy, being peevish, ill-tempered, and self-willed. He said he did not want to be cured, but wished to die, and expressed himself in so remarkable a manner for one so young that it was clear his whole nature was thoroughly morbid; and then I suspected that his symptoms were purely nervous and emotional. Presently he had an attack of the so-called croup, which was nothing more than an hysterical barking noise. I then told him he was a naughty boy to say he wanted to die, and to cause so much distress to his mother; that he would soon get well, and that I should soon call again and find him cured. After I had left the room he resented my conduct towards him, and said he would kill any more doctors who came near him. The parents' eyes being thus opened, a new course which was laid down was pursued, and in a few days this dying boy was quite well.

The parents had themselves to thank for the affair. He was an excitable emotional boy, and had been very badly educated; he had been practised for a religious object in the habit of self-reflection, and had been much to the services of Messrs Sankey and Moody, who had a tent close by his residence. The boy had only too rigidly accepted his teaching, that it was better to die than to live, and in this way the imposture was brought about. While relating this case, I may add that it is not a solitary instance of the kind which I have seen.

I had another lad once under my care, who caused much anxiety to his friends on account of a paroxysmal cough accompanied by a choking. He would suddenly call out, and then begin barking like a dog. Another boy was brought to me for aphonia. He has attacks of loss of voice which last a few days, and then he is well for some weeks. I had seen him previously for chorea, and on another occasion with attacks in which he would clap his hands. Boys will even concoct maladies, like hysterical girls, as in a case lately related in the journals of a boy who passed "worms." These turned out to be portions of arteries which he had procured from a sheep.

A very remarkable case of an extreme excitability of the nervous system in a very clever boy, brought about by a distinct cause, I saw at Egham with Mr Roberts.

CASE.—A very precocious clever boy, æt. 12, had been in a state of maniacal excitement for some months when I saw him. After lying quiet for a few minutes he would throw himself across the bed, scream out, and declare that he had pains all over him, put himself into dreadful contortions, one of which was hanging out of bed with his head near the floor. As soon as we left the room he screamed out for his parents and had another paroxysm. He was a very intelligent lad, described his symptoms and spoke in a very old-fashioned way for a child. One of the most remarkable things in the case was the opinion which had been formed by some most distinguished medical men that he was the subject of spinal meningitis. Mr Roberts, who had charge of the case, suspected the existence of bad practices. We agreed that the complaint was functional, and aggravated by the presence of sympathising parents and friends. We obtained the assent of the parents to allow the doctor to take him to his own house. Here he was well watched, the symptoms rapidly abated, and he was restored well to his parents in a fortnight.

It is thought by some that phimosis itself, apart from the active friction induced, will produce the most severe nerve symptoms, and should always be relieved.

CASE.—A lad about 9 was lately in Dr Pavy's ward, presenting the same symptoms as I have often seen in girls. He sat up in bed with both arms in constant movement as in hammering, corresponding to the "malleation" of hysteria. When one hand was held firm, the other moved with greater violence; when both were held, he attempted to bite. If placed on his belly, and his hands held, the legs would move up and down. If the legs were also held, then the body would move backwards and forwards. He generally lay with his eyes closed, his eyelids contracted and quivering, with eyes turned up as seen in hysteria. He had a galvanic shock applied, which immediately quieted him. His appetite was good, and he slept quietly and well. He quite recovered.

Hyperæsthesia is met with in boys as in hysterical women, and I have known the slightest touch throw them almost into convulsions, like those excited in a tetanised frog. This has more usually occurred when the neighbourhood of the neck has been touched. One of the most remarkable cases recorded of an influence exerted over the cerebro-spinal centres by touching the periphery of a nerve was that of a lad under Mr Holden in St Bartholomew's Hospital.

CASE.—A lad, æt. 12, had a fatty tumour on the right side of the neck. If this swelling were touched gently by the finger, or even by a feather, he instantly lost consciousness, and was thrown into a most violent tetanic spasm. The body got quite stiff, the pupils dilated, and he was quite unconscious, having no feeling whatever in any way he was tested. After about a minute he drew a deep breath, and recovered. As often as the lump was touched the same phenomena occurred, and even whilst he was asleep in bed. Touching not only

the lump but the region around and over the spine would produce the same result. By continuing pressure on the lump Mr Holden kept him in an unconscious state for twenty minutes. If he were raised in bed or taken out, he became quite rigid. Besides these paroxysms he had other attacks of an hysterical kind, such as barking and crowing. Generally about once a day, when not touched, he would go off in a paroxysm, calling out, "Oh, my bump!" sometimes jumping out of bed and throwing himself about like a maniac, or biting at the attendants like a dog. He was a clever precocious boy, but his mental state was very strange. Mr Holden subsequently removed the tumour, and all his nervous symptoms ceased.

I have seen nervous anorexia also in boys. A lad, æt. 16, grew so ill and emaciated that malignant disease was suspected. The case appeared simply nervous, and he subsequently perfectly recovered. Vagaries in respiration are not at all uncommon in hysterical women, and the same may occur in boys.

Nervous dyspnœa in a boy

Case.—Robert W—, æt. 16, admitted March, 1871. About three months ago he began to feel sharp pains in the back and abdomen, which were relieved by rest. He often also vomited his meals. Some years ago he had shingles. The pains, accompanied by difficulty of breathing, still continuing, he came to the hospital.

On admission, he was seen to be a boy of delicate constitution, fair complexion, with great tenderness over the epigastric region, and along the spine to the loins; also a tightness in the chest. He said he could not breathe, the respiration being remarkably quick, and amounting to 84 per minute. The heart and lungs, on examination, were found to be healthy. Was ordered gr. j of valerianate of zinc three times a day. He improved, and at the end of a week his breathing was 40 and pulse 72. He afterwards had a return of the symptoms, and his respirations increased to 60. He continued better and worse, sometimes the respiration decreasing to 40, and then rising again to 60, whilst the pulse was 70. After a trial of the zinc he took quinine and the bromide of potassium, besides having blisters to the spine. He generally kept his bed, for he said he was invariably worse after being up, the breathing being quicker and the pains in the chest increased.

As no actual disease was apparent, he was ordered to get up and to take Mist. Ferri co. He seemed better for a few days, and was then sent to the Convalescent Hospital, after having been in the hospital six weeks.

I have spoken of the remarkable perversion of the moral sense in girls who are the subjects of hysteria, and of its very striking occurrence about the age of puberty. Their acts are often so wanton that they cannot be resolved into any other motive than that of pure wickedness. A boy's nature, too, is often seen to partake of the same diabolical taint, and he will be seen to perform acts whose only object is mischief. The wickedness of an adult is deliberate, and is performed for some object or gain to the actor, but boys and girls about the age of puberty seem to be instigated

by some devilish agency alone. A few days ago I took up an evening paper, and on one side I read the three following occurrences:

ATTEMPT TO POISON A FAMILY.—This morning, at the Preston Police-court, a youth named William Walmsley, aged 17, was charged with attempting to poison his master, Mr. Edward Harrison, grocer, Fishergate, and family. The prisoner was engaged to run errands and to assist about the shop. *He had een well treated, and there was nothing known to cause him to regard his master with dislike. On the other hand, he had cause to be thankful for his treatment and the confidence shown in him, for he had been in a reformatory.* Yesterday, Mr Harrison sent the prisoner to the spirit vaults of Mr France, which are opposite his shop, for a quart of beer for dinner. The lad took a bottle and asked Mr France for the beer, saying he would run across to the shop of Mr Simpson, druggist, while he was filling the bottle. He had been in the habit of purchasing oxalic acid to clean brass work, and he yesterday asked for, and was supplied with, a pennyworth of acid. He then returned for the bottle, which he took to his master's dining-room. Prisoner spilled some acid on the cheffonier and carpet, and he remarked, in reply to the servant's reprimand, that it was sugar. The prisoner seems to have put oxalic acid in the bottle of beer. Mr Harrison tasted the beer shortly afterwards and found it was of a most disagreeable flavour. He went across to Mr France, who drew Mr Harrison's attention to the fact that the lad had been to the druggist's. Mr Simpson's assistant stated he had supplied oxalic acid. The police were afterwards communicated with, and the prisoner was last evening arrested. The prisoner was remanded.

DOUBLE MURDER BY A BROTHER.—A tragedy of a painful character was perpetrated last night at Tipton, near Dudley, by a youth named Charles Hindelang, aged 18, the son of Emil Hindelang, a clock and watch dealer, of Wolverhampton Street, Dudley, by throwing two of his younger brothers, Francis Applebut, and Lewis Benjamin, into the Birmingham Canal. Hindelang left home shortly after five o'clock, and meeting his brothers as they were leaving school, induced them to take a walk with him, the three proceeding to Tipton; and when walking by the side of the canal he deliberately threw his brothers, whose ages were nine and seven respectively, into the canal, the result being that they were drowned. Shortly after eight o'clook Hindelang gave himself up to the police on the charge of murder. The canal was afterwards dragged, and the two lifeless bodies were found about a quarter past ten. Hindelang asked another brother to accompany him, but he refused. Hindelang states that he committed the murder through poverty, alleging that there was not sufficient food for his brothers to eat at home. The prisoner was charged with drowning his two brothers, Frank and Lewis, before the Dudley Magistrates this morning. *He said the confession he made to the officer who gave evidence was quite true, and repeated that he did kill his brothers, and watched them drown.* The prisoner was remanded for a week.

REPRIEVE.—A reprieve was received in Nottingham this morning for the lad Herbert Snell, 17 years of age, who was sentenced to death at the Nottingham Assizes last week by Mr Justice Hawkins for the murder of an old man, named George Hardy, a farmer, living near Retford, in whose employ the convict was. The jury strongly recommended him to mercy on the ground of his youth.

ON THE CONNECTION BETWEEN THE CEREBRO-SPINAL SYSTEM AND THE SYMPATHETIC

I wish now to speak of the intimate relation existing between the spinal and the sympathetic system. I have explained how the one regulates our voluntary movements, and the other the action of the viscera; but besides these, their special functions, many spinal nerves have a direct distribution to the organs of the body, and exert an influence over them; indeed, late observations have tended to show that in some cases the sympathetic and spinal nerves possess their own special attributes when sent to the same organ. Suffice it for my present purpose to present to you the intimate relations between the two systems, whereby impulses from the cerebral, emotional, or spinal centres may react on the whole bodily machinery, and, on the contrary, disturbances within the viscera make themselves manifest by unpleasant impressions on the sensorium.

I have already alluded to the ordinary excito-motor results obtained by touching the body, remarking how a violent blow on the spine will act on the heart, by partially paralysing, I suppose, the sympathetic ganglia, and allowing the pneumogastric to come into play; but to show the connection between the cerebro-spinal and sympathetic systems I need only refer you to the effects on the secretory organs. It is worthy of remark that there is scarcely an emotion to which the animal frame is liable but what is evidenced by an effect on the secretions. Sorrow will produce tears. Pent-up grief may influence the liver, and the sufferer becomes jaundiced. Fear may arrest secretion of saliva, as is seen in some of the ordeals of savage nations; whilst the mere thought of a luxurious repast will bring water to the mouth. Fear, while drying one end of the alimentary canal, may cause undue secretion in the other; a fact which might be illustrated by numerous examples, scientific, pathetic, or humourous. The trail which some nasty animals leave behind them when hunted is well known, especially, I believe, in America. Another effect is seen on the skin, when the hair stands on end and the terror-stricken man is bathed in a cold perspiration. The result of mental emotion is seen on the kidneys, where a large quantity of pale urine is secreted. There is many a person who has irritable bowels or bladder solely by giving these organs thought. Only lately I saw a young man who told me he never could sit out a piece at a theatre or a sermon at church if by chance he once thought of making water. I do not know that the music had any influence, although we do read in the 'Merchant of Venice'

that "some men there are, when the bagpipe plays in the nose, cannot contain their urine." You see, then, that even in the case of a supposed bladder affection you cannot overlook the nervous supply of the organ.

I know the case of a gentleman who always feels a desire to have the bowels moved before entering the pulpit. Another gentleman has a great dislike to be on a height, and now he cannot cross a bridge or stand in a pulpit higher than the congregation.

I will remind you again of what I said in my first lecture, that these nerve forces, once produced by emotion or passion, must have their way of exit somewhere. If acting either on the lachrymal gland or on the alimentary canal, they must be discharged into the pocket-handkerchief or into the water-closet, otherwise they will react injuriously on the system of the patient. The last illustration, although truly scientific, is also a piece of popular pathology; for a woman once told me that the cause of her son's illness was being frightened by a large dog at a house where he went on an errand, and that if the master of the house had let her son go to the water-closet, as he desired, she believed he would not have been ill. *She* said the fright struck inwards. We might adopt a different phraseology, but not a better explanation. We hear of the hair turning suddenly grey from fright, as in the case of Marie Antoinette, whose hair turned white in a single night. I would rather take an example from a man than a woman, for I myself have on more than one occasion had a visit from a lady with jet-black hair, and found on the morrow, when seeing her in bed, that this had changed to grey. There are, however, authentic cases of the hair suddenly turning grey, as a whole or in parts, in connection with severe neuralgia. This can be understood, since irritation of a sensory nerve affects nutrition. Dr Raymond describes the case of a lady who suffered from severe neuralgia. After a violent attack she found in the morning that her black hair had become in part red, and in part white. It afterwards nearly all fell off.

We also hear sometimes of fear turning the whole mass of blood. I believe this is literally correct. I have now seen so many cases of anæmia, some of them fatal, occurring after a severe shock to the nervous system, that I have no doubt of the fact. How this occurs I cannot tell, until the physiologists inform us in what part of the body the blood is manufactured.

These illustrations are merely to show you that, although the organic machinery is kept at work by the sympathetic system of nerves, yet that, these being associated with the spinal, they are influenced by causes which violently disturb the cerebro-spinal centres. Now let us consider, on the other hand, how, under similar excep-

tional and perturbing influences, we become sensible of changes going on within us. In a perfect state of health we probably ought to be in no way cognisant of the machinery which is at work within us, whether this is making new blood, or pumping it through the system. Certain it is that persons in the enjoyment of rude health feel a simple pleasure in existence; they know not they have a brain or a heart, or a stomach. Alas! how few of us can say that! We students who consume the midnight oil know what it is to have a throbbing brain, a palpitating heart, or a flatulent stomach. I suppose there is scarcely any one, even in the best of health, who has not experienced some internal sensations: he has had a sinking before dinner, and perhaps a rising afterwards. Now, it has long been a question, with certain of the metaphysical writers as well as physiologists, to what sense these feelings are to be referred. Are they a part of common sensation, or are they to be regarded in the light of a sixth sense? Some have had no hesitation in teaching that certain sensations which we have within us, dependent on the operations in the alimentary canal, are not referable to common sensation, but must be included in a new sense, in the same way as the muscular sense (supposing there be one), must be regarded as a seventh. At the present time we have no other words to express our internal feelings than those derived from common sensation, and thus, when our patients complain of pricking, burning, swelling, &c., we must take the terms for what they are worth. You will soon observe that patients tell you of swellings within them, which you, innocently translating into tumours, examine in the expectation of discovering some positive adventitious growth; you discover nothing; but the term is the most definite which they can adopt to express their feelings. If it be said that all our expressions for common sensation have reference to touch, it is certain that many of the feelings which we experience within us cannot come under that category; therefore the belly-ache is worthy of being exalted into a sixth sense.

It has ever been a subject of discussion whether some individuals have a magnetic sense. It has been said that there are persons who can feel the approach of a magnet, and are conscious of the presence of metals in the earth, &c. It is true that many people are much influenced by an electrical state of the atmosphere, and can recognise a thundery day by their feelings; but whether there is in the body a true galvanometer appreciative of electricity without has yet to be determined by a scientific method.

It has been thought that animals and flowers are under the influence of electric currents, and it has been suggested that dogs may find their way home under their guidance. I believe Dr Rae

says that reindeer kids, when very young and deprived of their mothers, will always turn towards the north, however much you may try and drive them the other way. I have read that buffaloes when alarmed run southward, and that in making enclosures to catch them the entrance must always be made in a northern direction.

As regards the vegetable world, it has been shown that sensitive plants are influenced by electrical currents, and therefore may be affected by natural electricity. Whether the description of the compass-flower in 'Evangeline' is true I have no means of ascertaining:

> "Look at this delicate plant, that lifts its head from the meadow;
> See how its leaves all point to the north, as true as the magnet;
> It is the compass-flower."

The subject of pain has never, as far as I know, been scientifically considered as a whole, but is one of great practical importance. The sensory nerves are, as you are aware, distributed all over the skin, and thus we become sensitive creatures, and acquire a perception of all around us. The internal organs have no need of such nerves; and therefore you find that the brain may be softened, or the lungs be riddled from end to end, and yet no pain exist. The liver may be full of abscesses, and the patient perfectly unconscious of it; or advanced Bright's disease may be known only to the medical man. This is a matter of every-day experience, and therefore, if we could absolutely state that the external shell of the body is sensitive while the interior is not, we should have an important fact to help us clinically. I myself believe this, in a general sense, to be true, and of great assistance in diagnosis. For instance, pain in the head generally indicates an affection of the sensitive nerves in the skull or membranes, but not disease of the brain itself. The pain in pleurisy means that the chest walls are involved, there being none in the simple pleurisy accompanying a pneumonia. In peritonitis, pain implies an implication of the abdominal walls, for the inflammation of the coverings of the organs or deeper-seated parts does not necessarily produce pain. In the case of the hollow organs severe pain may occur, but certainly not, as in the common sensation of the skin, from substances passing over the mucous membrane; for not only may large bodies, as stones, pass along them without producing any sensation, but ulceration may exist in the stomach and throughout the intestines without the production of any pain whatever. When these organs spasmodically contract, or are unduly stretched, as in colic of the intestinal canal, gall-duct, or ureter, then alone an agonising pain is produced. The tension is greater, and is carried back to a sensitive centre. I

repeat it would be an important and interesting study to ascertain what amount of sensation exists within the body, and under what exact circumstances pain is produced.

The uses of pain are obvious in expressing to us the abnormal condition of some part of the body, but it must be remembered, at the same time, that the sensitiveness of persons varies immensely. Thus, I have seen a man endeavour to hide the fact that he had received a severe blow on the head by saying he had had a slight knock, when at the time he was suffering from fractured skull. Another person, especially a woman, may grow eloquent over her sufferings, when you can find nothing but a quick-beating heart or flatulent abdomen. This shows that in judging of pain we have not only to regard the spot where the pain is said to have its seat, but we must not neglect the condition of the nerve centre on which that impression is made. We must remember the law of our natures, whereby all sensations are referred outwardly, and recollect the fact that when a nerve is irritated in any part of its trunk the sensation is referred to its extremity. The commonest example is that where, a leg being amputated in any portion of its length, an irritation of the nerves of the stump produces a sensation referred by the recipient to the foot or some part below, where the branches of the irritated nerve had at one time been distributed. A pain thus produced is a real objective sensation, but by what name shall we designate that sensation caused by an irritation made at the centre itself or by no irritation at all, but due merely to an over-sentient or morbid condition of the ganglionic centre? It does seem possible for a person to have such an impressionable sensorium, either as a natural or morbid condition, that he would, were that centre sensitive, have pain in it; but not being sensitive (the brain, spinal cord, and ganglia possessing no feeling), the impressions are referred to some external part of the body. A person, therefore, who possessed this morbid nerve centre would feel a pain in some part of the body to which is distributed a nerve which has its origin in that centre. He would be suffering a pain having no outward cause, and that man I call a *hypochondriac*. You see the pain is real, for, if not, the patient would be shamming; the hypochondriac does not sham, the pain is a reality within him.

The patient necessarily refers the cause of the pain to the spot where it is felt; it is a law of his nature so to do, as he can know nothing of the centre within where lies the sensorium or perceptive organ; but for us medical men our daily and hourly occupation is to interpret pain, and to discover whether that which the patient regards as outward and local is really objective or only subjective. If the latter, we consider that the sensory centres are mor-

bidly acute, or at least that they permanently retain that actively receptive state which is only a temporary one during the existence of actual pain. When, for example, from an irritation of the skin, at the point of the finger, a pain is felt, we know that the recipient grey matter in some centre is for the moment disturbed, since if we cut the nerve leading to it from the finger no sensation would be experienced. Now, if we suppose this temporarily altered condition to continue, and that the centre does not return to its quiescent state, the pain would also remain. In this way the abnormal conditions, with the resulting sensation, would become habitual.

It has always been assumed that a somewhat analogous alteration may occur in the motor apparatus, and therefore, if this be true, there seems no good reason why the same theory should not apply to the sensory. For example, if a person voluntarily throws himself into a state resembling tetanus, epilepsy, or chorea, he is for the time inducing a special action in certain cells which rule over the motor nerves and muscles employed in the movements; and the same occurs if he merely moves one arm or leg. Now, we cannot but think that whilst these muscles are still in action there must be some corresponding disturbance in the motor centres which rule over them; so that in the case of chorea we must look upon the complaint not as a real disease but only as an abnormal persistence of a state which in its temporary form is purely physiological. If, then, a temporarily disturbed motor centre does not resume its normal quiet, and we have in consequence a continuous movement, so in the same way it can be supposed that a temporary disturbed sensitive centre not falling back into quiescence would produce what is equivalent to a continuous pain. In such cases, where pain is constantly felt, as in the hypochondriac, the health is too good, and the bodily functions are too soundly maintained for us to suppose that any real morbid condition of the nerve centres can exist. It is therefore in one sense true, as the doctor assures the patient, that there is nothing the matter with him.

If you take this idea in the larger sense, and say that the whole sensorium is so affected or so morbidly sensitive that impressions existing there have no reality, then the brain is diseased—the person is mad. He is conjuring up images without any corresponding picture on the retina, or hearing sounds without the membrana tympani having responded to a single vibration. The man, I say, is mad. "He hears a voice you cannot hear; he sees a hand you cannot see, &c.;" and so I take it that hypochondriasis is a species of madness, or a little madness, for some nerve centre must be wrong when it is sensible of impressions which have never been made upon it. If this be so, say you, how difficult to ascertain the

real state of a patient when we have nothing but pain to guide us to the truth. It is most difficult. It is the great difficulty which the medical man is attempting to surmount all day long. You may infer as a rule that when you see a patient very impressionable, the real cause of suffering is less than it would be in another. If tears are shed, showing the patient to be very emotional, the cause may be most trivial. A short time ago I had two women patients side by side in the ward. One had most violent attacks of neuralgia coming on in paroxysms. She suffered an agony, but never exclaimed, and never shed a tear. Her neighbour, an anæmic woman much out of condition, in a highly nervous state at the climacteric period of life, could never relate her sufferings without weeping; but, as far as I could discover, she had no bodily disorder. You may now understand what I meant to imply when, showing you that old man in Stephen Ward who has had an excruciating pain at the pit of the stomach for six years, I said he had a mad semilunar ganglion. The inexperienced generally argue in a manner the very reverse of this, and thus you will find that nervous women, and the most demonstrative, and the most emotional, are those who will receive the sympathy of the benevolent, while the real sufferer will keep his troubles to himself, and be uncared for.

I might here inform you that 'groaning' is no sign of pain. Patients say, if they feel ill or low, that it relieves them. One patient says "instead of breath coming out, words come out;" she cannot help it. Another patient feeling depressed said, "Let me groan, it relieves me."

If, then, a person have a feeling of discomfort in any part of the body, or a pain, and there be no cause for it at the spot, in the nerve, or in any other part whence the irritation might be reflected, the nerve-centre is at fault. In an extreme case he would be said to have delusions—to be mad. We can form some conception of this by remembering what condition our brains are in during sleep when the dreaming thoughts are regarded as realities.

> "They are the children of an idle brain,
> Begot of nothing but vain phantasy."

A man in his sleep may start up fancying that he has seen some one, or be aroused by a loud knock at the door when all has been still. Such a condition during waking is madness; a modification of it is hypochondriasis.

No cases require our serious attention more than these, especially in women. Where a real pain exists and is due to a definite cause, it must be treated; but, as is often the case when the sensation is only within, much mischief must accrue from keeping the

attention of the patient fixed on an imaginary evil instead of attempting to divert her from herself. The evil of treating imaginary disorders is exceedingly great, especially in the more secret troubles of women.

The relation of the cerebro-spinal system to the sympathetic is one whose importance cannot be overrated. The impressions made upon us from without we feel as mental processes, and therefore we are obliged to use such terms as the influence of the body on the mind and the mind on the body; but the very instances which we use in illustration are sufficient to show that we are not speaking of two distinct natures, for the forces which affect the mind are material, and the effects of mental processes on the body are no less material; indeed, the mental processes themselves are material, that is, they belong and are the usual phenomena attendant upon a particular kind of matter. John Hunter said it was possible to concentrate one's thought on a part until it became inflamed; and I have read how a lady, shortly after being shocked by seeing a child crush his foot, became herself lame, and found, on returning home, that she had an inflammation of the ankle-joint. I have already said that there are some who regard the case of the ecstatic Louise Lateau as genuine and consider that the strong mental effort which the girl is able to exert over herself is sufficient to produce the bleeding stigmata on her hands and feet. This may be less surprising if we for a moment consider that a real and positive force is constantly being produced in the brain and spinal cord. Think of the weight of these organs amounting to several pounds, and the enormously disproportionate amount of blood which they receive. They have no ducts, like many other organs, whereby we can become cognisant in part of the work done, but they have nerves proceeding from them, and these are distributed to all parts of the body. Must it not be true, then, that they convey forces which are generated in the centres? Probably much of this force is actually used in the performance of work in the various organs; and even more than this, for it was the opinion of Sir B. Brodie, gained from his experiments, that animal heat may be in part correlated to nerve force. A large part of this force is no doubt used in the production of muscular power, even though it be true that at the moment of the contraction of muscles we do little more than unloose the latent force already existent in them. In health we have this under our control, whilst in such affections as chorea and paralysis agitans the nerve force is being emitted in jets, or is dribbling away, and in epilepsy, as some think, it rushes out in an explosion.

Müller speaks of the nervous principle contained in the centres

as being in a state of tension, and always ready to act; and he says that the slightest change in their condition excites a discharge of nervous influence, as is manifested in laughing, sneezing, &c. Thus every mental impulse to motion disturbs the balance of this tension, and causes a discharge of nervous force in a determinate direction. He also compares the nervous system to a musical organ with its bellows charged with air, which is ready to pass through any given pipe, according to the particular key that may be touched. Using this illustration, we may imagine the air either rushing out of the organ with a scream, roaring out through the larger tubes, or diffusing itself melodiously through a series of small musical pipes. In a similar way the superfluous nerve force is thought by some to display its operations according to the sex, age, and temperament of the patient. For example, the same cause which may produce hysterics in a mother might induce chorea in her child, the one disease being almost peculiar to the adult period of life, and the other to childhood. The same fright which may excite so great an amount of nerve force in the mother as to cause the explosion known as hysterics may operate on the child in a slower manner, and give rise to the less violent action known as chorea.

The explosion of nerve force by an hysterical attack acts as a kind of safety valve, protecting the internal machinery from danger, and although all persons are not alike impressionable there is scarcely an individual who may not find the value of this provision when he is acted on by an overpowering stimulus. Relief is, therefore, often obtainable to an over-excited nervous system by laughing or crying. For, as Byron observes, the power which women possess, compared with men, of pouring their troubles into their pocket-handkerchiefs, is no doubt often very beneficial to them, so far as their health is concerned.[1] A woman who is excited, if she do not have a good cry, often allows the redundant nerve force to escape through that unruly member, the tongue, and thus an extreme volubility of utterance perhaps eases her from further unpleasantness. Of course, the talk which flows from her lips is altogether different from the result of an intellectual process; and therefore it

[1] It is interesting to remark how impressions and emotions are influenced by custom or nationality. It would be considered unmanly now for the male sex to shed tears, whereas in ancient times it seems to have been the habit of men to cry under the slightest provocation. Victors at the Olympian games could shed tears. Cæsar's soldiers would weep at the sight of hosts of barbarians, and the Old Testament heroes were ever ready to give way to their feelings. Even the strong and hairy Esau, whose lot it was to live by his sword, lifted up his voice and wept. The influence of habit and nationality is seen in the delight with which Spanish ladies will witness a bullfight.

is still true now as in ancient times that "anger is a short madness." In other cases the superfluous force escapes by the limbs. Thus, an angry person slams the door or destroys her own property.[1] A man of better sense, when vexed, takes a walk, and in this way gets rid of his extra nerve force, or, if the irritation and its results are more chronic, sits down, takes up his pen, and eases his mind by "publishing the whole correspondence." This is by no means incompatible with the view before taken, that the emotional system is excited at the expense of the intellectual, and that many of the phenomena mentioned show a weakened condition of the higher centres. A strong brain could suppress the emotion which a weak one could not.

Should this tension of the nerves not be lessened in any of these various ways, it is very likely to react on the bodily functions, and may thus produce injuries as serious as would be the pent-up steam in a boiler, even amounting to the destruction of the individual who is the subject of it. It is well known that pent-up grief induces manifest evils, and so popular a piece of pathology is this that tales of fiction and books of poetry contain numberless instances of it. Indeed, we must turn to the writings of the poets rather than to those on medicine to find its illustrations. A very perfect story of the kind is to be found in the two following verses from Tennyson's 'Princess:'

> "Home they brought her warrior dead,
> She nor swoon'd nor uttered cry;
> All her maidens watching said,
> 'She must weep or she will *die*.'
> Rose a nurse of ninety years,
> Set his child upon her knee;
> Like summer tempest came her tears—
> 'Sweet my child, I *live* for thee.'"

Such a case is no poetical fiction, for I verily believe that a flood of tears may be the safeguard against a serious illness. This is popular pathology, I know, but also scientific. It comes home to us very positively, does this mental emotion, when we see it induce an indigestion, a jaundice, or a fatal anæmia.

[1] The following appears in the police reports:—"A young man, a gardener came before Mr Paget, the magistrate, to ask his advice. He had been married five months to a woman, who turned out to be a great shrew, and who, acting under the advice of her mother, had broken up her home three times. On Tuesday afternoon he was engaged in a gardening operation, which he could not complete by dinner time. There was delay of an hour, and when he did come home he was soundly rated by his wife, who commenced breaking the plates and dishes, destroyed the furniture, and made a general wreck of the place. She then attacked him," &c.

Our own Shakspeare might be quoted copiously in illustration of this. Take, for instance, the following well-known lines, showing that unavowed love may be the cause of chlorosis.

> "She never told her love,
> But let concealment, like a worm i' the bud,
> Feed on her damask cheek. She pined in thought,
> And with a green and yellow melancholy
> She sat like Patience on a monument,
> Smiling at grief."

Or these, illustrating the relief of giving vent to sorrow, where Malcolm says to Macduff, who hears of the slaughter of his wife and children:

> "What, man! ne'er pull your hat upon your brows,
> Give sorrow words; the grief that does not speak
> Whispers the o'erfraught heart, and bids it break."

I believe myself that idiopathic fatal anæmia, or "pernicious anæmia," as it has lately been styled, may result from a shock to the nervous system. The late Sir H. Marsh related the case of a young lady who accidentally poisoned her father by giving him laudanum instead of a black draught. The occurrence so preyed on her mind that she took to her bed, became anæmic, and before many months had elapsed died, without any apparent organic disease.

The most remarkable case which I ever witnessed of a person dying from grief was one which I had an opportunity of seeing in consultation with Mr Brown, of Lewisham.

Mental Shock. Death in Five Weeks

Case.—Two young ladies, residing with their widowed mother, were most devotedly attached to one another. The younger died rather suddenly of disease of the heart. The elder one was for the moment like one thunder-struck. At first she could not realise the calamity by which she was afflicted, but she soon saw the event in all its terrible reality. She never shed a tear. She declared that, her only object of affection being gone, she would go seek her sister in another world. She then arranged the whole funeral ceremony for her sister, and chose the grave in a neighbouring cemetery. Almost immediately after returning home she began to suffer from palpitations, sickness, and pain over the region of the heart, as her sister had done. She would eat nothing, and declared that she had her sister's complaint, and should shortly follow her. There was no reason to suppose that any disease existed; in fact, the disturbance was clearly functional, and, as she herself declared, was produced simply by emotion. She was a well-grown, healthy-looking girl, and I had no fear that her illness was due to anything more than temporary excitement. However, I failed to gain the co-operation of the friends to have her removed from the scene of her trouble, for they not only sympathised with the girl, but agreed that her case was the exact counterpart of her sister. I, on the contrary, regarded her symptoms simply as

the result of good acting. In spite of all the influence that could be used she would not be comforted. She refused food, and rejected what was given to her; and at last, much to my horror and surprise, she died in a kind of hysterical convulsion, exactly five weeks after her sister, and was laid in the same grave.

In a case like this, one cannot overlook the possible similarity of organisation which in the case of twins is most remarkable. I attended a young man who died of pleurisy after a week's illness. This so affected his twin brother that he said he should soon follow him. He was then seized with pleurisy, like his brother, and died also in a week, the two cases resembling one another in every particular. We have all heard of the celebrated comic actor who, consulting a physican for depression of spirits, was advised by the doctor (who was ignorant of the name of his patient) to go and see Grimaldi play; upon which the patient retorted, "Alas! I am that unhappy man!" In such a case it is not improbable that although the actor displayed the utmost gravity, his brain might have been in sympathetic relation with his audience, and thus its excitation, not finding the ordinary channels of outlet, might have produced an injurious reaction on his whole nervous system. Had he laughed with his audience, much of the humour might have been wanting, but he would have suffered less.

CASE.—I was called to see two young ladies, Misses H—, residing with their aunt, who had brought them up from childhood. The latter died after a short illness. This caused so great a shock to the nieces that they both fell into a torpid state and had to be put to bed. I found them both in a bewildered state of mind scarcely knowing what they were talking about, but making no allusion to their loss, nor acting in any way as an excitable or emotional hysterical woman would have done. They had to be roused just as a person who had received a violent blow on the head; indeed they presented all the symptoms of concussion. They had no active brain symptoms whatever. One of them lay simply in a torpor until roused, her pulse labouring; 60 per minute. The other spoke in an incoherent way with a sharp voice. After a few days they both recovered, and I considered that they had been suffering from a moral concussion of the brain.

I might allude also to cases of shock which are neither due to a direct injury to the brain, on the one hand, nor to a moral cause on the other, but where the whole system has been upset by a physical cause operating on a distant part of the body. In this way the effects of different causes can be compared. I have already alluded under "Spine" to the case of a little girl who suffered from a violent perturbation of the whole body from a fall on the abdomen.

CASE.—Edwin M—, æt. 12, had a quarrel with another boy in the mustard works in which they were employed. The latter "jobbed" him in the mouth with a scoop, knocking off the upper half of the two lower incisors and the anterior

surface of the lateral ones. In the evening he felt ill, and had diarrhœa. On the following day and the next this continued; he had swimming and pains in his head, and he vomited. On admission, he was seen to look extremely ill, being pale, having an anxious expression, with a hot dry skin. Temperature 100, pulse 120. Tongue furred. The mouth emitted an unpleasant odour. The lower central incisors were cut through obliquely exposing the pulps, which were red and very tender, so that he could not bear them to be touched by the tongue, or to draw in air quickly through the mouth. The lateral incisors were cut off, and their pulp also exposed and extremely sensitive. He was put under chloroform, and Mr Moon extirpated the pulps of the injured teeth, and filled the cavities with carbolic acid and wool. After this he got rapidly better, the fever abated, he was able to eat, and left his bed. The teeth were again stopped, and in a few days he left the hospital well.

Inasmuch as all mental conditions are associated with changes in the brain, we may suppose that long-continued excitement or passion may by their disturbing influence on the circulation produce at last permanent alteration in the structure.

Luys speaks of moral and intellectual excitement protracted beyond physiological limits affecting the minute mechanism of the brain, and implanting incurable disorders due to disturbance of nutrition, and quotes Calmeil to this effect: "All the so-called moral influences, whether they betray themselves by the persistence of annoyances or regrets, or take the form of jealousy, hatred, or ambitious disappointment, may concur to produce a morbid accumulation of blood in the encephalic capillaries."

This idea would bring the cases of physical and moral shock into closer relationship. If mental emotion will produce a blush or rapid effusion of blood in the face, we see no reason why the brain should not be affected in the same way. If so, the circulation would be in a constant state of variability.

These are neither metaphysical abstractions nor poet's sentiments. The poet, if he truly describes nature, and more especially human nature, cannot portray anything different from what the physiologist sees, since they are both looking on the same body and at the same phenomena.

One of the most important considerations resulting from the idea that the human body contains a living force, or rather that it is itself an active machine, is this—that it must be employed. If it is not used for good purposes it will be for bad, and "the devil still will find some work for idle hands to do." The evil is most marked in young ladies who are brought up to no occupation, and remain unmarried. Better than doing nothing are the frivolities and amusements of a London season, when "idly busy rolls their world away." But the young lady who has not these opportunities, or whose conscientious scruples forbid her to indulge in them, who

even has not the parish church or school to patronise, falls into a listless wayward hysterical condition, becomes a prey to her own feelings, and is consumed by her own pent-up fires. When you meet with these cases, may you be wise enough to adopt a rational and moral treatment, rather than aggravate them by an injudicious sympathy and the administration of worse than useless drugs.

HYPOCHONDRIASIS

I have told you already that the hysterical patient is often weak-minded as well as being over-sensitive, and that a strong-minded person would therefore be able to subdue all hysterical promptings. The hypochondriac is by no means necessarily deficient in either mental or physical vigour, and yet may fall a prey to his own feelings and be at times the most wretched of mortals. Many men of historical renown who have performed deeds famous in the annals of their country have suffered from this nervous ailment. I have already alluded to the hypochondriacal patient, and what a plague he is to the doctors, how he presents them with a sheet of paper completely filled with a description of his symptoms, how he reads medical works, first imagining he has this disease and then that, until a moment's reflection sometimes tells him that many of these maladies are incompatible, and so his disease works its own cure. The hypochondriacal patient really suffers from dyspeptic symptoms, as he complains of flatulence, eructations, and palpitations, and thus, I I have no doubt, he feels really ill. He looks upon his body as if it were a piece of machinery that wants his hourly superintendence, lest it should go wrong. He watches every symptom, and comments upon it with the utmost vivacity. He visits in turn every doctor in London, and carries about a heap of prescriptions, enough for a hundred people. He never looks away from himself; his mind is always turned inwards on his own feelings. He reads medical books, and finds his own case exactly delineated within. He feels his pulse, carefully examines his tongue every morning, and to keep it clean buys a tongue-scraper. He will tell you about his urine and motions, even to the most disgusting minutiæ. Even during his dinner he is thinking about his bowels, and is taking such articles of diet as will in some way affect his "secretions." Such patients exist in very large numbers. They are often deranged in health, and that their whole nervous system is out of gear is clear from the dyspepsia, flatulence, palpitation, and other symptoms from which they suffer. The proper treatment can rarely be adopted, because the patient is his own master,

and no sufficient control can be exerted over him. He calls upon a medical man, who, should he take a right view of the case, would inform the patient that very little really ailed him, and that by swallowing physic for these different troubles he was only perpetuating them. The doctor may give the advice, but cannot enforce it; consequently the patient may go to some one less conscientious, or at last fall into the hands of quacks, who then keep a tight hold of their victim—unless, indeed, he be advised by some enthusiastic lady to try homœopathy; then there may come about a very harmless termination to his difficulties: for then he may consult his book all day long, and amuse himself by calx No. 5 every morning, or tincture of sulphur to the millionth dilution every night. There is a gentleman in this neighbourhood, of independent means, and with nothing to occupy his time but his own feelings. He looks upon his body as a piece of machinery, which must be constantly kept oiled, and he has a file of prescriptions containing various remedies. One he takes for flatulence, another for heartburn, one when his tongue is furred, and another when his eye is yellow; he has a medicine for his bowels when he goes to the water-closet once a day, and another when he goes twice; and becomes really eloquent over the colour of his motions, or the "secretions," as he politely calls them. He meets me in the street; I am obliged to feel his pulse, unless I can rapidly pass behind him whilst he is standing before the jeweller's shop, apparently looking at the goods, but really gazing at his own tongue.

When a person is so affected by a slight trouble as to prevent him occupying himself in business, his complaint certainly borders very closely on monomania, and thus those who like distinctive names have called it *nosomania* or *nosophobia*. There can be no doubt that in a natural state a man should be occupied; his mind should be away from himself, and all knowledge of his feelings is morbid. No wonder that a certain nation believed that the happiness of heaven consisted in activity without consciousness. In an unhealthy state man becomes sensible of the working of the machinery within him, and in the extreme form known as hypochondriasis we have (to use an expression which I have somewhere seen) "a meditation of man on his own health." The feeling of illness has no direct relation to disease; it may exist, as I have said, without any real disease, and on the other hand fatal maladies may progress and the patient declare that he is not really ill. The amount of depression which the patient experiences is not the measure of his illness.

Ordinary hypochondriasis is a complaint very commonly met with amongst our private patients, but it would only be seen within the

wards of the hospital when existing in an excessive degree—if then, indeed, it could strictly be styled by the name. I do not allude to the cases where the patient has a variety of maladies, but to those where there is a complaint of a never-ceasing torment in some part of the body, mostly in the abdomen towards its upper part. You have seen three patients of mine suffering in this manner. One man has a constant pain at the epigastrium, which is often so bad that he calls up his friends and says he shall not survive the night. This has been for eight years. Another man has a constant burning at the epigastrium, and declares he has got a worm inside him. The third patient is a woman, who has a fixed pain in the left side of the abdomen. She has had it for years, but is fat and looks well. I have just seen a private patient, a woman, who has such indescribable sensations over the region of the cæcum that she constantly awakes her husband in the night to send for the doctor. She has had some of the best opinions in London, and no one can discover any disease: in fact, there is none, but she has what I called a "mad cæcum." It would seem that a certain class of persons, especially those who are inclined towards insanity, have a number of morbid sensations; how these are to be accounted for is not very clear, whether the sensorium—that is, the brain—or whether some intermediate structures, such as the sympathetic ganglia, are at fault; nevertheless you must try and distinguish them from feigned pains; these patients do not sham; the pain is real to them. If a person have an impression, it is the same to him whether it is a real or a false image, but the medical man would call the impression arising from a reality natural, whilst the other being morbid he would style a delusion. So, if a patient have a pain, and we can discover an objective cause for it, we call it a reality; if none exist, we style it a delusion, although it is quite the same to the patient. At least I suppose it is all the same to him whether he has a pain or thinks he has it.

When we say that the *sympathetic system* is at fault in the hypochondriac we are stating more than an hypothesis, for there are very evident manifestations of its being disturbed, and probably weakened. We may first observe the flatulence and dyspepsia, and then the palpitations and throbbings from which hypochondriacs sometimes suffer. I am now seeing a gentleman who, besides his ordinary distressing feelings, suffers from attacks of fulness of the head, flushing of the face, palpitation of the heart, and a sensation of pulsation through every part of the frame. A lady patient, too, who has always been ailing, has suffered all her life from strange feelings in every part of the body; sometimes there are pains, at other times a sensation of coldness at the back of the neck, extend-

ing to the throat and various parts of the face; or sometimes the sensation is that of a swelling in different portions of the body. One of my patients, a man of 60, who has various nervous ailments, is also hyperæsthetic all over his body, and in his symptoms very much resembles an hysterical girl. That there is a kind of paralytic condition of the blood-vessels is known by the pulsations and throbbings of the aorta, which can easily be detected by placing the hand over the abdomen.

The disease known as exophthalmic goitre is supposed to be due to a paralytic affection of some regions of the sympathetic system. In corroboration of this we observe besides the more characteristic symptoms, attacks of profuse perspiration and diarrhœa occasionally coming on during the progress of the disorder. The latter symptoms may be sometimes predominant. Thus a woman, æt. 43, a laundress, was admitted into the hospital, as she had been too ill to work for three months, being thin, sick, and very feeble. No organic disease could be discovered, but she had a most excited or agitated look as if she had just undergone some violent exertion. She felt a throbbing all over her body, her heart and large vessels were seen to be beating violently, and at the rate of 140 a minute. The skin was perspiring. After getting a little better she went out.

A lady whom I have known for many years is highly hysterical and nervous, although she has had a large family, having had every variety of complaint besides aphonia for months together. On one occasion, the day being a very cold one in the winter, I found her sitting by an open window saying she could not breathe; her face was flushed, her skin hot and perspiring, and she was panting for breath. She had the appearance of a woman in an extreme state of excitement.

The association of the organic nerves of the stomach and bowels with the mental condition and temper is well known. One of the commonest causes of dyspepsia is mental worry; and, on the other hand, depression of spirits often means in common parlance "liver." Lawrence in his lectures published many years ago alludes to this. He says—

"This has been perceived by some who have not made medicine the direct or immediate object of their study. At all events the truth is illustrated with a mixture of drollery and good sense by Voltaire in an article in his philosophical dictionary entitled 'Ventres Paresseux,' which if it were translated into English would be *costive bellies*. He says that the character and turn of mind will be greatly influenced by the state of the large intestines, by the way in which these organs perform their office. He states that if

a man is of a bilious character and does not evacuate freely, his bile is retained, flows back into the circulation, heats the blood, and then he is rendered choleric. This is not very correct physiology, but it accords with the medical notions current at the time when Voltaire wrote. He says that Cardinal Richelieu suffered from inward piles which obstructed the regular action of the lower bowels, and caused his colon to become filled with the hardened fæces. This he says, made the Cardinal ill humoured and cruel, and thus Voltaire accounts for the sanguinary character of some of his public measures. He says that Queen Anne of Austria used to call him *cu pourri.* We cannot well translate this into decent English; it means *rotten* ——. Voltaire adds that if a person should have to ask a favour of a minister or minister's secretary or kept mistress, he should endeavour by all means to ascertain carefully whether they go to stool regularly, and if possible to approach them after a comfortable evacuation, that being a most propitious moment, one of the *mollia tempora fandi*, when a person is good humoured and pleased with all around him."

I have already said that Sydenham was apt to regard hypochondriasis of men as the same affection as hysteria in women, but you will now see the great distinction between them. Hypochondriacs are people of middle age, dyspeptic, ill-tempered, careful of their health, and always going to the doctor to be cured; whereas hysterical women, though young, gay, in good health, and cheerful, like to be considered ill and crave for sympathy. Of course, great discernment is required in making the diagnosis between these affections as well as between a real disease and an imaginary one. A mistake in either direction may be attended by the most disastrous consequences.

I can scarcely tell you how to *treat* these people. Occupation and diversion for the mind are no doubt the most essential elements in any treatment, but they are just those which you cannot enforce. Therapeutics are here very weak, for the patient will not take your advice, and by prescribing medicine for him you are assisting in perpetuating his illness. You might think that a patient who was always ailing and got no relief from treatment would not trouble medical men any further, but it is very remarkable that it is that very patient who takes our physic. He will sit down and tell you of the number of medical men he has seen, and show you a bundle of prescriptions, declaring that they have done him no good, and yet he will ask for another. On asking one of my lady patients why she continued to come to me though I and others had never done her any good, she exclaimed, "I come to you because I never feel any the worse for what you prescribe for me." You effect no purpose by offending

such patients, because they go elsewhere for sympathy, and this is what they want. I have observed, however, where a medical man, in regular attendance, has had sufficient courage to give his patients a good scolding they have always been better for it. If the patient has been a woman, and has not tamely submitted to this correction, but denounced the hardheartedness of those around her, and subsequently had a "good cry," she will be observed to be considerably better for some days after. The hypochondriac wants sympathy, and he generally gets it, both disinterestedly from his friends, who believe in his maladies, and from the doctor, who is paid for treating them as realities. The prospect of cure is thus very remote. With reference to judicious treatment, I will again quote Sydenham: "One of our reverend bishops, famous for prudence and learning, studied too hard a long while, and fell at length into a hypochondriacal disease, which, afflicting him a long time, vitiated all the ferments of the body, and wholly subverted the concretions. He had passed through long steel courses more than once and had tried almost all sorts of mineral waters, with often-repeated purges and anti-scorbutics of all kinds, and a great many testaceous powders, which are reckoned proper to sweeten the blood, and so, being in a manner worn out, partly by the disease and partly by physick, at length he consulted me. I presently considered that there was no more room for medicine, and I advised him to ride horseback. Had he not been a judicious man, he would not have been persuaded to try such a kind of exercise. I entreated him to persist in it daily, going further and further, till at last he went so many miles without regard to meat and drink or weather, like a traveller. He continued this method until he rode many miles a day, and at length not only recovered, but also gained a strong and brisk habit of body."

Another piece of good advice for a hypochondriac is that of Abernethy: "Live on a pound a week, and earn it."

There is another class of patients who are equally troublesome, but differ from the true hypochondriacs in not suffering from depression of spirits. Nevertheless they are solely occupied in a study of themselves and the preservation of their health. They, therefore, consider it quite correct to occupy the time of the busiest and most celebrated physicians in every capital of Europe, to ascertain what their exact regimen should be, what German watering-place they should go to in the summer, and what spot in the Mediterranean for the winter. If they take a house in England, the nature of the soil is of vital importance to their health; they talk a good deal about chalk and clay, and they are anxious to select a convenient spot for the ready call of the medical man. Whilst

they are thus striving to live for ever their health is frequently suffering from idleness and the imbibition of too much wine.

We define the true hypochondriac as a man whose mind is in possession of some imaginary evil, from which he cannot be diverted. A case of this kind is rare compared with the host of those who suffer from nervous depression arising from anxiety or irregularities of life, although probably the pathology of the two conditions is the same, and varies merely in degree. Patients come for advice, declaring that they are unfitted for the duties of life, that they wake in the morning depressed in mind and tired in body, that they have no appetite, and suffer from a number of morbid sensations, as pain or heat at the top of the head, pains or tingling in the limbs, suggestive to them of paralysis; they have palpitation, and think that they have heart disease, though their muscular frame is good, and they can walk without fatigue. If they are possessed of one idea it is usually of a sexual character, and we are obliged to hear a number of particulars which are supposed to imply impotence. It is very evident in many cases that the so-called spermatorrhœa is a fiction of the mind, since no reasoning can disabuse the patient of his delusion. One young man was so convinced that his seed came away with his water that I was obliged to examine it microscopically in his presence, and on declaring that not a single spermatozoon was to be seen, he was quite prepared to refute me by saying that they were probably in the form of cells containing undeveloped germs, as Lallemand had described. Another kind of patient believes he has syphilis, and presents himself every now and then with a pimple on his face, being assured that it is a manifestation of the disease. The syphilophobist cannot, however, be convinced; for example, on telling a patient the other day that he could not have venereal disease without a sore, he at once declared that he had had a gonorrhœa. On further investiga tion, finding that he had had no discharge at all, he simply replied that it was the dry form.

I believe the opinion promulgated by Lallemand and some other writers as to the fearful effects of spermatorrhœa, and the doctrine that all the troubles of those who suffer from it are dependent upon the discharge, to be fraught with infinite harm. It has been a fruitful source of profit to quacks who, trading on their victims' fears, have not hesitated to bring about their ruin in mind, body, and estate. I have had to deal with a great many of these unfortunate hypochondriacs, and I am sure that the popular view taken of spermatorrhœa is a most mischievous and mistaken one. It is very often found that those who make the loudest complaints and the deepest confessions of their guilt can scarcely be said to suffer from the disease at all, unless a very occasional emission is worthy of being

called by the name, and sometimes even this occurrence is doubtful, for the discharge at the time of stool, and the whitish fluid seen at the termination of micturition is often nothing more than an escape of prostatic fluid. What we do observe is that the patients are of a highly sensitive or nervous temperament, and who, according to their own showing, evinced during their school days a failure of the robustness of character and strength of body belonging to healthy boys. The bad habit, if it had existed, was merely a manifestation of a peculiar irritability belonging to nervous and timid youths given to introspection both as to their bodily and mental condition, and who then become a prey to a thousand morbid feelings, all of which they attribute to the practice they style onanism.[1] The occasional seminal or prostatic discharge is but one of their symptoms, and an evidence of their irritable and unstable nervous system. The idea impressed upon their mind by the work entitled the 'Secret Friend,' which they have been reading, is that a few drops of seminal fluid are equal in potency to several pounds of good flesh and blood, or to their equivalent in nerve force, and they are thus enabled to weigh and value their impoverished condition. It will soon be evident that these patients are hypochondriacs, and that their complaint is only a mental one.

It must be well known to medical men that masturbation does exist, and that many evil consequences follow, but these troubles are not forced upon the doctor; he is called in to see boys and girls with chorea, epilepsy, and various hysterical disorders, and having his suspicions as to the cause, he finds he has the greatest difficulty in arriving at the truth. The symptoms are produced by a continued excitation of the nerve centres, and not through the loss of any supposed exquisitely vital fluid, for often in these young boys there is no secretion. The same remarks apply more strongly to girls. It is most important to remember that the practice exists with all its baneful consequences, but the evils of it are not to be found amongst those who openly parade their imaginary complaint to a number of doctors.

The spermatorrhœa patient is a real sufferer, although a hypochondriac, and he therefore wants his mind diverted from the imaginary cause of all his troubles. The reality of his condition

[1] An unfortunate word, for it is only justice to the name of Onan, to declare that he has no right to the dishonorable title which makes him the representative of the miserable class of persons of whom we have been treating. Nor with less discredit can he be considered as the first to put in practice the Malthusian creed; he was simply vexed at the thought of begetting a son for the sole object of the latter inheriting his brother's property in conformity with the law of many eastern nations.

is shown by the remarkable resemblance of the symptoms in this class of patients. They usually write down every particular as to the state of their feelings, lest they might forget some important fact when in the presence of the doctor; they will thus fill three or four sides of a sheet of foolscap paper, which they present for one's perusal. When this is put into my hand I at once form my diagnosis, and know exactly the kind of patient with whom I have to deal. One morning, not having time to hear this eternal sheet, I told my patient that I believed all these documents were stereotyped, for I knew them word for word by heart. I then began to tell him how he had written down an account of his tongue, the thick water he found in his chamber-vessel of a morning, and how his testicles hung down very low; when he heard this he burst out in laughter, said he had it all written down verbatim, and then put his document in the fire. I reckoned his case amongst some of my best cures.[1]

In treating the nervous complaints of young people, although it is important to bear in mind every possible case, we often meet with a class of cases where mere apathy seems to be the principal symptom. The patients are not hypochondriacs in the commoner sense, nor has there been any anxiety or worry to trouble them. They merely fall into a state of depression. Fathers article their sons to solicitors, or send them to the hospital as students, but the lads declare their perfect incompetency to read or pursue their studies. If clerks, they cannot run up a column of figures, or the attempt gives them a violent pain in the head. If the patient be a girl, the mother believes that she has had already too much brain work, and has broken down under the tension. They cannot read without an effort, they take no pleasure in society, and although just entering upon life and with good prospects before them, they see only the dark side of the picture, and if they talk at all they moralise as if they had been in a sea of troubles. I am often consulted about cases of the kind; they cannot be styled instances of insanity, although perhaps approaching it, nor is there reason to suppose the existence of any special exciting cause. I look upon the condition as a phase of life which is apt to occur in persons of a particular temperament, and in the female is probably some manifestation of the non-fulfilment of the awakening sexual relations. It partakes of the impulse which belongs to the young bird trying to escape from the nest, and to seek an independent life of its own. In the case of the girl a happy courtship may effect a cure, but often less than this will suffice; and trans-

[1] See some of these letters from hospital patients, in 'Guy's Hospital Reports,' for 1866.

plantation to a new soil, or travel, will open up a new world of ideas. Wendell Holmes, in speaking of one of his heroines, says: "Just at the period of adolescence the mind often begins to come into flower and to get its fruit. Then it is that many young natures, having exhausted the spiritual soil around them of all it contains of the elements they demand, wither away, undeveloped and uncoloured, unless they are transplanted." For a further and fuller exposition of this phase of human nature in the time of youth novels rather than medical treatises must be consulted, such as those by that keen and philosophic observer Balzac. You cannot ignore the subject as trivial, as you will constantly be consulted about the failing health of the growing boys and girls.

It is a curious circumstance that the very change for which these young persons are instinctively longing is in some nervous temperaments the event which upsets the balance of their unstable brains. But lately I have had three such cases to advise upon. A young lady engaged to be married to an officer, suddenly woke up to the idea that she would have to leave her home and friends, and this, with the novelty of the situation, threw her into a brooding and almost maniacal state. Another and older lady engaged to a clergyman, began to contemplate the new life which she would have to live and to suspect her affection, and sank into a state of melancholia. A gentleman in a fair way of business engaged himself to be married, when the novel prospect and the question of the propriety of the marriage were too much for him. He lost his appetite, could not sleep at night, was obliged to leave his business, and did not recover until the lady had released him. He still declared his affection for her.

In speaking of *overwork* a great deal might be said on this matter. There are very erroneous opinions held about the subject of overwork. We are daily confronted by patients and their friends, who declare that all their ailments are induced by this excessive labour. The wives say that their husbands are too long away on business, and that this is too much for them; the husbands speak of their wives tiring themselves with domestic cares; the mothers bring their daughters and suggest that the lessons given by the daily governess, the occasional teaching of poor children, the district visiting, or the playing the organ at church, is wearing them out. When we compare the amount of labour complained of with that performed by our statesmen and public and professional men we conclude either that people are made of different stuff or that the popular belief in overwork is a delusion. I once gave a short lecture on this subject, and

to save my time I will read an epitome of it as reported in the newspapers.[1]

"The lecturer commenced by remarking that the question of overwork, over study, and under work could not be settled by any fixed rule, and that the only way in which they could be considered would be in the physiological aspect—by comparing the body to a machine and estimating its capabilities, or regarding it as a kind of chemical laboratory in which various forces were engaged in the supply of food or fuel to the furnace, always remembering, however, that the animal body, unlike the mechanical one, could not be wholly continuous in its action, as rest was necessary to the production of animal power. Rest and work were as natural as light and darkness, day and night, and when the physician was asked sometimes if a man could work the twenty-four hours at physical labour, the answer would be that, given a proper time for food and sleep, a man could work all the rest of the twenty-four hours. But 'proper food' and 'proper rest' were necessary in all classes of work—a fact not recognised by people of supposed intelligence, as he had had to prove to an enthusiastic young curate that he would be able to do better work by proper attention to his physical wants; that this attention to the body was a religious duty, in order to enable a man to work to the full extent of his powers. With regard to the people who suffer from 'nerve depression,' Dr Wilks held that the mode of life of those who thus suffered sufficiently accounted for their condition—that they had pursued a course of living which had made its effects felt in pressing mental toil of one kind upon the brain over lengthened periods. The question was asked if by a person having physical exercise, good food, and rest, the rest of the intervening hours could healthfully be spent in mental labour. This was a question which could not be answered by rule. The points would have to be considered as to the amount of physical exercise to be taken and the kind and the character of the mental labour. There were some kinds of mental labour which were mere relaxations against others, and remarkable examples had been presented of the vigour derived from varied exercises in mental labour alternated with physical exercises; but where the mental labour had been attempted without the physical the persons had broken down. Some persons holding to the idea that 'use is second nature,' had not accustomed themselves to physical exercise in the midst of their mental labour; but there was a necessity for this physical labour, the body required it. The necessity first was shown

[1] "Overwork and Underwork:" a lecture by Dr Samuel Wilks, F.R.S., delivered at 23, Hertford Street, under the auspices of the National Health Society.

by the studious man pacing his room, as the animals perambulated their cages at the 'Zoo;' by the errand boys in the streets putting down their goods to fight other boys, or in their 'overing' posts —all these were actions showing that the body needed exercise. Then came the question, If a man has good food, rest, and exercise, can he spend the rest of the hours in mental labour? The answer was, certainly he can; but it must not be one kind of mental labour or one kind of pursuit, for one pursuit would abnormally exercise one small faculty of the mind and cause it to be overworked to the impoverishment and loss of other faculties. Such a man would have strong opinions about things of which he knew nothing—he hated foreign languages, and knew nothing of them; he abhorred theatres, and never had been to one; disliked Darwin's views, but would say, 'Never read a volume of Darwin's in my life, and never will.' On the other hand, political history was filled with facts about men with many ideas and examples of the good in varied work. Lord Palmerston, Lord Brougham, and others were referred to, and the lecturer especially dwelt upon the case of an eminent statesman who, at seventy years of age, held the highest place in politics, could turn with freshness to a theological controversy, could discuss learned questions with the utmost vigour, and was known to love physical exercises. The right honorable gentleman referred to was known to spend his waking hours in the highest mental work, varied by physical labour, was stated to sleep soundly, and presented a living example of the value to be attached to varied mental work. The lecturer, speaking upon the subject of sleeplessness in some brain-workers, stated that this arose from a too continuous toil in one class of brain work. In all such cases he advised changes of mental work, giving cases to show that the sleeplessness was induced by the brain being overcharged with the 'worry' of one mode of thought which had filled the man's mind morning, noon, and night. Dr Wilks insisted upon the necessity of work for the mind and body, and in the cases of young men urged that they should have at least two occupations, even if the second should only be a 'hobby.' As to women, he insisted that the ladies in towns suffered from lack of proper occupation, and the illnesses supposed to be induced by overwork were in reality the result of want of means of using the mental and physical energies possessed. The women in the lower orders used their superfluous energies in wordy warfare—in a general 'mutual undervaluation,' and in bygone times ladies used to throw off theirs in hysteria. He did not advise ladies to follow men's professions; but he advised a healthful use by women of their mental and phy-

sical powers. With regard to the late discussions in the 'Times' as to the 'overwork' in girls' day and Board schools, he said that, all other proper conditions observed, he could not admit that the few hours' mental work which the girls had could do harm; the harm would arise if the girls had to go home to a stuffy room to 'mind the baby,' were badly supplied with food, or slept in a bad atmosphere. It was unfair in these cases to blame the school and the lessons; the causes of the so-called 'overwork' were outside of the school or the lessons."

I have repeatedly observed that every organic disease may be simulated by a functional one, and more than this, that a complaint which in the first place is purely functional will result, through the influence of mere inactivity, in an atrophy of the quiescent organ. I have spoken of the cases of two or three women now hopelessly bedridden from want of power over the legs, and whose complaint in the first instance was a mere functional or hysterical paraplegia. In the same way a hypochondriasis may terminate in a positive want of power in the nervous centres.

A gentleman, well made and strong, had a fortune left him. He immediately gave up his profession and entered upon a new mode of life. He soon became hypochondriacal and a prey during many years to every imaginary complaint. He visited me first in June, 1870. He said he was much out of health, was very weak, and walked slowly into my study. He thought he was a sufferer from diabetes, but nothing was found wrong in his urine, nor indeed in any part of his body. He continued to come complaining of a variety of symptoms, and commenced tottering in his walk. He sometimes had dyspepsia, sometimes a cough; at other times he came with his shirt collar undone, for fear he should be choked. After three years he resembled a man with paralysis agitans; he tottered in his walk, his hands shook, and he walked slowly. He then took to his house, and declared he could not move from his chair. He afterwards went out of town, and was able to walk by the help of his servant. He again took to his bed. He then changed his residence, and was able to walk a little. All this went on for ten years; his case presented no symptoms suggestive of any of the well-known system diseases. During this time he was always taking medicine and cod-liver oil, and was continuously galvanised. He was never tired of describing his complaints and saying his was a most remarkable case. He finally went to Dover, and there walked with assistance, his legs trembling, and his voice faltering. He soon afterwards got an attack of pneumonia and died.

A post-mortem examination was made by Dr Goodhart, who carefully examined the brain and spinal cord, and found no disease

whatever. My opinion throughout was that he was a hypochondriac, and that the nervous weakness and torpid state of his spinal cord had been induced by long inactivity.

A gentleman of good fortune and position suddenly heard a piece of domestic news, which gave him so great a shock that he left his home, went into the country, and took to his bed. He there remained three years, when his friends came to rescue him. He was totally unable to stand, and had various instruments and supports made to assist him, but it was several months before he could walk alone.

No doubt there are plenty of persons suffering from over-work or fatigue, who really have an exhausted state of the nervous system, and are constantly martyrs to various pains and morbid sensations. They have headache, pain in the back, sleepless nights, disturbed digestion, and feel unequal to their daily task. A holiday usually sets these persons right. A judicious method is to get such a person out of himself, and by inducing him to occupy himself with new surroundings, and make use of other faculties of his brain, you will soon bring about a cure.

If you want a good description of nervous ailments you will find them nowhere so well described as in the quack advertisements. The charlatan, whose only object is to trade on the unfortunate sufferer, details to him every morbid feeling which he is likely to have, having familiarised himself with all the commonest symptoms of the hypochondriac. Here is a bill which was handed to me to-day in the street:—"Professor L— is the most successful practitioner in England for the cure of nervous debility, loss of energy and vital power, mental and physical depression, indecision, impaired sight and memory, indigestion, loss of appetite, palpitation of the heart, dizziness, noises in the head, prostration, lassitude, pains in the back and limbs, timidity, disinclination for business, groundless fears, local weakness, impediment to marriage, impurities in the system, blotches on the skin, &c. His medicines enrich and purify the blood, &c." The quack has made himself acquainted with all the troubles which a nervous patient can suffer from, he dwells on the importance of them, causes them in this way to be more indelibly impressed on the victim's mind, and does not let him escape until he has reaped a golden harvest.

Patients with supposed impotence require moral treatment like hysterical women, for it is usually found that the malady is as often mental as physical. A gentleman who had been under several quacks in London subsequently consulted M. Laségue, in Paris, who wrote an opinion of his case. This is conveyed in those concise and appropriate terms which are so remarkable in French

writings, that I will read it to you: "J'incline à croire qu'il a exercé sur ses fonctions génitaux une surveillance inquiète, et qu'il est devenu peu à peu hypochondriaque limité, a partir de ce moment l'acte genital est devenu une occasion d'apprehension de crainte d'insuccés plutôt qu'un plaisir desirable. Le malade a ainsi perdu l'appetit sexuel comme une homme préoccupé de l'imminence d'un vomissement perd l'appetit gastrique. Cette influence plus morale que physique me semble jouir ici le principal rôle."

Do not let us, though with an honest purpose, be the instruments of perpetuating the evils for the cure of which our advice is sought. This is not so likely to happen in the case of men who are occupied in business as in women who have no occupation but housekeeping, which can be dismissed at once if illness need it. I am sorry to say that I have seen numerous women sacrificed to medical treatment. A lady, for example, of middle age, gets out of health, and in consequence has bad nights and suffers from want of appetite and great debility. Advice is sought, and it ought to be given with the object of restoring the patient to health. Such a remote object may perhaps be in view, but in the mean time a plan is adopted which renders life completely artificial, and is so injurious that it must before long bring the poor woman to her end. A tonic or stimulant medicine is ordered because the patient is low, more wine because she cannot eat, chloral or opium at night because she cannot sleep; in a short time, from continued use, the effect of these drugs is lost; they are, therefore, increased in amount until chloral, morphia, and alcohol are given all day long, and death soon closes the scene.

Sleep and Insomnia.—There cannot be a doubt as to the injurious effect of narcotics when long continued. The least harmful is, I believe, solid opium; this seems to be borne much better than morphia, and certainly is less injurious than chloral. Morphia, when continually injected, produces depression and depravity of the whole muscular and nervous systems. Instead of a permanent lethargy it often induces pain, and I have seen hyperæsthesia, intense gastralgia, and restlessness caused by it. The patient becomes sallow, emaciated, and altogether demoralised.

Chloral is often given because it is thought to be a remedy of a milder nature than opium. This is not my experience. Opium may be taken by some people for years with impunity, but this is not the case with chloral. This drug produces great depression of body and mind, and, as Dr Savage declares, a melancholic and often a suicidal tendency. In other respects chloral cannot be compared with opium as a therapeutic agent; the latter is useful in numerous

ways, but the sole property of chloral is its power of inducing temporary sleep. It is possible that its depressing influence is far greater than is generally supposed, if we take into account those constantly occurring cases of probable suicide by this drug.

We are continually reading in our papers of the cases of medical men and others, who are found dead in bed with bottles of chloral by their side, or chloral and morphia mixed. The evidence on inquiry shows that they were in the habit of taking these drugs to procure sleep, but whether or not the final dose was taken with a suicidal intention there was nothing to show. It has been clear, however, that in many cases the dose had been continually increased, and the person's mind had become so morbid or depressed that he was quite careless as to the amount and callous as to the consequences.

We have occasionally the satisfaction of being able to rescue patients from these baneful and mortal habits. A retired officer had been ailing three years with various nervous and hepatic troubles, for which he had been taking much medicine, large doses of chloral every night, very special diet, with sundry wines, &c. There seemed no reason why he should be living so artificial a life, and I asked him why he should not eat and drink like other people. and sleep without chloral. He had strength of mind to give up the drug, and to begin to eat after the ordinary fashion. At the end of six weeks he had dismissed his doctors and their drugs, was walking about, had picked up flesh, and was fast recovering his health. When I saw him, seven months afterwards, he was quite well.

As drugs are so often taken to procure sleep it becomes a most important consideration for the medical man to discover the cause of wakefulness, and then he will be in a better position to discover the best mode to overcome it. Many years ago Dr Macnish published a work on the 'Philosophy of Sleep,' in which he endeavoured to refute the common belief that it was due to congestion and compression. He says: "The greater the quantity of blood sent to an organ the greater is the energy of its manifestation. Why should the brain be an exception to the general law? So far from there being any increase of blood in the brain during healthy sleep, it is proved that the circulatory fluid in that organ is actually lessened, as I have had occasion to show in a case related by Blumenbach of a person who had been trepanned, and whose brain had been observed to *sink* when he was asleep, and swell out when he was awake. The abolition of the cerebral functions is, to my mind, sufficient evidence of diminished action going on in the brain. I cannot conceive increased assimilation without increased circulation, nor increased circulation without augmented functional energy.

When the brain is at work in the waking state it is then most highly vascularised."

Dr Caldwell, of America, held the same view, and alludes to cases given by Sir Astley Cooper and other surgeons, where the brain became visible as a result of accident, and the convolutions were seen to grow pale and subside during sleep. He mentions the case he knew of a girl who had lost a large part of the calvaria from venereal disease, and a portion of the brain was bare. When she was in a dreamless state her brain was motionless and lay within the cranium; when her sleep was imperfect and agitated by dreams her brain moved and protruded beyond the cranium. When she was perfectly awake and engaged in conversation the protrusion was still greater.

In a like spirit was a lecture delivered at Manchester by Dr Lyon Playfair in 1844, naturally bearing, however, on the chemical side of the subject. He showed how everything which diminished the supply of oxygen to the brain induced sleep; therefore sleep occurred after hæmorrhage and after dinner, when with an increased flow of blood to the stomach there was a diminished flow to the brain. The winter sleep of hybernating animals he attributed to deficient oxygenation of the blood, as cold contracts the blood-vessels, and causes the circulation to be more sluggish. The phlegmatic person, whose heart beats slowly, rarely dreams. The greatest dreamer is the man of nervous temperament, whose heart and lungs are fitful in their action. These were the examples mentioned by Dr Playfair to show that activity of the brain and the converse are proportioned to the amount of arterial blood supplied to it.

The subject is one of much clinical interest as explaining why the patient with throbbing arteries, from whatever cause, cannot sleep, and why the patient with cardiac disease should have his rest as intermittent as his heart's action.

The positive experiments of Mr Durham have since demonstrated to the eye the actual state of the brain during the periods of waking and sleeping, or, in other words, during the times of activity and repose. These states correspond to and confirm the general physiological law of *ubi stimulus ibi fluxus*—that where there is increased function there is a greater distribution of blood. If, then, during sleep the brain is quiet and comparatively bloodless, we can understand how all mental activity or worry, by keeping the thoughts in a constant strain, should prevent the occurrence of the needful rest; also how exhaustion and other causes which deprive the brain of its stimulus should tend to promote it. Now, these conditions have a close relation to the question of digestion and eating late at night. According to the physiological dictum just mentioned, the

stomach is more vascular during the digestive process, and in all probability there is less blood elsewhere. Any occupation of the brain, therefore, during dinner diverts the blood from its proper channel, and indigestion is the consequence, the natural tendency during a meal or after it being towards inaction of the brain, and even towards sleep. There is, therefore, no more important question to discuss than that of meal time in the case of sleepless patients, and if the fears of supper could be got over there is many a person who would pass a good night by having something in his stomach. A very common distribution of meals amongst the middle classes, however, is a dinner in the middle of the day and tea with bread and butter at six o'clock; so that for twelve hours of the day there is little or nothing in the stomach.

Medical men are often consulted about sleeplessness, and many I am sorry to think at once prescribe narcotics as if the remedy for it were ever at hand. In various maladies it may be necessary to administer drugs to procure sleep, but in the cases of pure insomnia there is so often found a disposition to insanity that great caution is required in their use. The patient bitterly complains of his inability to sleep declaring that if he cannot sleep he will go mad, and yet it is in these very persons that I have found the continued use of chloral so harmful. In this respect it is worth remarking how little opium is given in lunatic asylums, where, if the indication of restlessness necessitated it, the drug would be in constant use.

It is a very interesting and important fact to notice that many hypochondriacs and others suffering from nervous depression fall to sleep on first lying down, but wake in the early hours of the morning and are unable to close their eyes again. During this period they experience all the horrors which the blackest picture of the future can present to them; they give way to despondency, and contemplate terminating their existence. Thus it is that a very large number of cases of suicide take place in the early morning, and it is in the same circumstances and from the same dismal forbodings that parents will kill their children before attempting their own lives. Tragedies of this kind almost invariably take place in the early morning; rarely at night when the blood runs hotter and quicker, productive of another character of crime. This lowering of the circulation of the brain and fall of temperature of the body in the early morning are only phenomena of remarkable changes which occur during the sleeping hours of the night. It is then that stomach disturbances come on, that persons are seized with cholera during epidemic periods; that hæmoptysis occurs in phthisical patients, and that many other troubles are experienced.

In very many cases of insomnia a sedative does not procure natural sleep but merely makes the patient torpid, an effect very similar to what would have been produced by a blow on his head to keep him quiet. This method has been not inappropriately styled "chemical restraint," to show its correspondence with mechanical restraint. We should always bear in mind the physiological substratum necessary for sleep—a quiet and inactive brain. The method of excluding all painful or troublesome thought by the substitution of the simplest process of mental action is often put in vogue by patients. Reading themselves to sleep by perusing a simple tale; thinking of numbers or persons' names or giving their minds to the process of breathing are devices described to us by patients. The driving away thought by the production of a monotonous or rhythmical sound will often induce sleep. When at one time living out of town and travelling by train I observed that on a part of the road which was an incline, and where the engine went up hill with a slow deliberate puff, the passengers fell off one after the other into a deep sleep. During a dry discourse, especially when the air contains too much carbonic acid, sleep often comes on. I should think few persons troubled with insomnia would fail to find a remedy, if they cared to attend a lecture in the theatre of the College of Physicians.

The effect of baths is often very remarkable by diverting probably more blood to the surface. A hot bath is a proverbial remedy, and if this fail, the late Dr Newington maintained that mustard added would undoubtedly make it succeed. This was his common practice at his large asylum. Even a cold bath, by its action on the skin, is often serviceable, and the method is as old as Horace, where we read

> "'Verum nequeo dormire.' 'Ter uncti
> Transnanto Tiberim somno quibus est opus alto.'"

It is a most difficult question to determine the amount of sleep which is requisite for each individual. The brain requires rest after mental labour, and as much or more after physical labour. As a matter of observation it seems associated closely with the quiescence of the mind. Infants sleep very much, also old persons, country labourers and idle people; and other persons who make long journeys will sleep their time away in railway carriages and steamboats. Those who are using their brains actively often make seven, six, or five hours suffice. The latter was the period, I believe, allowed himself by John Wesley when full of work and chary of his time. Medical men will sometimes not obtain complete rest for nights together, and all of us must have observed a

devoted wife or mother remain in a sick room for weeks without a single night's rest. Without doubt the majority of persons take much the same amount of sleep, and regard this as a physiological necessity; yet the facts I have mentioned tend to show that the amount of sleep required and its connection with the previous activities of the individual are by no means settled, much less obvious, at first sight. There may be kinds or degrees of sleep; the sleep, for instance, of perfect oblivion, and the sleep of dreams. Then there is the remarkable fact so often told me by different individuals of the refreshing effects of a momentary or very few minutes' loss of consciousness. Medical men have informed me of the unpleasant efforts they make to ward off sleepiness whilst visiting their patients, when as soon as they are seated in their carriage and can lose themselves but one minute, they are ready for work again. A lady tells me in exactly the same words as many others, that if she can but have a quiet minute after dinner to lose her consciousness, she is lively all the evening, but failing this, she is sleepy and unfit for her ordinary duties.

Occasionally patients come to us in whom wakefulness, or the opposite condition, sleepiness, constitutes the principal complaint. In these cases, sometimes after the most rigid investigation, the cause remains undiscovered. For example, a governess tells me she is quite incapacitated from earning her living owing to the tendency to sleep; as soon as she sits down she falls into a slumber. A young man also comes to me for the same complaint, and his case is interesting as showing how the tendency is always greatest when the brain is probably least supplied with blood. He is constantly sleepy, but more especially before dinner, and whilst standing or talking he will sometimes fall into a doze. His circulation is very feeble, and his fingers often become dead. You may often observe, amongst persons who have difficult digestion, cold extremities, or even dead fingers, together with sleepiness.

During the war in West Africa we heard of a remarkable complaint existing there, in which the patients (natives) had a great tendency to sleep. It was said that the sufferers had enlargement of the cervical glands, and that if these were removed the complaint was cured, from which it was conjectured that these glands in some way affected the circulation of the brain. Much controversy took place about the authentic nature of these statements, but Mr Gaskoin informed us that Portuguese writers had long before mentioned a complaint of coma and lethargy as prevailing amongst the islands of the African coast.

Melancholia and Sympathetic Mania.—I have spoken of hypochondriasis as the case where, from an extreme sensibility of the

nervous centres, the thoughts are directed to the existence of some imaginary complaint, and where the patient either from a morbid activity or sluggishness of his sympathetic ganglia may suffer as much as if he had a real neuralgia or paralysis. The nature of the malady and its functional character is shown by the good effect of diverting the mind and by the success attending moral treatment; and that the pain has been altogether subjective and indicative of a morbid state of mind only has been often shown the subsequent absolute mental derangement of the patient, whilst by the local trouble has at the same time ceased. We have, nevertheless, to notice how a trifling ailment may react on a sensitive centre, and set up a true maniacal condition. It will sometimes require all our acumen to discover what relation the mental and local affections bear to one another; which is the cause and which the effect. In some cases a supposed local affection turns out to be a purely imaginary trouble; whilst, on the other hand, a truly maniacal state is solely produced by a localised malady.

In the following cases the supposed local disease had probably no existence:

Case.—A gentleman of middle age began to complain of an agonising pain and strange sensations in the neighbourhood of the rectum and bladder, which, he said, destroyed the whole comfort of his life. He consulted numerous medical men, and amongst others the most eminent who had made diseases of the bladder and rectum their speciality. They all prescribed, but without avail. He became irritable, did not sleep, and declared life was a burden to him. This went on for two years, when he became maniacal, and was obliged to be sent to an asylum. His mental symptoms during the several months he was there were of the worst description; he was dirty, had extraordinary delusions, and he wasted away; but he made no further complaint of his urinary trouble. On my visiting him one day, and asking him about it, he said there was nothing the matter with him, and never had been. At the end of a year he had recovered, is now quite well, and makes no mention of his old complaint.

Case.—A lady complained of irritable bladder, shown by a constant feeling of distress and desire to make water. She consulted the most eminent surgeons and obstetric physicians, who prescribed medicines internally, and all sorts of local remedies, including washing out the bladder with opiates. This went on for a long time without any result, when she passed into a state of melancholia. She immediately ceased to complain of the vesical symptoms. She could spend several hours of the day and night without any desire to pass water; in fact, every symptom of irritability had disappeared. Thus it seemed to depend wholly upon the condition of her nerve centres.

Case.—Miss —, æt. 50, seen with Dr Joseph Burton, of Blackheath. She had been the subject for many years of spasmodic asthma. During the last few months this had passed off, but she had suffered for some weeks with intense pain in the abdomen near the umbilicus. The pain often was most excruciating and could only be relieved by the doctor pressing upon it with all his might.

Failing this she obtained a weight of several pounds and had it placed on the abdomen. I could find no cause for the pain, and no medicine relieved her. Her only resource was this heavy weight which she constantly had resting upon her. The symptoms continued some time when one day she left her bed, wandered about the house without any clothing, and was otherwise very strange in her manner, and then went raving mad. She was sent to an asylum, and no more was heard of the pain.

When such patients come to us as strangers, of whom we know nothing, it is very difficult to form a correct estimation of their case. For example, a gentleman lately came to see me, stating that he was the subject of pain and uneasiness all over the right side of his chest; and that the pain sometimes went over his face, so that the whole of the right side of his body felt different from the left. He had been a sufferer from this for many years, and had been obliged to place the desk in his counting-house in such a position that no one should approach him on his right side. He had not any hyperæsthesia, but was always conscious of his side, and dreaded it being touched. No one had done him any good, and he feared that the case was incurable, as he had long ago been told that his uneasiness was due to the lung growing to the side. The patient looked well, but gave me a good neurotic history of his family. I believe the unfortunate explanation of his symptoms had so rooted itself on his mind that it was impossible for him to get rid of them, and that the whole of his troubles were subjective. This is the case where the theory of habit is applicable. We say that an abnormal movement, such as the choreal spasm of a muscle, is due to habit; and in the same way an abnormal and constant pain may also be due to habit.

Another gentleman, æt. 64, has had for twenty years a feeling of tightness or tension over both sides of the face, corresponding to the area of distribution of the infra-orbital nerve. He has no sense of smell. In this case, however, there may be a positive lesion.

I was told lately of a case where a man had for several years a most severe neuralgia in his head. During the paroxysms it was so severe that it quite incapacitated him from doing anything. Injections of morphia were used, and these quickly gave relief. It was afterwards found that pure water did equally well. After his death a careful examination was made, but failed to reveal anything abnormal in his brain or head.

Cases of this kind, where the head or chest are the affected parts, are not so common as those in which morbid sensations are referred to the abdomen, and where there is often a delusion that there is something alive in the bowels. As a rule, it may be said that when patients come before us saying they have a tapeworm, because

of some strange feeling in the abdomen, they very rarely have one. If, owing to their importunity, an appropriate medicine for worms should be given, and none be discharged, the delusion still remains.

It has been suggested whether, as the brain has different functions, special portions of it may not be affected in different cases, through some reflex action or more direct influence of the circulation, and that so the mental or other nerve symptoms may differ accordingly. For example, since the anterior and posterior portions of the brain are supplied by the carotid or vertebral arteries respectively, the cerebral symptoms might depend upon causes affecting these vessels separately. Bright had already published cases which he thought supported these views, but having reference rather to the more positive conditions of pain in the head, sleepiness, &c., than to the results of modern reseaches, which might lead us to think that the mental condition would be characterised by a greater intellectual disturbance in the one case and sensational disturbance in the other.

There probably may be a difference between a simple maniacal condition and one associatied with special symptoms. The one may be mere derangement, the other a more tangible disease of the brain. Thus, a young lady with mental derangement is always speaking of "creeping" in her head and "pricking" down the arms. A gentleman who is, in ordinary language, mad, says he feels as if his skull was off, as if tied by strings, or as if electricity were running all over him.

I may add that, just as neuralgic pains are often periodic in character, so also are the subjective and imaginary ones. Patients, for example, who are undoubtedly hypochondriacal, and have no tangible cause for their suffering, will look for its approach at a given time every day or night.

In contrast to the cases we have been discussing, we meet with persons whose minds have lost their balance from being constantly directed to a part of the body where actual disease exists, and with others who fall into a maniacal state from the sympathy of similar disease, but without their being conscious of its existence. A case of the first kind was related to me by the late Sir C. Hood, where a woman's attention was uninterruptedly fixed on a small subcutaneous tumour on the abdomen. In order to satisfy her, it was removed, when her mind became calmed, and she left the asylum cured. I have read lately of a case of insanity cured by replacing the uterus in position. Of the second kind was a case reported by Dr Savage of a woman who died in Bethlem of cancer of the stomach and neighbouring glands. She was admitted because she was un-

tidy, dirty in her habits, had delusions, and refused her food; when this was forcibly given her it was rejected. Should mental disturbance be associated with phthisis, it is still, as in other cases, of the melancholy type; a remarkable circumstance, as Dr Savage remarks, since the usual mental condition accompanying consumption is of the cheerful and hopeful kind. It is very probable that minor forms of melancholia and hypochondriasis may often have a real seat in the abdomen, as, for example, in the case of an old lady who was so great a trouble to the doctors that they regarded her as a confirmed hypochondriac; she always had a most dismal countenance, and a long string of troubles to relate to them, but no disease of any kind was discoverable after repeated examinations. This patient having died of chest disease, I took the opportunity of procuring a post-mortem examination, in order to discover, if possible, why she always had such disagreeable feelings in her abdomen. I found a portion of omentum adherent to a femoral sac, and this dragged down the colon to the pelvis. I conjecture that this might, through the sympathetic system, have been the cause of her abdominal anguish and continued low spirits. But lately I have seen an extreme form of hypochondriasis in a woman with a large umbilical hernia, and also the case of a genuinely maniacal patient who had a cæcal abscess. She had eaten nothing for six weeks, as she said nothing could pass the diseased bowel. I ordered her to be fed but I learned afterwards that she died of starvation.

A man was lately in Stephen Ward with marked hypochondriasis. He said he was very well until a year before, when a plank fell on his abdomen, and he was brought to the hospital with such severe symptoms that it was thought he had ruptured his intestines. He, however, recovered, but ever since has had all the symptoms of the most confirmed hypochondriac, complaining of a sensation at the pit of his stomach, of palpitation, of low spirits, and feelings of great depression at times coming over him. It is well known that writers on insanity have constantly noticed the fact of misplacement of the colon having been met with in persons who have died of mania or melancholia. Dr. Shaw has stated that ulceration of the intestines is not an uncommon condition in the insane.

The sympathy between the mental condition and the abdominal organs is a fact which may be any day proved by observing the gloomy and desponding disposition of the dyspeptic, and contrasting it with the cheerful nature of the phthisical patient. The cause no doubt is to be sought in the anatomical arrangements, whereby the sympathetic nerves exert their influence over the vascular system, so that the difference between the collapse arising from abdominal injuries and the depression with the low spirits of

dyspepsia or colitis is merely one of degree. From the beginning of history low and disturbed mental states have been observed to be associated with affections of the abdominal organs, and it is an every-day experience that liveliness takes the place of apathy in children after a good purge.

I have already alluded, under the head of "Ataxia," to the opinion declared by Drs Pierret and Rougier, of Lyons, as to the mental alienation of patients suffering from this disorder. They are subject to hallucinations of various kinds, and these are ascribed by the writers to impairment of the nerves of common sensation as well as of those of the special senses. Even their suspicion of being poisoned may be suggested by some morbid sensibility of the stomach.

Mania after Acute Disease.—This subject was first brought distinctly under the notice of the profession by Griesinger, and it is remarkable that it had not more forcibly attracted the attention of its members before this, since, in my experience, cases of the kind are by no means uncommon. Patients, for example, who have had an acute disease, when the height of it has passed or during convalescence, become acutely maniacal. The brain symptoms form no part of the delirium, which may have been present during the pyrexia, and therefore are not due to unnatural heat; the mania must be owing either to an impoverishment of the brain, or some morbid state of blood resulting from the previous fever. I have seen it after typhoid, scarlatina, pleurisy, and some other acute diseases. In all my cases the patients recovered, except in that of a lady, where the mania followed peritonitis; she sank into a state of permanent dementia, with occasional maniacal attacks. These cases may have the same immediate cause as those of puerperal mania, although in them we must not disregard the frequent albuminuria, and the direct nervous influences which are at work. In the pregnant state there is often seen a tendency to nervous excitement, even to the production of chorea and similar affections. That nervous shock may be sufficient to affect the mind is proved by a fatal case of mania which I witnessed after removal of the breast, and the case of a man I have lately heard of who had a similar attack after the operation of lithotomy.

PART IV—NERVES

THE EFFECTS OF INJURY AND INFLAMMATION

Having described the various diseases of the brain and spinal cord, we come to the nerves. Now you can imagine that as each compound nerve has numerous origins for its different fibres, we must already, in treating of diseases of the cerebro-spinal centres, have spoken of cases where one or more functions of this compound nerve have been arrested or disturbed. In cases, for example, of spinal disease there may have been loss of power of a limb, loss of sensibility, increased spasmodic action, or a total destruction of every function of the nerve.

It may be as well, however, to again look at these disturbed functions where the nerve itself is involved, and by so doing we shall find that the symptoms vary somewhat from those where the central origins are affected, this difference arising from our own want of anatomical knowledge as to the exact relation between them. We will first ask what would be the consequences of a complete paralysis of a compound nerve arising from its division? There would be loss of power, loss of sensibility, and changes in nutrition. The latter are amongst the most interesting of the results which would follow the lesion of a nerve, and the question is now asked, why do they occur? Are there special trophic nerves which rule over nutrition, having their own centres in the spinal cord, or is nutrition dependent merely on vaso-motor nerves which regulate the blood supply to the part? and again, are these nerves none other than the sympathetic originating in their own ganglia? The question is at present a difficult one to answer, since, although the effects of nerve lesions are very obvious, the necessity for nerve influence on growth is not so clear. For example, the lower animal life proceeds without a nervous system, and in the human body tumours increase rapidly without any exertion of nerve power. Besides, a considerable amount of disease of the cerebro-spinal centres can exist without any apparent effect on nutrition; although this, of course, may arise from the circumstance that the special centres which may rule over growth and decay are not interfered with.

Lesions of the nerves do, however, indisputably show the influence which these structures have on nutrition, although from clinical experience we find the motor and sensory are far more potent in this respect than the vaso-motor; one of the most striking facts in pathology being the power which the motor nerve has over the muscle, just as the grey centre from which it springs has power over the nerve itself. Wasting of the muscle following an injury of the nerve which supplies it is one of the most evident and important facts observed in practice, and this is quite independent of vaso-motor influence, as is exemplified in the oft-quoted instance of division of the sciatic nerve. If this be done the muscles supplied by it will waste, although its vaso-motor nerves accompanying the blood-vessels are entire, as they arise from the crural and lumbar plexus.

Then, again, the influence of the sensory nerve is seen in the ulceration of the cornea after division of the fifth nerve, and also in the eruptions which accompany the various neuralgias.

Another very striking fact is the influence exerted over the various secretions through the nerves, as in the case of the salivary, lachrymal, mammary, and other glands.

If a *compound nerve be injured, irritated, or inflamed*, various changes take place in the parts to which it is distributed; the skin becomes dry and atrophied, and, as Paget mentions, the fingers become glossy and painful to the touch, the nails curved and wrinkled, and occasionally vesicles appear. A supposed natural example of this atrophic change is to be seen in lepra anæsthetica, or joint-evil, as the wasting away of the fingers is called; the skin loses its sensitiveness, and becomes brown and atrophied; sometimes the bones also waste. The disease is supposed to be due to a fibrous degeneration of the nerve. Where, as in infant paralysis, the limb wastes, the cause is often put down to disuse, but now it is known to be due to a failure of nerve influence. If this be so, it would appear that every tissue, even the bone, is controlled in its growth by the power of the nerves. I have seen a case where the skin of the whole body became remarkably thickened, and, as this state was associated with cerebral disease, I attributed it to a nerve origin.[1] It is well known, also, that some persons grow fat and that others waste in different nervous disorders, and that the secretions become fetid.

In neuritis from injury, more marked and active changes occur; the skin may ulcerate and become very painful, or vesicles and blebs may appear on it. The temperature is probably lowered, the

[1] I now recognise this and similar cases as probably coming into the category of diseases known as "myxœdema."

secretion from the skin may become excessive or fetid, and the skin sometimes of a reddish colour. Worse effects seem to arise from nerve irritation or neuritis than from nerve paralysis or nerve division; at all events this is true of the face, although in the limbs severance of the nerves has been sometimes attended by all the evils named. A continuance of the irritation will produce intense pain in the limb, with spasm or flexion and great constitutional fever and irritability. Several remarkable instances are mentioned by Mr Hilton in his work on 'Rest,' where irritable ulcers were cured by dividing the nerve proceeding to them. These cases show also how the healing process can take place without nerve influence.

Some cases of nerve injury, with its consequences, were lately reported in the 'Med. Times and Gazette.'

A man received a wound in the arm by a table-knife, which severed the median and ulnar nerves. Ten weeks afterwards knots formed beneath the scars, and the hand became cold; the skin thin, shiny, and brownish red; the nails thick, crumpled, crushed, and furrowed; the muscles supplied by the two nerves atrophied and paralysed. An operation by cutting through the injured nerves and bringing the ends together by stitches was followed by perfect recovery of the limb. This remarkable case came from Germany.

There was reported also the case of an injury to the head exactly over the supra-orbital nerve, and which was followed by vesication in the course of the nerve.

Also a case of injury to the median nerve, followed by an eruption of bullæ, and another of injury to the ulnar, followed by wasting of all the muscles supplied by this nerve.

I have already alluded to the nutritive changes occurring in paraplegia, as bed-sore and vesication. It is interesting for us to know that Bright observed this tendency to sloughing and production of vesication in cases of spinal disease, and suggested that nerve influence might be very important in the nutrition of the body. He mentions the case of a man who had a fracture through the first dorsal vertebra, where "two or three large bullæ, the size of pigeons' eggs, or larger, full of clear yellow serum, appeared on the ankles and feet, and where any particular pressure had occurred." Also another case, where vesicles formed on the inside of the knees. He then gives the case of a woman who died of acute paraplegia, with a slough on the back and cystitis, and where "several large oval vesicles, filled with clear serum, appeared on the feet and legs." After speaking of the paralysis of the bladder, Bright remarks: "Another curious circumstance connected with the paralysis of the

lower extremities is illustrated by this case—the tendency which is observed in such affections to the formation of vesications or bullæ, which frequently make their appearance in a night on some part, as the knee, the ankle, or the instep, where accidental pressure or irritation has taken place. They contain a limpid fluid, which, after a few days, becomes opaque. It has sometimes struck me that this connection between interrupted nervous action and the formation of bullæ might be found hereafter to throw light on the nature of that most singular disease, herpes zoster, which, from the peculiar pain with which it is accompanied, as well as from its strict confinement to one side of the body, seems to be connected with some peculiar condition, perhaps the distension of the sentient nerves."

The experiments, therefore, made for us in the wards are of this kind: that injury to a motor nerve produces atrophy of the muscle; that irritation of a sensitive nerve produces inflammation of the skin, with eruptions; and that division or disease of a whole nerve produces atrophic changes in the skin, as I have described. What amount of participation the vaso-motor nerves have in the result is not determined.

In Bernard's well-known experiment of dividing the sympathetic nerve in the rabbit's neck no further changes ensued than dilatation of the vessels and rise of temperature. I believe no immediate alterations in nutrition were observed, but that after a time the ear grew larger.

Allied to these facts is the state of blushing, which is evidently a sudden dilatation of the blood-vessels arising under nervous influence; also, forms of erythema and other skin affections having a nervous origin, as well as partial sweatings corresponding to the distribution of nerves. Thus, there is now in the hospital a man with some of the symptoms of exophthalmic goitre, who is constantly observed to have a perspiration on one side of his face. Cases of partial *hyperidrosis* are occasionally seen. I used to know a lad who perspired on one side of his face, and I have now a patient who is distressed by the upper part of his shirt always being wet, this occurring mostly in cold weather. Then we know that certain drugs acting immediately on the nerves will cause contraction or dilatation of the vessels, notably digitalis and nitrite of amyl. We see also in cases where there is a tendency to general paresis, as in hysterical paralysis of a limb, not only loss of power and sensation, but the limb congested. A division of a nerve produces, I might have said, in the first place, a kind of chilblain; and there is a very interesting fact, too, in connection with ataxia and other forms of spinal disease, viz. the occurrence of a chronic change in the joints. A case is mentioned by Sir James Paget, of

a gentleman whose feet whenever he commenced to walk grew cold, white and dead. He could only attribute this to a reflex action on the vaso-motor nerves. I myself have had a visit from a gentleman, who informed me that as soon as he sat down he experienced cold in his feet. I might allude to a somewhat similar reflex condition observed in the white and senseless fingers of young dyspeptics, when their fingers grow dead, as they say. I am now seeing a woman with paraplegia, who has occasional attacks of cramps in the muscles of the legs, which at the same time become white and cold. Numerous other illustrations I might give which clearly point to the nervous system ruling over the supply of blood. I lately found a lady of highly nervous temperament sitting by the open window on a very cold winter day complaining of the excessive heat, her face flushed, breathing very quick, and pulse very rapid. The case reminded me of what one sees after the inhalation of nitrite of amyl, where a warmth and a glow are produced all over the body, from an evident dilatation of the blood-vessels. This is frequently witnessed in exophthalmic goitre, which is supposed to be due to paralysis of the vaso-motor nerves at their central origin, and where, besides the well-known characteristic symptoms, the patient is often breaking out into violent heats and perspiration. The flushes of heat at the climacteric period are also well known. The palms of the hands may be noticed of a deep red in many nervous diorders, or the joints inflamed.

It is remarkable that, although from physiological considerations we are constantly speaking of the influence of the vaso-motor nerves on nutrition, our facts at present show no more than altered states of vascularity when these structures are interfered with; whilst, on the other hand, the most evident changes in the tissues occurring in connection with disease of the nerves are seen when the motor and sensory nerves are implicated. I might allude to the fact mentioned by Dr Owen Rees (as perhaps bearing upon the chemical element in nutritive processes), that the nerves of the cerebro-spinal system end in acid fluid, whilst those of the sympathetic end in an alkaline one.

I have already told you that if a nerve is cut it gradually degenerates, as if it received a nutritive influence from its centre. If it be simply injured it inflames like other structures, becomes pulpy and infiltrated with exudative products. In chronic inflammation it becomes indurated from infiltration of connective tissue, and at last undergoes a cirrhosis, in which little is left of the original nerve fibre, or perhaps only the central axis. The nerve has been found to have undergone this process in animals through artificial chronic poisoning by lead. *Neuritis* resulting from an in-

jury causes paralysis of the muscles and some loss of sensation, but during the active inflammation there is often great pain and burning in the part, accompanied by ulceration or vesication, which may pass on eventually to atrophy and contraction of the limb; and, as before mentioned, many of these active and painful conditions may be removed by division of the nerve.

It is curious that in nerve injuries, where a complete motor paralysis has resulted, sensation should still remain, as if the least possible remnant of a nerve were sufficient to carry impressions to the sensorium, but that much more is required to preserve the muscles in their proper tone. The one function is passive, and the other active. It may also be remarked that after division of a nerve sensation may often return, as if sensory impressions had found a path by other channels.

The pain in *neuritis* is often very severe, and if the nerve of a limb be affected, may be referred to the periphery, where the distribution takes place, just as is observed in the case of a stump after amputation. Not only are these subjective feelings referred to a distance when the sensory nerve is touched, but, what is very remarkable, as pointed out by Mr Weir Mitchell, if an electric current be passed through the stump of a limb the patient becomes conscious of certain contractions of the fingers and toes, and painfully so, if the force of the galvanism be increased.

We constantly see patients who complain of weakness of a limb associated with pain and with some degree of atrophy, and we are at a loss to know in what category to place them. Well marked sciatica is an example of this, but we also occasionally see the same series of morbid conditions in the arm, and in which I conclude that a *neuritis* is really the source of the mischief. It is important to distinguish this class of affection from chronic arthritis of the shoulder. I have frequently been asked to see patients with paralysed arms whose disease has been in the joint; the mistake has arisen from the wasting and powerlessness of the limb, but a close examination has shown at the same time stiffness of the joint, crepitation, thickening, and other evidence of changes in the articular surfaces. The rapid wasting in these cases is remarkable, but I have seen the same follow a dislocation.

In old cases of wasted limbs attended by some stiffness of joints it is often difficult to point to the pathology of the disease, but in the following examples I believe we see cases of neuritis. I judge so on account of the pain, wasting, and subsequent recovery. It is a very interesting question to ask whether the whole of the nerves of the body might become the subject of inflammation. For example, I was reading of the case of a woman who was seized

with acute pains in all her limbs, which made her groan night and day. Soon the limbs began to waste until considerable atrophy had occurred. She died of pneumonia, and it was said no visible change could be found in any part of the nervous system.

Those who have a difficulty in attributing lead palsy to an inflammation of the grey matter of the cord, refer the cause to the nerves, for it is positively stated by experimenters that lead will produce a very positive and well marked neuritis.

Brachial Neuritis

Case.—Mr T—, æt. 52. For three months had suffered most acute pain in the left arm; it was so severe as sometimes to make him cry. At the same time the arm grew weak. When I saw him the pain was less severe, but occasionally came on in severe paroxysms; the arm was somewhat smaller than the right, and the muscles were softer. Those of the thumb, the little finger, and the interossei were the most markedly lessened. Was ordered iodide of potash and arsenic. The pain did not leave him until another month. He was then ordered tonics and galvanism, and slowly improved, having quite recovered at the end of a year.

Case.—Mr D—, æt. 50. Whilst abroad had suffered from most intense pain down the left arm, proceeding more especially from a point near the insertion of the deltoid. From the description it was evidently of a neuralgic character. The pain had of late become less. On examination of the arm no local disease could be found in the joints or in the bones, and the pain was not increased on movement. There was a marked wasting of the deltoid, pectoral, as well as the muscles of arm, more particularly the triceps. Galvanism and iodide of potassium were ordered. I did not see him again but heard some months afterwards that he was better.

Case.—Henry W. G—, æt. 34. For six months had suffered from numbness and strange feeling down the right arm, pursuing more especially the course of the ulnar nerve to the little finger. At the same time the arm had become weak. When seen at the end of this time the limb presented all the appearance of progressive muscular atrophy, the pectoral, deltoid, biceps, were slightly diminished and flabby, whilst there was marked wasting of the muscles of the thumb and of the interossei. There was a history of syphilis. He took for some time liq. hyd., with iodide of potassium, and afterwards tonics; and used galvanism. He gradually improved and when seen at the end of five months the limb was markedly better.

Having now seen the results of marked injuries to the nerves, we can take up the several cases where we find them affected as a result of various morbid conditions. We may first remember the case of altered sensations, including hyperæsthesia, anæsthesia, and analgesia, which we have already considered in speaking of various paralytic states. We can then pass on to painful conditions of nerves known as neuralgia; afterwards to affections of the motor nerves, as witnessed in local paralyses and spasm.

NEURALGIA

We understand by neuralgia some affection of a nerve, whereby it becomes the seat of excessive pain. We do not use the term where there is a local lesion affecting the peripheral terminations of the nerve, nor apply it to those cases where there is manifest disease implicating its trunk; we limit the use of the expression to pain in the nerve itself. If in any case of pain in the course of a nerve we are led to exclude every tangible cause which may produce it, we place the pain in the nerve itself, and style it neuralgia. In a case of pain in the legs, due to pressure by a growth in the abdomen, I do not think we should with propriety call it one of neuralgia. It seems, however, as if any nerve may be the subject of some morbid state causing it to be highly sensitive, and so we can have neuralgia of every part of the body. What the pathology of this condition is we do not know. Dr Anstie thought the nerve was inflamed, or sometimes wasted, but he offered no evidence in proof of it. I believe Dr Radcliffe states that neuralgia is associated generally with anæmia, and that inflammatory and hyperæmic conditions are not accompanied by pain.

Under the name of neuralgia we have all those sensations which I have mentioned in connection with irritation or inflammation of a nerve; there is not only pain but a sense of burning, coldness, and every feeling with which you must be familiar when you strike the "funny bone."

I have already alluded to the nutritive changes in connection with injuries and irritation of nerves, and we frequently meet with them in connection with neuralgia. They are mostly seen in the form of vesications of the skin, as bullæ or herpes. In the case of intercostal neuralgia the eruption of *shingles* is regarded as the essential disease, and the pain as a nerve symptom accompanying it, but the opposite is the truth, for the pain may exist long before the appearance of the eruption, and may continue for a long time after it has gone. You may sometimes also see, though more rarely, an herpetic eruption down the thigh in a case of sciatica, or in the arm after an attack of brachialgia. In tic of the fifth nerve an herpetic eruption may often be met with, corresponding to the division of the nerve which is affected, and in the case of the first division this is very important, by reason of its supplying the eye through the otic ganglion and nasal branch. The vesication, may, therefore, extend to this organ and involve its structures in inflammation. Mr Hutchinson has pointed out how the corymbiform or cluster-like character of the eruption corre-

sponds to the branching periphery of the nerve. In my own experience the herpetic rash accompanies only simple neuralgia, and very rarely the cases of nerve pain which are due to organic disease. Therefore I have been able to give a favorable prognosis, and have argued that the pain has been merely functional in every case where I heard that an herpetic eruption has at any time existed. It may be that in organic disease the function of the nerve is interfered with, whereas in cases where herpes exists there is merely irritation of the nerve. Then, again, the *secretions* may be affected through the nerves and we may observe lachrymation, salivation, or catarrh. The *hair* too, as already mentioned, may fall off, or change colour. Probably every nerve in the body may be the subject of neuralgia, and not only the ordinary sensory nerves but even the sympathetic, owing to their close connection with the spinal. For example, though the viscera cannot be called sensitive organs, since the food will pass along the alimentary canal without there being any consciousness of it, yet at the same time under morbid conditions they may become the subject of most exquisite pain, as in gastrodynia or enteralgia. The solid organs also, as the heart and liver, may apparently also be the subjects of pain.

You must remember that the symptoms attendant upon irritation of a nerve may be of the most varied character, passing on from pain to spasm and paralysis. And then, again, under the name of pain, there are sensations which can scarcely be put in words, such as feelings of burning and coldness. You can imagine that there would be all varieties of strange sensations when a sensory nerve was irritated, in the same way as there may be all stages of colour-blindness or deafness, leading up to a complete loss of vision or hearing when the optic or auditory nerves are affected. Thus, patients constantly complain of a feeling of coldness in a leg or an arm, which I regard as a variety of neuralgia, as it corresponds to it in all other particulars.

The causes for neuralgia are diverse, and yet in individual cases rarely discovered. Direct cold to a part can no doubt produce a nerve pain in it, and we often find that it is the cause of an attack. Malarious influences are amongst the most marked and certain causes of neuralgia, as well as all circumstances which tend to impoverishment of the system, or produce cachexia. An exhausted state of the nerve centres renders them very susceptible, and at the same time, probably, starts the nerve itself into morbid activity.

Neuralgia of the Fifth Nerve.—This is one of the most common and painful forms of neuralgia, and is often styled tic douloureux. It may affect the whole nerve, but more usually a single branch

or even one filament only. The pain may be limited to the course of one nerve, or it may by sympathy involve other nerves, and thus the pain may be radiated from the original seat as a centre. It may be pretty constant, or may come on in paroxysms, and then is often of the most excruciating character; it is sometimes of a burning nature, or as if a red-hot iron were being run into the face, the pain being felt all over the forehead, eye, cheek, or jaw; it may be accompanied by lachrymation or by constant reflex spasmodic movement of the face. An herpetic eruption may accompany the attack, and if the tic be paroxysmal there may be a corresponding tendency to a vesicular rash. Neuralgia of the *first division*, or ophthalmic branch of the fifth, is often seen as a temporary complaint, more especially in the hemicrania of migraine. In the permanent neuralgia or tic it is the supra-orbital nerve which is mostly affected, and it is this which is met with generally in the malarious kind known as brow ague. An herpetic eruption attending neuralgia of the first division is very important, on account of the nerve supply to the eye, through the ciliary nerves of the nasal branch. Where the eye is not affected this branch has probably escaped. This may set up an inflammation which in most cases is superficial, but may proceed to the iris and cornea, producing destruction of the eye. This is the reason why the patient so often presents himself first to the eye surgeon, who recognises the disease as *herpes* or *zona ophthalmica*. I have had several such cases under my care. At the present time there is a man in Stephen Ward who was sent to us by the ophthalmic surgeon; his temples are covered with scabs of an herpetic eruption; his eye has recovered, but he is now suffering from severe neuralgia of the first and second divisions of the fifth nerve. I am constantly seeing a lady who has been for two years the subject of tic of these two upper divisions; her face is red and rough from the constant occurrence also of vesication, although this rarely reaches a true herpes.

A less common form of neuralgia affects the eye alone, and is known as *ciliary neuralgia*. The patient is seized with paroxysms of violent pain in the globe of the eye and eyebrow, accompanied by lachrymation, and the eye becomes very sensitive and vascular. After a time some opacity or ulceration of the cornea may ensue. The attacks come on like migraine, without much warning, but induced often by disturbing nerve causes, in neurotic or gouty subjects. I know a lady who has periodic attacks, coming on every few weeks, of this disorder, and ophthalmic surgeons have not been able to do anything for her relief. The eye becomes acutely painful, and the attack, which lasts a few hours, is aggravated by strong light; when the pain has ceased the eye is seen to be acutely inflamed.

The only remedy which has any control in lessening the number of paroxysms is the one I prescribed—arsenic.

The only surgeon with whose writings I am acquainted, who has made a study of this painful complaint, is Galezowski. He styles it *ophthalmic migraine*, involving the fifth nerve and vaso-motor nerve of the retinal centre. He states that he has seen between seventy and eighty cases, and of these four have terminated in an organic lesion. One patient, an oldish man, had been troubled for twenty years with these attacks, which lasted two or three hours. He finally got thrombosis of the central artery, and lost his vision. Another patient, a young girl, had occasional attacks of lightning flashes and pain through the eye; when these passed off no visual trouble remained. She suddenly became blind, and it was found she had thrombosis of the retinal artery.

Neuralgia of the *second division* sometimes accompanies that of the first, or it may exist independently. Some of the worst cases which I have ever seen have been those of tic of this nerve. We had in the hospital at the same time two men who might be seen sitting up in bed violently rubbing their faces as paroxysms of pain came on.

Neuralgia of the *third division* we often meet with alone, and it also constitutes a very frightful form of the complaint. Occasionally, as in the other case, it may be relieved by friction, but generally the skin is very sensitive, and the pain is much aggravated by movement. This depends very much upon which branch is most affected, whether, for example, the mental or lingual; but we find all movements of the lower jaw, as in eating, bring on a paroxysm of pain. Probably the same would occur in the tic of the two upper divisions of the fifth, if the parts with which they are connected admitted of movement. It is curious, however, to observe how, in some cases of tic, rubbing the part will relieve, whilst in some other cases the merest touch will start the paroxysm. There is often one spot which is highly sensitive when touched, and from this the pain radiates.

Neuralgia of the tongue alone I have met with, but it is comparatively rare. I have seen also a sore mouth with tic, which probably had an herpetic origin. It may show itself also by the sensation of a bad taste in the mouth, or by the feeling of heat or cold.

There has been no disease in which so many *remedies* have been tried, and in all probability every one of them has at times been successful. In choosing a medicine we are guided in part by the speedy action of some drugs over others, and these we naturally are inclined to give first. Now, amongst the most efficacious

of these is the chloride of ammonium, an old and approved remedy for neuralgia. I generally give fifteen grains three or four times a day, and a few doses suffice if the remedy be likely to act beneficially. In other cases quinine at once cuts short the disease, administered in large doses to begin with, followed by lesser ones. It is thought to be peculiarly efficacious in the supra-orbital form when paroxysmal. If the disease be clearly of miasmatic origin the quinine will undoubtedly cure; but even if it be not of this nature this drug will often be successful, for periodic neuralgia is not necessarily malarious. In other cases iron will cure. The old sesquioxide had long a celebrity as a remedy against nerve pains. Lately we have had a new medicine—gelseminum—and of this I have given the tincture in twenty-drop doses three times a day with good effect, but it is a remedy still on its trial. In other cases chloral is very serviceable, and some give the preference to croton chloral. If all the more powerful remedies fail I usually give arsenic, one of the most efficient drugs we possess, but time is required for its beneficial action. Then there are various applications of the irritant and soothing kinds, such as blisters, mustard, &c., or ointments of aconite and belladonna. If these fail we have recourse to injections of morphia. It is very remarkable that in cases of periodic neuralgia plain water may sometimes be substituted for morphia with equally good effect, but whether this is due to any mechanical pressure of the fluid, to the irritation caused by the puncture, or to the effects on the imagination, is not very clear. Galvanism is sometimes a very potent remedy, and ought always to be tried, the continuous current being better than faradisation. In a case just now alluded to of tic accompanied by herpes it slowly effected a cure. I will give one example more at length.

Case.—Sophia C—, æt. 60, came into the hospital, having suffered from neuralgia of the left side of the head for five months. The pain was in the temple and forehead extending down the nose, involving nearly the whole of the first division. At first the pains were slight and transient, but they gradually became worse and more frequent until they were most excruciating in character, and were brought on by slight causes, such as blowing the nose, talking, or eating. She had lost all her teeth on the affected side, and in consequence of this and the pain caused by mastication, she was obliged to cut her food very fine. She was ordered three drops of the tincture of aconite three times a day, and this was increased until, a fortnight after admission, it reached seven drops. She was no better, and the pains, which came in paroxysms, were of the most excruciating character. She was then ordered a drachm of chloride of ammonium every four hours. This she took, and subsequently iron and quinine, without effect. Galvanism was now ordered, one pole of the battery being placed over the forehead and the other stroked down towards the temple. She began slowly to improve, so that at the end of a week she was much better, and at the

end of a fortnight she had scarcely any pain. It was continued, however, for another week, when she left the hospital quite well.

Occipital neuralgia, that is, a pain running along the course of the great occipital nerve, is not uncommon. In any of those conditions where headache is liable to occur, and more especially the neuralgic, this form may be met with. Sometimes the back of the head is the exclusive seat of headache of a neuralgic kind, as is shown by its evanescent character and its curability by appropriate remedies.

Cervical neuralgia is a form occasionally met with where the pain is distributed over the neck and shoulders. If extending down the arm it may be called a *cervico-brachial neuralgia*.

Phrenic neuralgia is supposed to account for a pain sometimes met with, running from the neck and shoulder and across the chest, in the position of the diaphragm.

Intercostal neuralgia is one of the most common and painful forms, and, being very frequently associated with herpes, is known as "shingles." The pain may precede the eruption for a short time, and when this has disappeared may continue for many weeks or months afterwards. The nerve affected is generally one of the middle dorsal, although it may be one of the upper or lower dorsal. The complaint occurs mostly at the middle or later periods of life, and by its severity and persistence makes the patient really ill. Sometimes the skin is excessively tender if touched. When the eruption is developed a little starch powder is usually applied, and remedies are given for the neuralgia. Local irritants, which again bring out a rash, often give relief, but this is only temporary. As the pain is likely to be persistent, I usually give arsenic, and this, if continued, will often cure. I sometimes give it with quinine, and in other cases with the bromide of potassium. I have tried galvanism in several cases, but without much success.

Pleurodynia is an intercostal neuralgia, but the term has reference to those cases where the pain is fixed at one spot. It is very commonly met with in women.

Brachialgia is not so common a form of neuralgia as that of the leg, but I have several times met with it. I once saw a gentleman suffering from agonising pain in his arms, as if the whole brachial plexus on both sides was affected. He got well, but I never ascertained the cause of the attack. Sometimes it is evidently a neuritis, of which I have just given examples. In one case the pain involved the *musculo-spiral nerve*, and there was great tenderness on the outer part of the arm, with paroxysms of intense pain on the back of the hand. In some cases the *ulnar nerve* is the one

affected, and in one instance of a lady the pain alternated with a feeling of coldness along the outer side of the forearm. I may here remind you of the pains in the arms associated with angina pectoris, and those met with in real spine disease, besides others which are of a neuralgic character associated with gout. We are constantly consulted by patients on account of pains and numbness in their arms and legs, which they fear are the onset of paralysis. This has often, too, been suggested by their medical man, who knows that pains of this kind do sometimes have a central origin, and who consequently warns his patients of the possible consequences. They are, however, more frequently of a neuralgic character, having their origin in morbid blood conditions. Let me ask you to remember neuralgia of certain joints, which are mostly met with in young women, under the name of *hysterical joints*.

Sciatica is one of the commonest of all forms of neuralgia. It is a pain commencing at the point of exit of the nerve, and extending all down the back part of the leg. Sometimes the pain takes the course of the tibial nerve, and at other times of the peroneal. In severe cases there may be tenderness over the course of the nerve, and the pain is usually aggravated by movement. The thigh may be slightly bent in walking, and the muscles spasmodically contracted and sometimes wasted.

There can be no doubt that sciatica is a very loose expression, and often used to cover ignorance when hip-joint disease, pelvic abscess, aneurysm, &c., are overlooked. In old persons the symptoms described as those of sciatica accord also very well with those of osteo-arthritis, and Mr Hutchinson's experience is that a very large number of cases called by this name are examples of hip-joint disease. There has always also been a difficulty in regarding sciatica as an affection of a nerve, from the fact that the character of the pain differs from what is seen in other neuralgias. In these the pain is felt in the distribution of the nerve or periphery, and not in the trunk itself, whereas in sciatica the pain is mainly or exclusively in the trunk itself. If this be the case it would look as if the parts around the nerve were affected rather than the fibres of the nerve proper. It is a disease much more common in men than women, which has been attributed to the difference in their clothing.

As regards treatment, we may use all the remedies found beneficial in neuralgia. In some cases iodide of potassium is very useful, and with this I sometimes combine the Tr. Actææ racemosæ. The daily injection of morphia will sometimes slowly cure the disease, just as the older method of sprinkling morphia on the abraded surface made by a blister. Hot salt-water baths and shampooing

are also very excellent remedies in very chronic cases. Galvanism also will sometimes effect a cure when all other remedies have failed; but it must be used in a different manner to that in which it is employed in paralysis. The method is to let the current simply run down the painful limb without moving the rheophores. The positive pole is placed over the spine or the hip, and the negative pole on the foot, and then the current is allowed to run for about a quarter of an hour or longer. In this way I have seen several cures effected. One man, æt. 31, had scarcely been able to walk for seven weeks, owing to the pain down the back of the leg. After five applications the pain had almost gone. Another man, æt. 55, had had sciatica off and on for years, and been twice in the hospital. He had on the last occasion suffered for several months. The continuous current was used by applying one pole to the loins and the other under the foot, and retaining them in these situations for half an hour daily. After six applications he was walking about, and said he was nearly well, never having been relieved so quickly before.

I have had a patient in whom the pain ran down the thigh in the course of the obturator nerve, and, no disease being discernible to cause it, we gave it the name of *obturator neuralgia*. When pains take the course of other nerves around the back, hips, and genital organs we suppose the existence of *neuralgia of the gluteal and lesser sciatic nerves.*

You may also remember a pain which we call *coccygodynia*, met with in women, in whom an operation by cutting down on the bone has been performed. If the pain run down the front of the thigh and leg we may have a true *crural neuralgia*, an example of which we lately had in the hospital.

CASE.—John N—, æt. 41, a blacksmith. Well until ten days ago, when he began to feel a stiffness in the left hip, as well as pains and weakness in the leg. These symptoms increased so that he was obliged to apply for relief. He was a strong, healthy-looking man, and nothing on examination could be discovered. He had pain in the left hip, extending along the front and inner side of thigh to below the knee. There was also sense of numbness. The pain was increased on flexing the thigh. He was ordered to keep in bed, and take iodide of potassium, with Tr. Actææ racemosæ. He gradually improved, and at the end of a fortnight could walk about the ward; and in nearly a month from the time of his admission he left the hospital well.

Quite lately a new operative measure has been performed for the cure of neuralgia, called *stretching the nerve*, and more especially in those cases where a neuritis has been thought to exist, as in contraction of the limbs, or in painful stumps. If is mentioned by Billroth, although I think he was not the proposer of the opera-

tion; it was first attempted in this country by Mr Callender. In the German case the median nerve was isolated, the surgeon pulled forcibly upon it, and the patient was cured. I suppose the *modus operandi* is by the breaking down of adhesions, and so altering the relation of the nerve fibres. A man was lately in this hospital who had had the operation performed at Chicago. After an injury to the back the legs became drawn up and rigid. Both sciatic nerves were cut down upon and stretched. He was relieved for a time, but the contraction again returned. Mr Durham has lately performed the same operation on the infra-orbital nerve with some success.

Internal and Visceral Neuralgias. — In the diseases of the several organs which we have to treat, neuralgia may be the principal symptom; as, for example, in the *mastodynia* or irritable breast of young women, which is sometimes associated with small hard tumours.

Angina pectoris, or cardiac neuralgia, is a hyperæsthesia of the heart. It is usually associated with degeneration of the muscular tissue and disease of the blood-vessels. The nerve fibrils are no doubt involved in the morbid process. The connection of the cardiac plexus with the cervical nerves directly through the cervical ganglia explains the pain which is often felt down the arm. Why this should be more often on the left than the right side is not very evident. It is a complaint which is necessarily incurable, but, showing its neuralgic nature, I have seen more than one case in which great temporary benefit was obtained by arsenic. It is also sometimes relieved by inhalation of nitrite of amyl.

Gastralgia is a complaint we shall be constantly called upon to treat. It seems to be a pure neuralgia, but it is not so evident where its exact seat may be; or whether the sympathetic or pneumogastric is most instrumental in the production of the pain. That the latter is capable of causing it is seen by cases of painful chronic ulcer examined by Dr Habershon, in which he found fibres of this nerve exposed on the walls of the ulcer. Addison's attention was long ago drawn to the fact of this disease occurring in young impoverished girls, who exhibited other evidence of neurosis in the frequent pleurodynia and other signs of what is called spinal irritation.

Enteralgia is an abdominal pain having its seat in the intestines, where some irritant cause for it may exist; or it may be due to a true hyperæsthesia of the nerves of the hypogastric plexus. Neuralgia of the *rectum* is often associated with hæmorrhoids or ulcer, but it may exist alone as a most painful disorder. Neuralgia of the testes, or *spermatic neuralgia*, is occasionally met with. I know

the case of a gentleman who for many years has had attacks of most excruciating pain in the testes. Nothing tangible has appeared, showing the purely nervous nature of the malady. Whether other solid organs suffer from neuralgia I cannot say; that is, whether there be, for example, a *hepatalgia* or *nephralgia*. It is certain that pains may exist over the liver and the region of the gall ducts without any evidence of disease, and also that patients may suffer with pain passing down from the kidney to the bladder, exactly as if they had stone, and yet that these organs may contain none. I have seen several such cases in women.

In nervous and hysterical women it is remarkable what a great variety of pains may exist, especially in the abdomen. It was the opinion of Briquet that these were situated in the muscles, and were therefore *myalgic*. There is no difficulty, however, in regarding them as purely neuralgic, when we consider the relation of the nerves of the solar plexus and mesentery to the neighbouring parts, and more especially when we observe the disturbance of the abdominal organs, as shown by dyspepsia, flatulence, and general depression. In lead poisoning, where we know the nervous system is affected, there is no reason why the sympathetic should not also be involved, and in this way enteralgia is explicable in those cases where colic is absent.[1] Where, however, as in true colic, the pain seems to be due to excessively powerful contraction of the bowel, and yet we know that ordinary peristalsis takes place without the production of any sensation, we are forced to believe that ordinary impressions are carried no further back than the next ganglion which takes cognisance of them, but that in the extreme contraction of colic the impressions proceed further on to the spinal system, and so to the sensorium, until we become conscious of them. In all visceral neuralgias we should have to acknowledge the same law, viz. that the sympathetic or other nerves being stimulated beyond their ordinary and due measure force their impressions beyond the sympathetic ganglia into the spinal system, and so on to the brain.

Cephalalgia, or Headache.—Of all the lesser ailments to which mankind is liable none is more common than headache. It may have its origin in organic disease within the cranium, or it may merely arise from sympathy with some other organ. In various morbid conditions of the blood headache is a very common symptom, not only in those dependent on a specific cause, as the contagious fevers, but where the blood is contaminated with some extraneous matter, as alcohol, urea, or opium. It is, therefore,

[1] Dr Fagge has lately shown the presence of lead on the whole surface of the colon, which was of a greenish-black colour.

merely a symptom, and does not require our direct attention. It is only when headache becomes the prominent trouble or special ailment from which the patient suffers that we have to regard it and treat it separately. It would be a question of much interest and importance to decide where the seat of the pain is. In cases of organic disease we find very often that tumours, softenings, and abscesses have existed in the brain substance without the production of any pain; whilst, on the other hand, disease of the membranes has given rise to the greatest suffering. It is difficult, however, to argue from these facts as to the seat of the pain in ordinary headache. A certain neurotic disposition is necessary for its production, since many persons declare that they have never had anything like a headache, and cannot conceive the nature of the pain.

Looking upon it clinically, you must remember the general and very severe headache accompanying morbid states of the blood in various fevers; then the pain associated with organic disease within the cranium. If the bone and membranes be the seat of it the pain is constant and localised; if the disease, as a tumour, be within the brain substance, then, if there be pain at all, it is very severe, and generally paroxysmal. Headache arising from gastro-hepatic disorder is generally characterised by a pain and feeling of weight across the forehead; whilst that of anæmia and exhaustion is altogether of a different character. In this case the pain and other sensations are felt at the top of the head, and it is in this region that the patient often feels a burning or sensation of creeping, intermixed with actual pain. This is a form of headache for which we are often consulted. It is daily and persistent. The patient wakes with it in the morning, and goes to bed with it at night. It is due to nervous exhaustion, and ceases with rest, good living, and tonic medicines.

Headache is sometimes produced in young people by straining their eyes when they have any anomaly of focal accommodation. It is at once cured by spectacles.

The principal case in which we are consulted for headache alone is that of nervous headache; this requires, therefore, our special consideration.

Hemicrania (Migraine) or Sick Headache.—This I shall dwell upon for a short time, because it is so common and peculiar in its nature that it deserves a place by itself, and because, as far as I know, a good description of it has not yet found its way into medical literature.[1] The reason of this omission probably is that medical men have cared little to make such a study of a mere functional disorder as

[1] This was when I first gave the lecture.

they would of a more marked or tangible malady, and perhaps also because, personally, they have had no conception of the symptoms attending it. I once knew a very eminent medical man of the melancholic temperament who told me he had no conception of what was meant by the term headache. I am sorry to say that this is not my case, and therefore I take this opportunity to draw your attention to a malady the particulars of which are, for the most part, gathered from personal experience. I am alluding to the affection popularly known as sick-headache, or technically as hemicrania or migraine. Like many other complaints, it is hereditary, and in a most marked degree. It is a complaint met with in members of particular families, and transmitted from father to son, whilst there are other families of different temperaments in which a headache is unknown. All the members belonging to a particular family may suffer, both male and female, and therefore the complaint is not to be considered as identical with the clavus hystericus, although the latter, I have no doubt, owns the same immediate cause. This might be included with hemicrania under the term nervous headache; but although clavus, because styled hysteric, may be regarded by some as a trifling disorder, there can be no doubt that the true hemicrania is a reality of the gravest kind, unfitting its victim, while it lasts, for all the avocations of life.

Being so frequently associated with stomach disturbance, it is often styled sick headache; head and stomach disorders standing in the relation of cause and effect, though constantly changing places. Remembering, however, that the gastric disturbance is often greatest when the primary cause is in the brain, the term hemicrania is not an unfit one; for, as a rule, although the pain may reach far over the head, it is most usually fixed to one spot, or is more concentrated on one side than the other. It may commence as a dull pain over the forehead, then, as it increases, pass down to one eye, and so to the temple, where it remains fixed. Exceptionally, the pain is at the top or back of the head. The pain is sometimes so violent as to deserve the name of neuralgia, but generally it is somewhat duller and of a most sickening character. Its great peculiarity is a throbbing that occurs with each beat of the heart, aggravated by every movement of the body, and more especially of the head itself. The movements required for washing and dressing on rising can scarcely be endured. The sufferer walks slowly, since everything which tends to make his arteries beat a degree more violently adds to his misery; in his head he perpetually hears or feels "throb," "throb," "throb," and his only relief is to support the head against a pillow or rest it on the hand, and to avoid all possible excitement. His whole attention is distracted by the

painful throbbing, and he becomes utterly incapacitated for business; every movement, every word spoken, aggravates the pain. His only desire is to be let alone. During this time he looks exceedingly ill, very pale, with a dark margin round the eyes, and the pupils contracted; he may have also indistinct vision, or hemiopsia, or dazzling lights or bright images before his eyes; there is a general feeling of chilliness over the whole body, excepting the head; the pulse at the wrist is feeble, whilst that in the head is strong. The anorexia is complete; the loathing of food being so great that it is often impossible to swallow a single mouthful, and sometimes there is actual vomiting. In a bad attack the stomach generally refuses food for twenty-four hours. There may have been no error of diet to account for the attack, nor any constipation of the bowels, as is often thought to be the case; although a disturbance of these parts is often one of the symptoms of the complaint. It is remarkable, however, that anorexia is not always present. Some persons, although suffering from headache, eat as usual, others vary in this respect, according to the severity of the attack; and, what is very remarkable, the sympathetic affection of the stomach is occasionally related to the seat of the pain. Thus, I have a patient who, if she awake with a pain over her right temple, is a sufferer the whole of the day, can eat nothing, and would be made worse by stimulants; whereas if the pain were seated over the left temple she would be relieved by a stimulant, and, as a rule, be better after dinner. She is always made worse by lying down, and this peculiarity in her own case she has observed as distinguishing it from a headache arising from a bilious attack. This case is not singular, for many patients tell me how the general symptoms vary with the seat of the pain. Another lady is always sick when the pain is over the right eye, but not when it is over the left. She is always sleepy, but is not better for sleep, as twenty-fours hours are necessary for the cure. The duration of a bad attack is generally several hours. If the person awake with it, the headache persists during the day, and it is only after another night's rest that he rises free.

If it should come on during the day it gradually increases in force, and then the night brings little comfort, for the throbbing, aching head entirely precludes sleep; indeed, the recumbent posture becomes impossible, and a sitting or upright position is the only one in which the patient can endure his suffering. I know several persons who cannot lie down, and whose only comparative comfort is found by spending their night in an easy chair. This is my own case during a bad attack. A young lady whom I occasionally see has attacks of migraine, with throbbing over the temple; as lying down increases the pain, she is compelled to sit up until the attack

is over. All remedies have failed to relieve her. When the attack is less severe, there is, fortunately for the sufferer, a strong disposition to slumber; he lays his head against any surface, and readily sleeps. I have observed, however, as regards myself, that if ever, during the evening, I feel drowsy, and, on lying down in bed, very quickly fall asleep, on the following morning I rise with a headache. How far the sleepiness induces the subsequent attack, or how far it is a mere symptom of the approaching disorder, I am uncertain.

The hemiopsia to which I have alluded has been fully described by Dr Hubert Airy in the 'Philosophical Transactions.' He himself is subject to it, as are also his father the Astronomer Royal and a great many other distinguished men. A spot of light appears near the centre, and spreads out in a luminous semicircle over the outer half of the eye. The outline, however, is not circular, but zigzag, or, as Fothergill said a century ago, like a fortification. It contains often all the prismatic colours, and is rather like a cloud with an edging of light of zigzag shape. It thus differs from hemiopsia arising from real paralysis. It lasts about two hours, and is quite unaffected by shutting the eye. From its shape Dr Airy proposes the name "Teichopsia" (τειχος, a wall; ὀψις, vision). He quotes Professor Dufour, of Lausanne, who is subject to the complaint, and who is always relieved by the application of cold water to the head.

Now, as to the cause of this misery, I have already said that whilst the body is cold the head is hot, and that whilst the radial artery is small the carotid is full; in fact, if the term determination of the blood to the head be applicable to any malady, it is assuredly to this. This irregularity in the circulation due to nervous influence has created much interest of late years, as I have already told you in describing various diseases. It has been clearly shown that the blood-vessels are regulated in calibre by the sympathetic nerves, and that the supply of blood is immediately under nervous control. Now, in this complaint of which I am speaking, the carotid on one side with its branches throbs inordinately, is apparently very full, and is sending too much blood to the brain and its coverings. This I knew when quite a boy, for when leaning my head on my hand I distinctly felt the increased size of the throbbing temporal artery on the side of the pain, which would be sometimes on the right and sometimes on the left side. I remember mentioning the circumstance to more than one medical man, and they received the statement with incredulity. I knew it, however, to be a fact, nevertheless, and am sorry to say I have been too fully aware of it up to the present day. The fact is, that in this distended throbbing carotid and its branches lies the source of the trouble. The vaso-motor nerve on

one side seems for the time paralysed, the vessels of the head dilate, more blood is sent to it, hence the increased heat, throbbing, and pain which the patient has to suffer until the tone of the nerve is restored. There can be little doubt of the truth of this condition when the head is felt to be hot and throbbing, whilst the feet and hands are cold, coupled with the fact of the aggravation of the symptoms induced by the recumbent posture. I may even mention another fact in proof of this increased arterial flow of blood. It is well known that activity of organic function is in proportion to vascularity. It is remarkable in the form of headache of which I am now speaking how quickened the mental powers often are. In spite of the distressing pain there are none of the low spirits evinced in much less painful abdominal affections, and the mind, as far as is possible, may be occupied with subjects requiring much vigour of thought. Indeed, some patients have told me that before the onset of an attack their minds have been in a state of the utmost tension, and that they have been the subjects of an intensity of thought which seemed to make them all but ready for the solution of the most subtle and difficult problems. I may remark that, although I have no doubt of the fact of the throbbing vessels and increased flow of blood, many demur to an explanation founded on a vaso-motor paralysis, but rather, since we have been enabled to measure better the pressure of blood, refer the condition to an increased tension of the vessels. This would, according to some theories, imply that there is a decreased flow of blood to the brain, a supposition supported, perhaps, by the pallor of the face, contraction of the pupil, and the evidence of general nerve disturbance at the onset. It would be very important, therefore, to ascetain whether in migraine there be more or less tension on the vessels, since the appropriate remedies might then be suggested. If the altered tension be due, as it seems to be, to a nerve cause, it is also important to discover why the nerves are thus acted upon. Since a stomach derangement usually accompanies the hemicrania, it is very frequently thought that the source of the trouble is always gastric, and that medicine of a particular kind will relieve. That this is partially true is no doubt correct, but just as frequently the complaint arises from a direct influence on the nervous system. Besides, if it does arise from the stomach, the cause is not the same as that which operates injuriously in the mass of people from over-indulgence in eating and drinking, where a more general headache is the consequence, but the gastric disturbance is dependent upon a number of trivial circumstances of which the sufferer himself alone has any knowledge. It may be said, no doubt, with truth, that gastric derangement is a very common exciting cause

in those who are subject to the complaint, but very frequently no cause for the attack is apparent, and certainly none attributable to the stomach. When the cause is evident, it is very often one which has acted directly on some portion of the nervous system, and to the non-susceptible would scarcely be credited with so powerful an operation. Thus all worry, excitement, or overwork will readily produce a headache; walking in the sun is a very sure method of inducing an attack; strong impressions on the olfactory nerve, as the smell of paint, and in some persons the odour of spring flowers; also impressions on the retina, as long use of the microscope, or a protracted visit to a picture gallery. An atmosphere overcharged with carbonic acid is one of the most fruitful sources of headache, as that of a crowded assembly-room, and what would affect myself at once and in the most intense degree would be the presence of unconsumed carbon from candles or lamps. Loud noises in the ear will also cause a headache. One patient says that listening attentively will also bring it on; in fact, it would seem that a strong impression made upon any part of the nervous system is sufficient to induce an attack. Probably derangements of any organ might cause it, not only of the stomach, as we constantly see, but of the uterus in women, more especially at the catamenial periods. Some of the most violent attacks which we witness are in women at these periods. There are those who are doomed every month to an illness of a few days, with intense headache, prostration, and sickness; if there be much uterine pain, the case is styled one of dysmenorrhœa, and the cause attributed to the uterus, which may or may not be true. Those, of either sex, who are thus liable to violent headache, are deprived of many of the pleasures of life, since irregularities of any kind are so apt to lead to their wonted complaint. Under the most favouring circumstances, however, it is my experience that they can never escape an occasional attack. There is no doubt that persons subject to gout are liable to headache, and that the same causes which are favorable to the production of one may induce the other.

I said just now that headache was closely associated with sleepiness. How the two stand as regards cause and effect is difficult to say, but I do know that the warding off sleepiness may prevent headache. I have been frequently told by patients that "forty winks" after dinner will allow them to have a wakeful and bright evening, but the loss of this will render them sleepy and dispose them to seek their bed. They then sleep heavily, and wake with a headache; or if after a walk or exertion they should feel tired and sleepy, and fearing the accustomed headache, they have taken a cup of coffee or tea to counteract the sleepiness, they have escaped the

attack. This is much my own case, in which also the converse is true, that being kept awake all night or several nights would not produce a headache. Inasmuch, then, as there is some close association between sleeping and headache, and inasmuch as all considerations point to an anæmic state existing during sleep, it would be conjectured that in migraine the same condition prevailed; but, as before said, my own observations would lead me to consider that hyperæmia was the accompaniment of headache, judging from the fulness and beating of the vessels, the relief obtained by sitting in the upright position, and by the application of cold to the head. I might also mention that in a case where ciliary neuralgia alternates with migraine the vessels of the eye become extremely full, and in cases of disease of the brain where the post-mortem has revealed intense congestion and thrombosis headache has been the most prominent symptom. It is difficult, therefore, to reconcile some of the facts observable in this strange complaint.

That the headache must be intimately associated with the state of the circulation there can be no doubt, and thus it is that the most trivial circumstances may cure a headache. The necessity to do some mental work, although accompanied by a great effort, may sometimes cause the pain to depart.

Many writers, observing the strange onset of an attack of migraine, have thought that it might be a variety of epilepsy, and such an opinion has suggested itself to Anstie, Liveing and Fagge. As a matter of experience, I have no reason to think this. Epileptics do not suffer from headache, and, on the other hand, I know several "headachy" families, but have not found that any members suffer from epilepsy.

The immediate seat of headache is not known; various opinions have been given. Many have denied that it is in the brain itself, seeing that the organ may be diseased in various ways without pain being present. Some have considered that the pain resides in the dura mater, and originates in the branches of the fifth nerve, which are distributed to this membrane. Briquet, who has in his investigation of various hysterical conditions shown that many local pains are in the muscle, or myalgic, considers that headache is of the same kind, the seat of it being in the temporal and occipito-frontalis muscles. I suppose that one's own feelings ought not to influence the judgment, otherwise it would be thought that the pain is situated in the very depths of the brain itself. I once had an opportunity of testing the power which the individual has in discovering the seat of pain. Having scalded my head with steam issuing from a pipe to vaporise a sick room, I endeavoured to analyse the character of the pain which followed, but was unable

to discover how it differed in kind from the pain of ordinary headache.

As such trivial causes are sufficient to induce an attack of this hemicrania or migraine, it might be supposed that some equally slight circumstance might be sufficient to counteract or cure it. I should think it probable that such is the case, although, after long searching for the remedy, I have not yet discovered it. Certainly the ordinary aperient doses which the medical man so commonly prescribes for a headache are useless; besides, the attack may have spontaneously subsided before there could be any expectation of a result from the medicine. The act of vomiting, however, does in some cases afford very speedy relief. This is not by getting rid of any crudities, for the stomach may be empty, and therefore the effect must have been through the nervous system. As regards stimulants, as a rule they cannot be prescribed; they often aggravate the complaint to an intense degree, although I have found that in some milder cases a little brandy-and-water or a glass of champagne has, after a short period, been apparently beneficial; sometimes a cigar. Of all remedies, perhaps tea is the best, but I am not quite certain what amount of benefit is to be ascribed to the tea, and what amount to the hot water. Tea, of course, is well known to have a direct and marked action on the nervous system, and thus it might appear absurd to raise a doubt as to its efficacy did not I know more than one person who obtains more relief for a headache by sipping very hot water than by any medicine which has ever been prescribed.

Those who have any knowledge of the perpetual and horrible throbbing in the brow or temple also know that nature prompts us to seek relief by pressure on the aching part. Leaning the head against the hand or any other object is in obedience to what instinct dictates. On lying down, if the attack be not too severe to allow it, the aching brow is always pressed against the pillow. By more direct and intentional pressure a more marked relief is obtained. Pressure on the carotid in the neck will produce a suspension of the throbbing and the pain, but the effect is only for a time, as the blood apparently soon finds its way to the head by other channels. Although the use of pressure may at the present time have a show of reason, it has no doubt always been adopted at the dictate of nature. It is probable that medical authors may allude to the method, but we need only go to our own Shakespeare, who appeared to be possessed of universal knowledge, to lead us to the belief that it must always have been in common use. Thus, in the scene between Hubert and Arthur, in 'King John,' when the latter is petitioning for the preservation of his eyes:

"When your head did but ache,
I knit my handkerchief about your brows."

Also, as you know, in 'Othello' the main feature of the play lies in the loss of a handkerchief, which Desdemona produced for the object I have been mentioning.

Desdemona. Why do you speak so faintly?
Are you not well?
Othello. I have a pain upon my forehead here.
Desdemona. Faith, that's with watching; 'twill away again:
Let me but bind it hard, within this hour
It will be well.

Then, again, besides pressure, the application of cold gives relief, as a wet cloth bound round the temples. I have already alluded to the effects of cold and heat upon the nerves, and the resultant influence on the blood-vessels; thus, cold is said to depress the action of the nerve centres or ganglia, and heat to excite it; consequently the former would be used when we wished to remove nerve stimulation and cause a greater flow of blood, whilst heat would be used for a contrary purpose, as to check hæmorrhage—at least I believe it is said that heat to the spine will repress hæmorrhage from the uterus, whilst cold will produce warmth in the extremities. However this may be, and on the supposition that the theory is true, there must be immense difficulties in the way of making the application to the appropriate part; so we must be content with the fact that it is cold, and not heat, which affords most relief in headache. It may be that the cold acts directly on the vessels to constringe them, and thus causes the diminution and lessened blood-supply. The object required is to lessen the force of the head-vessels, for it is certain that whilst the pulse at the wrist is low, and the whole body inclined to be cold, the head is hot and throbbing. As the cause is nervous, our agencies should be directed to the fountain-head, and thus it is by no means improbable that something may be discovered which may have the power of affecting the sympathetic, and consequently curing the malady. For this purpose various remedies have suggested themselves, and theoretically galvanism to the neck or head would be beneficial. I have only used it a few times, and with some success.

As regards remedies, when I first gave a lecture on this subject I said that I knew of none, and even now, in many cases, every known drug fails to have any effect. The fact that I can at the present time declare that means have been discovered which can ward off or even cure a sick headache, speaks volumes in favour of an advance in therapeutic knowledge. As these remedies act specially

on the nervous centres, it is probable that they relieve by influencing the tension of the blood-vessels, especially as we know that simpler agents apparently operate in this way. For example, relief is obtained by the application of cold to the head, by a warm bath, or by placing the feet and hands in hot water. Amongst the simpler remedies in the more constant form of headache, bromide takes a good place; either in continued doses or in one large dose. There are persons in whom a scruple dose will produce sleep or quiet, and a speedy relief to their headache. I have found in several cases that *cannabis indica* long persisted in has warded off attacks for a very long period. I am in the habit of giving this once or twice daily for some weeks, with the best effect. Opium or morphia injection is sometimes the only remedy which has any power over the neuralgia, but unfortunately the unpleasant effects often forbid its use. In very bad attacks, however, the relief obtained is speedy and marked. Aconite, I have been informed, when given in a full dose, is sometimes followed by a very rapid relief to the pain, but I have no experience of it. In the same way nitrite of amyl has been recommended, and since we know its effects in dilating the capillaries in the head and brain, I should think that there can be no doubt that some striking effect must follow its use either for good or for evil. Then comes the last new remedy guarana; this I had been acquainted with for some years, and even had taken it myself before I made its value known to the profession. It had been quite useless in my own case, but considerable success with others made it clear that a really efficacious remedy was in our hands. My first method was to give about a scruple of the powder when the attack was coming on, and this would often avert it; to be followed by another powder if the first was not successful. In some cases where the headache has been very frequent, I have given smaller doses three times a day for several days together. We have now a liquid extract of guarana, which is a pleasanter preparation. Although the remedy altogether fails in some cases, there are others where the effect is so marked and speedy that no doubt can be entertained as to the power of this drug over migraine. I have received communications from a great many persons bearing witness to its efficacy. Amongst my notes I find one patient, a farmer's wife, who says she could never go out to tea, to market, or for a drive, without returning with a headache accompanied with much sickness, lasting always twelve hours. She carried guarana about with her, and took half drachm doses in tea at any time when she was squeamish or had a headache, and was always relieved within an hour. After taking six powders she had headaches much less frequently, and after

another half dozen could do anything or go anywhere without any headache coming on. I could quote a large number of cases in the fashion of the quack advertisements. Thus, a young lady writes, "I have found much benefit from the guarana powders you recommended me; they almost invariably cure my headache." A gentleman writes, "The headache remedy has been a wonderful success with me, and I am now almost a stranger to the pain." A young lady says, "I write to let you know the result of the guarana powders which you recommended to me. I think I may say it is decidedly satisfactory, as last Wednesday I woke up with all the symptoms of one of my bad headaches, and I took one of the powders immediately before breakfast. By midday I felt better, and by three o'clock my head was quite well. I felt all the more satisfied, because I know that otherwise by that time I should have been fit for nothing. It is the first thing I have tried with any success."

I have tried *caffeine*, but not with much success. I now rely mostly on cannabis.

Various local applications will sometimes cure neuralgia—when this is probably not of the migraine type—as galvanism, blisters, and the vapour of bisulphide of carbon, applied by means of a bottle containing a small quantity of the liquid placed on wool.

LOCAL PARALYSIS

Paralysis, besides arising from disease in the spinal centres or at the origin of the nerve, may occur from some affection of the nerve itself in the course of its trunk or at its periphery. The mere fact of the palsy being localised is sufficient very often to show its external character, for the tendency would be for it to extend or spread should it have a central origin. Moreover, it is not yet decided whether every spot in the cord does rule exclusively over a few muscles or muscular fibrillæ, and therefore, if diseased, necessitate a corresponding paralysis. Our knowledge seems rather to indicate that the roots or origins of the nerves are spread through so large a field of surface and are so interwoven with others that disease of any one spot cannot produce a complete paralysis of a muscle, and therefore whenever this is met with, it would imply some involvement of the nerve trunk itself. An example of this is seen in the case of paralysis of the seventh nerve.

The effects of galvanism also are very different in the two cases of central and local paralysis. Marshall Hall had already distinguished between cerebral and spinal paralysis, with regard to their electrical susceptibilities; in the one case referring to such a paralysis as hemiplegia, where the connection between the brain proper and the

spinal cord is severed, and in the other case to a paralysis arising in the cord itself. Of late we have further found that the two forms of galvanism act differently, according as the paralysis is local or central. For example, when a nerve has been injured from cold, pressure, or other cause, so as to produce paralysis, its trunk loses its susceptibilities to the faradaic and galvanic currents; and as regards the muscles which it supplies, these begin to waste, and very soon lose their excitability to the induced current or faradisation, whilst they remain susceptible to the primary or battery current. We shall see this in the case of ordinary facial paralysis and other forms of local palsy. By thus discovering that a particular form of paralysis is more susceptible to one kind of galvanism than to another, we are led to know which will be the one to effect a cure. We use electricity also not only to test the electro-mobility of a muscle, but also its electro-sensibility, since the latter varies very much in different forms of nerve disease.

We will first take paralyses of the cranial nerves, and then pass on to some local paralyses of the extremities and muscles of the trunk.

You may observe this fact, that if several cranial nerves are clearly involved, and these nerves have an origin near one another, we may surmise the existence of disease in those centres where they arise; but if, on the other hand, several nerves are affected which are separated in their origin, it will be found that probably their trunks are involved rather than their origin, and to account for this we must suppose some large patch of lymph spread over them. This is exactly what syphilitic inflammation brings about, and therefore we suspect its presence when we observe a number of nerves affected which have no central connection.

First, or olfactory nerves.—As regards paralysis of these nerves, if they be affected alone, the cause is found in disease of the cranium, and then there is total loss of smell. For the complete integrity of smell the mucous membrane of the nose must be sensitive, and its secretion healthy. It may therefore be impaired, as well as that of taste, in paralysis of the fifth nerve; but, showing the two senses are absolutely distinct, we often meet with cases where common sensation is perfect, whilst the sense of smell is lost. There is now a patient under my care where this is the case; and I often see a young man who, when a child, had a fracture of the frontal bone and injury to the brain, followed by a total loss of smell; but ordinary sensation is perfect. He has also partial loss of taste, but it must be remembered that this is a very complex sense, dependent upon odour and common sensation as well as upon its own special power. Dr Ogle has related several cases of *anosmia* resulting from injuries

to the head, which involved the olfactory bulbs, and in this way the experiment is made for us by which we can analyse the sense of taste. In such cases it is common for patients to say they have lost the sense of taste, but it will be found to apply only to those substances which have flavours, since acids, sweets, salines, and bitters, can still be appreciated, which shows that the true sense of taste can apply only to these qualities.

Second, or optic nerves.—These are constantly affected in connection with brain disease, as I have frequently mentioned; optic neuritis being very common, but the mode in which it comes about, from the presence of such a disease as a tumour in the brain or cerebellum, is not very clear.

Pupils.—Little, too, can be said positively as to the interpretation of alteration in the size of the pupils. Their movements depending upon different causes, you may see how their condition may be frequently deranged. You know that the circular fibres of the iris being supplied by the third nerve, a paralysis of this nerve will often produce a dilatation of the pupil; and you know how late experiments have shown that the radiating fibres are supplied with motor filaments, which run into the cervical sympathetic; and thus how pressure on this nerve, as is seen in cases of tumours of the neck, will cause contraction of the pupil. It has been found that irritation of the upper part of the spinal cord and upper thoracic nerves will influence the pupils through these same nerves, and also any affection of the first division of the fifth pair through the same channel. The exact nature of the nervous filaments which supply the radiating fibres of the iris has not yet been satisfactorily determined. It is clear that the ophthalmic nerve of the fifth has a power over the pupil, but this may be derived from the third or the sympathetic, seeing that the ciliary ganglion has sensory nerves from the ophthalmic, motor from the third, and sympathetic from the plexus. Through these it is connected with the so-called cilio-spinal centre, which is situated between the sixth cervical and second dorsal vertebra. Apart from these very definite and well-ascertained causes which influence the pupils, it is observed that they become altered in size under a great variety of circumstances. In the general paralysis of the insane, and in locomotor ataxy, the pupils are, as a rule, diminished and unequal in size; and the same condition may be observed in some other chronic diseases affecting the cerebro-spinal system. In various acute diseases of the brain the pupils are altered, but I am not aware that any definite lesion is necessarily associated with the phenomenon. In cases of pressure on the brain from effused blood, the pupil is often larger on one side than the other; and I have seen a case of chronic hydrocephalus in which the pupil of the side

on which the patient lay was always more dilated than the other. But although a difference in the size of the pupils will do little more than denote cerebral trouble, an extreme condition of dilatation or contraction always indicates a very serious affection of the brain. For instance, in ventricular effusion the pupils become, as a rule, widely dilated. This fact you should well bear in mind, because, on visiting a child suffering from head disease, you may be informed by the mother that it is in a "nice sleep," but when you raise the eyelids you find the pupils widely dilated. You know that in sleep the pupils are contracted, and so remarkable is this circumstance that, if you place the child before the window, their size remains unaltered, but immediately you awake him the pupils expand, although the light is still shining upon them. At the same time remember that a contraction of the pupil is an equally unfavorable sign in many cerebral disorders and more especially in apoplexy. In those fatal cases where blood has burst into the ventricles, or diffused itself over the base of the brain, the pupils are often found minutely contracted, just as they are in cases of effusion into the pons. In all cases contracted pupils denote a grave disturbance of the sympathetic nerve, either in the cervical ganglion, in the course of its fibres, or in the cilio-spinal region of the cord. Thus it is that in many chronic spinal affections myosis is seen. It is thought by some that the state of the pupils will inform us of the nature of the cerebral lesion. Certainly, a well-marked change in the pupils will always indicate something serious, but a natural condition may exist in most important diseases. Thus, I do not know that you can tell concussion of the brain or drunkenness by the pupils. In uræmic coma I have observed the condition of the pupils over and over again, and should say that they are not affected. I have repeatedly seen cases brought into the accident ward where injuries to the brain had occurred with various amounts of effusion of blood, and where the pupils, although at first contracted, afterwards became dilated, showing that the slightest change will affect them whilst the main lesion remains unaltered. You must also not only observe the size of the pupil, but whether the iris can still be stimulated by the influence of light upon the retina. In recent injury or acute disease, if there be immobility of the pupil when the light of a candle is thrown upon the eye, it generally is an evidence of some affection of the brain in which the optic tracts are implicated. You must also remember the sympathy which exists between the two eyes, and how the perfect susceptibility of the one will influence the other; hence the necessity of examining each eye separately. As regards the state of the pupils after death, I think no conclusion can be formed from their size, as they alter when life departs. We want more

facts with reference to their post-mortem state in poisoning by opium.

Paralysis of the third nerve.—There is paralysis of the muscles of the eye, excepting the superior oblique and external rectus, as well as of the levator palpebrarum and sphincters of the iris; there is generally, too, dilatation of the pupils, but this is by no means constant. In a case of paralysis of the lower branch only of the third nerve there was no ptosis, but the pupil was dilated. If the pupil is dilated to the utmost, atropine has no further effect upon it. It is curious to observe how readily this nerve becomes paralysed, either in association with disease of the brain or standing alone without any other symptom, The paralysis may come on suddenly, without any apparent cause. and in a slight degree is often seen in drunkenness, hepatic disorders, migraine, and other temporary disturbances of health. In connection with syphilis, mydriasis may be seen with or without any ocular paralysis, as if a portion of the nerve, as the ciliary branch alone, could be affected, and cause the dilatation. In sleep you know that the eye is turned upwards and inwards, and the pupil is contracted. Some physiologists have traced the roots of the third nerve to the corpora quadrigemina, which may indeed be also the origin of the optic, a fact of importance in relation to the connection between the muscles of the eyeballs and the retina. In tumours at the base of the brain and the cerebellum we often meet with complete blindness, dilatation of the pupils, and nystagmus. It is really very difficult to know what importance to attach to strabismus apart from other symptoms. In a case of severe illness, where cerebral mischief had been for a long time doubtful, its occurrence would be of serious moment, whilst under other circumstances it might be of no importance. The cases of squint, for example, so often operated on by the ophthalmic surgeon, may have occurred without any marked illness. I know now of the case of a child who has intermittent attacks of strabismus; every few days it is observed that her eyes converge, and after a few hours become straight again, but otherwise she appears to be in perfect health. What appears more alarming, is the occurrence of a sudden complete paralysis of the third nerve with ptosis. I have known this to happen without any other symptoms whatever, and where effusion of blood in the cavernous sinus, or some similar diagnosis, has been made, although founded on pure conjecture. I am now seeing a gentleman who was suddenly seized with ptosis and inability to move the eye, as in paralysis of the third nerve. I need not trouble you with the mode of testing which eye is affected in diplopia, as this is taught by the ophthalmic surgeon. I might allude to a remarkable case now in the clinical ward, of a man

who has double paralysis of the third nerve, and sees every object as three; that is, he sees double with the left eye. The explanation is difficult, as he has not astigmatism.

Mr Hutchinson has made a very clear exposition of the varying states of the pupil under different circumstances, and his observations are so valuable that, although I may repeat myself, I will briefly give them.

Activity means a normal state of the irido-motor nerves, but does not necessarily mean a soundness of the sensory part of the apparatus. Sluggishness implies some defect in the vaso-motor nerve. When one is sluggish, and yet responds when the other eye is open, it implies that the irido-motor apparatus is sound, and that the defect is in the percipient structures. If it does not act in concert with the other, but yet the sight is good, it shows a fault in the motor nerves. If there is a failure of accommodation as well, then probably the lenticular ganglion is at fault.

Mydriasis means a dilatation and *myosis* a contraction of the pupil due to a paralysis, spasm, or some artificial cause. When the iris ceases to act the case is one of *iridoplegia*. Paralysis of the ciliary muscle and power of accommodation is called *cycloplegia*. When the circular and radiating fibres of the iris are paralysed, together with the ciliary muscle, there is cessation of all muscular action within the eye, and the case is one of *ophthalmoplegia interna*. Paralysis of the ocular muscles is a case of *ophthalmoplegia externa*.

Although spasm may produce dilatation or contraction of the pupil, yet practically we rarely see it, nearly all the alterations being due to paralysis. Dilatation due to this cause is temporary, as in epilepsy, but myosis from spasm has never been positively shown to exist.

The iris is supplied by the third and vaso-motor nerves. The short root of the ciliary ganglion comes from the branch of the third, supplying the inferior oblique muscle, whilst the vaso-motor come from the carotid plexus. These, after passing through the ciliary ganglion, are distributed to the eye, and mainly to the radiating fibres. There is also a direct supply, independent of the ganglion. The long ciliary nerves are said by some to convey filaments to the iris. The ciliary muscle is supplied by the third nerve. Dilatation of the pupil is generally caused by a paralysis of the third nerve, or by its short root only, before it enters the ganglion.

In diphtheria we often see cycloplegia without mydriasis. In affections of the sympathetic in the neck the pupil is not always contracted; it is rather paralysed.

The two pupils may be of moderate size and equal, but if each in turn be shaded it may be found that one dilates and the other not.

If there be disease of the third nerve before it enters the ganglion, then a paralytic mydriasis results with more or less dilatation of the pupil. If the sympathetic be affected behind the ganglion, then paralytic myosis results.

The nerves are distinct before they reach the ciliary ganglion, where they become associated and give off filaments to the iris. If the ganglion is diseased we should expect paralysis of all the muscles of the eyeball and of the ciliary muscle; the pupil would be absolutely motionless. This would be ophthalmoplegia interna, which is generally seen in connection with syphilis. There has, as yet, been no proof of disease of the ganglion from post-mortem examination.

In ataxia the vaso-motor is affected, producing paralytic myosis. There might be a temporary paralysis of the third nerve, but the permanent condition is generally due to affection of the sympathetic. There is not always a small pupil, and one is usually affected more than the other.

These remarks are an abstract of Mr Hutchinson's various writings on the subject.

I have said that there is scarcely a disease of the cerebro-spinal centres in which the pupils may not be affected, and this appears the less remarkable when we remember how the pupil is affected by slight and transient emotions passing through the brain. We may observe sometimes a child with its back to the light, waiting or watching with intense interest, with the pupils so extraordinarily dilated that we have to bring a light to bear upon the eyes before we are sure of their normality. To what extent the pupil is affected by emotion I cannot say in a scientific sense, and I find nothing on the subject in medical works; but every one recognises the varied expressions of the eye in love, fear, or passion, and this depends much upon the state of the pupil. In the lower animals it is easy to watch this correspondence between the mental state and the size of the pupil. In my parrot the iris is constantly oscillating, and the widely-opened pupil, when she is in a benevolent mood, is in marked contrast to the contracted pupil of anger. In highly vivacious and intelligent children the wide pupil will be constantly observed, and it is the expression produced by this which painters aim at in giving beauty and purity to a face. It is said that the signification of belladonna is to be found in the capability of this plant to produce a large pupil.

I apprehend that the facts of which I speak are generally known, for a lady to whom I mentioned the subject said she was quite con-

versant with them, and that she herself had observed that if a woman in a drawing-room was addressed by a number of gentlemen wide dilatation of her pupil would at once betray the one for whom she had a "penchant." Artists certainly in painting religious subjects pourtray this state of the eye in those who are looking up in an attitude of adoration. Novelists, too, know it or assume it.[1]

Paralysis of the fourth nerve.—The pupil is slightly raised above the lower lid. There is no power of rotating the eye, and it moves with the head. If an object is looked at on a plane, the image approaches when the eye is directed upwards, and recedes when directed downwards. The simple test is this, if the person affected look at an object (say a pen) below the horizontal median line, he has diplopia, and that eye is the one affected which forms an image inclined towards the other.

Paralysis of the fifth nerve.—There will be loss of sensation of half of the face, from the middle line running backwards to the front of the ear; the posterior half of the ear and lower lobe being supplied by the auricularis magnus. There is also loss of sensibility in the eye, the nose, the front part of the mouth, the gums, and the tongue; so that, on eating, the tongue may be lacerated, and the patient not know it. The taste is unaffected, and this confirms Reid's views, that the sensory nerve to the tongue is not that of taste. The smell and hearing are not necessarily affected, although they are sometimes impaired, owing to the mucous secretions having become altered. In a case related by Althaus of double paralysis of the fifth there was no lachrymal secretion and no salivary secretion, but there was an abnormal discharge of mucus from the eyes, nose, and mouth, which formed a thick frothy layer on these parts.

In most cases of paralysis of the fifth nerve the cornea becomes ulcerated, and this fact has given rise to much discussion as to the influence of the nerve on nutrition. Those who have disputed this inference have offered in its place the explanation that irritating substances having got into the eye, which has lost all knowledge of their presence, an inflammation has been set up; and this is proved, they say, by the fact that if the eyelid be kept closed

[1] "Véronique était changée pour quelques instants. La prunelle de ses yeux, douée d'une grande contractilité semblait alors s'épanouir et repoussait le bleu de l'iris, qui ne formait plus qu'un léger cercle. Ainsi cette metamorphose de l'œil devenu aussi vif que celui de l'aigle, complétait le changement étrange du visage. Était-ce l'orage des passions contenues, était-ce une force venue des profondeurs de l'âme qui agrandissait la prunelle en plein jour, comme elle s'agrandit ordinairement chez tout le monde dans les ténèbres, en brunissant ainsi l'azur de ces yeux célestes?" (Balzac.)

by strapping, the ulcers will heal. Experiments on animals, however, seem to show that covering the eye makes no difference in the result, as corneitis always takes place, as well as ulceration of the mucous membrane of the nose. It is thought that the trophic nerves proceed from the Gasserian ganglion, and the ulceration depends entirely upon whether the disease of the nerve is on its distal or cerebral side. But here, again, experimenters do not seem to confirm the opinion that the nutritive changes depend upon injury to this ganglion. The pupil, also, is often contracted, as is seen in paralysis of the sympathetic of the neck; but as the ciliary nerves from the otic ganglion are in connection not only with the third but with the ophthalmic and sympathetic, it may be accounted for in this way. In connection with the inflammation of the cornea you ought not to forget the herpetic eruption in the neighbourhood of the eye, as well as the conjunctivitis often associated with neuralgia of the ophthalmic nerve.

Then, besides the loss of sensation, there is paralysis of the masticatory muscles, the pterygoids, temporal, masseter, anterior belly of digastricus, mylo-hyoid, and tensor palati, so that the patient cannot chew on the affected side, and if the hand is placed on the face no muscular contraction is felt. It may happen occasionally that each branch is separately paralysed. If it be the *first* division, there would be anæsthesia of the upper eyelid, conjunctiva, ala of nose, and the pupil would be contracted; if the *second* division, the nose, cheek, and upper jaw would be anæsthetic; and if the *third* division, the cheek and front of tongue would be anæsthetic, and the muscles of mastication paralysed.

It is interesting to observe the experience of a good clinical physician before the introduction of any physiological knowledge into the wards to bias him. Abercrombie says, in respect to paralysis of this nerve, "A remarkable circumstance connected with the affections of the fifth nerve is the tendency to inflammation and sloughing in parts which have lost their sensibility, particularly in the eye. A very instructive case occurred to my friend Dr Alison. The patient had loss of common sensation of the left side of the face, the left nostril, and left side of the tongue, with insensibility of the ball of the eye. There were frequent attacks of inflammation of the left eye, with dimness of the cornea, which were relieved from time to time, but at length the cornea sloughed out, and the contents of the eye were discharged. The muscles of the left side of the jaw were paralytic, and felt quite flaccid when the patient chewed or clenched the jaws, but the motion of the muscles of the cheek was unimpaired. The nerve was found, after death, to be almost destroyed near the ganglion."

Paralysis of the sixth nerve. — This nerve has its nucleus adjoining that of the seventh, and is occasionally paralysed with it.

Paralysis of the seventh or facial nerve.—This may arise from disease at its origin, at its course through the temporal bone, or at its periphery. The first form existing as an independent disease is almost unknown, for central paralysis occurs generally with other nerve lesions, as in hemiplegia. The second form is more common, and may remain as a permanent lesion, owing to a destruction of the nerve trunk. The third or peripheral variety generally arises from cold, and is the commonest form met with. You can understand that, the nerve having various connections, the symptoms would vary in these three forms, and how a peripheral paralysis would differ from one arising from disease of the trunk whilst it lies in the Fallopian canal.

In *peripheral paralysis of the facial* the expression of the face is very striking, for, owing to the loss of muscular tension on one side, it falls, whilst the opposite side is drawn up. The distortion is much increased in smiling or talking, or whenever the influence of the will is exerted on the muscles. Thus, the patient cannot wrinkle his forehead, cannot close his eyes from paralysis of the orbicularis palpebrarum and corrugator supercilii, and when he attempts to do so the eyeball is seen to roll upwards and generally inwards. When he sleeps the eye remains open, due mainly to the drooping of the lower eyelid, as the upper is counteracted by the levator palpebræ. Horner's muscle being also paralysed, the tears run over. If the patient take a deep breath the nostril is observed not to expand on the paralysed side, but falls in, and sometimes the tip of the nose is turned to the opposite side. Owing to paralysis of the lip, the angle of the mouth falls, and the opposite one is drawn up. The patient cannot speak as he should naturally, and is unable to whistle; the mouth is screwed on one side, and he cannot draw back his lips to display his gums; the saliva also runs from that side of the mouth, the buccinator is paralysed, and the cheeks puff out. He can chew well, though food gets in the cheek.

In *paralysis of the trunk* it was long ago observed by Romberg that the velum palati is sometimes paralysed; it cannot be lifted on one side, and the uvula is turned towards the weak side, the voice at the same time becoming nasal. He believed that, with these symptoms, the nerve was diseased in its course through the passage, and that the large superficial petrosal nerve had become involved, this nerve being attached to the seventh in the Fallopian canal, and communicating with Meckel's ganglion. In this way the

levator palati and azygos would obtain their nerve supply. Romberg and others have also thought that the tongue was sometimes paralysed, but I think that this is very doubtful. It was accounted for on the supposition that the chorda tympani nerve supplied the styloglossus and some fibres of the lingualis, a belief not now entertained. This is one of those cases in which Waller experimented according to his method. He showed that if a nerve were divided its branches wasted or underwent fatty degeneration in two or three weeks. Therefore, in reference to any supply to the tongue by the facial, he cut this nerve, and a fortnight afterwards examined the tongue and found no change in its nervous fibrillæ. He concluded, therefore, that the chorda tympani did not supply the tongue. This nerve is now known to have another function. It passes to the mucous membrane of the tongue, and to the submaxillary gland. and is known to be intimately associated with the *sense of taste.* Physiological observers had long discerned the function of this nerve, and have now pretty well agreed that it is the nerve of taste. Numerous cases of disease have occurred to corroborate the conclusions drawn from their experiments, where disease of the facial has affected the sense of taste, whilst it has not been destroyed in disease of the fifth. Cases under my own care have sufficiently established this, especially one where it was evident from other symptoms that the disease of the seventh nerve was in the trunk. In this case, when the tongue was protruded, common sensation was found to be perfect, but if any salt or sweet substance was placed on one side of the tongue, towards the tip, the patient could not taste it. In an instance related by Dr Noyes, of New York, where there was disease of the temporal bone, any pressure on the ear would cause a peculiar sensation at the side of the tongue, and a flow of saliva. Subsequently, from an extension of disease, a complete paralysis of the facial ensued, together with dryness of the tongue and loss of taste. Other observers have also shown how the chorda tympani sends fibres to the papillæ of the tongue and submaxillary gland; so that if it be involved in disease there ensues dryness of its surface, loss of taste, and diminished secretion of the submaxillary gland. If it be the nerve of taste, as now appears to be conclusively shown, another question arises how it becomes so. It has been conjectured that this property is derived from the superior maxillary through the petrosal and Meckel's ganglion. An objection to this is to be found in the case published by Dr. Heslop, where although a tumour destroyed the petrosal nerve in common with the fifth, no loss of taste ensued. Others have thought that the chorda tympani is really derived from the facial, but has its special function obtained from the root called the nerve of

Wrisberg. You may remember, therefore, that there is only loss of taste in those cases of paralysis where the lesion is above the spot where the chorda tympani is given off. In testing this sense you should not forget that sweets and salines are appreciated only by the tip of the tongue, while bitters are better recognised by the posterior part which is supplied by the glosso-pharyngeal. The nerve of which we have been speaking has to do only with the anterior two thirds of the tongue. Much care also is required in judging as to what is meant by taste, since many so-called tastes are merely smells appreciated by the olfactory organs. This fact may be proved by closing the nostrils when the taste disappears; also it may be nothing more than the sense of touch expressed by such terms as cool, hot, burning, &c.

The seventh nerve supplies also the platysma, the muscles of the auricle, and the stapedius. The tensor tympani is supplied by the fifth. *Deafness*, therefore, may be a symptom of disease of this nerve, and it may occur under three different conditions. The paralysis may have a central origin, and, the portio mollis being likewise affected, a perfect deafness would result. It may also arise from destruction of the organ of hearing in the petrous bone, and thus have the same cause as the paralysis of the seventh; or the deafness may arise simply from paralysis of the small muscles of the ear. Occasionally, noises in the ears have been observed, and the explanation has been a paralysis of the stapedius and over-action of the tensor tympani.

I might say that the movement of the eyeball upwards when an attempt is made to close the eye is not quite satisfactorily explained. It seems often to take this position in sleep, for if the eye be opened gently it will be seen to be turned upwards and inwards. This contraction of the superior and internal rectus and inferior oblique muscles is generally due to an active reflex state, for we observe the upper movement of the eye in coughing, sneezing, and some kinds of convulsions. The difficulty lies in explaining why it takes place during the quietude of sleep when all other muscles are relaxed.

When a facial paralysis has lasted for some time the same changes may take place as in other muscles; that is, they undergo contraction and the face becomes drawn up on the affected side. I have seen a mistake made in the diagnosis owing to this; as, for instance, in the case of a lady, æt. 54, whom I have lately seen, the subject of left facial paralysis of six months' standing, where the left side of the face is drawn up from contraction of the muscles. She has constantly used galvanism. I have more than once heard the contraction attributed to the protracted and indiscriminate use of galvanism, but there is no reason to suppose this. Inasmuch as in

every chronic case such treatment would have been adopted, the inference has been very naturally drawn. A double facial paralysis is sometimes seen, and is recognised by the face being fallen and expressionless. It is rarely observed except in connection with other lesions, such as bulbar disease.

Treatment.—This depends upon the seat and cause of the disease. When central, the paralysis is only one feature of the case. Also when there is disease of or injury to the temporal bone, the treatment is directed to that. It is only in the peripheral cases that special treatment is required, and here galvanism appears the most effectual. It acts merely by stimulating the muscles to increased activity, and both forms of galvanism are sometimes used to advantage. It is, however, the continuous current which has so marked an effect, both physiologically and therapeutically, in contrast to faradisation, and indeed facial peripheral paralysis affords a good example of the extreme susceptibility of the muscles in local paralysis to this form of galvanism. Thus, if both kinds are tried on a healthy face, a reaction naturally takes place, but if one side be paralysed, faradisation will produce but little excitation of the muscles, whilst a continuous current which is so weak as to be scarcely able to rouse the muscles on the healthy side will produce an instant contraction on the paralysed side. If the nerve be permanently damaged, the patient for the rest of his life has his face drawn up, and for this unfortunate the French have invented a new name, "zygomanique," applicable to Victor Hugo's "l'homme qui rit."

The eighth pair.—Paralysis of the *eighth pair* I have already alluded to under the name of labio-glosso-laryngeal paralysis—a form of paralysis in which the organs of speech are affected owing to an implication of the seventh, eighth, and ninth nerves; the portions of these nerves which act harmoniously for the purposes of vocalisation have their centres in close proximity, and consequently disease covering a very small spot in the medulla oblongata is sufficient to produce a well-marked paralysis. The fact of the larynx being also partially paralysed is explained by the observation of Lockhart Clarke, that the internal root of the spinal accessory nerve, which mainly forms the motor supply to the larynx, proceeds from the same spot as the lingual. The recurrent nerve, or motor nerve to the larynx, has, however, other filaments than those derived from the spinal accessory—viz. those from the lingual, facial, and cervical nerves; when, therefore, the grey centre of the spinal accessory is involved, the nerve is only partially affected. When the nerve is pressed on in its entirety, a complete paralysis occurs, and if both recurrent nerves are compressed, then the larynx is paralysed

and suffocation ensues; just as in Reid's experiments of dividing the recurrent nerve when the dilating muscles of the larynx were paralysed, and the aperture no longer opened during inspiration, the abductors, and more especially the crico-arytenoidei, being rendered inactive. In these circumstances tracheotomy has, on more than one occasion, saved the life of the patient. This double paralysis is not common, but paralysis of one side is often met with where the left recurrent, as it passes under the arch of the aorta, is compressed by an aneurysm. Such specimens you will see in our museum. A living example of this I believe I have now in my ward. When the larynx is examined by the laryngoscope, the vocal cord on one side is seen to be immovable, and the effect, which you hear, is what you might expect—a stridulous voice and a peculiar brassy cough.

Dr G. Johnson has observed cases where pressure on one nerve has been sufficient to cause paralysis of the larynx, and I think I have seen the same. The explanation has been sought for in a supposed reflex inhibitory action on the centres whence these nerves proceed, or on the supposition that one nerve alone is the active agent in stimulating the larynx, and that its fellow ganglion does no more than follow its impulse. A disease, therefore, of one side would be sufficient to cause paralysis, a theory in vogue to explain many of the phenomena of aphasia, &c.

I was shown one day at the Veterinary College an exact counterpart of a larynx in our museum, where the muscles on one side were wasted owing to pressure on the inferior laryngeal nerve. It came from a horse who was said to be a "roarer," and I was informed that this atrophy of muscles on one side was the pathology of "roaring." I could learn nothing about aneurysms as a cause.

As regards the trunk of the pneumogastric, I need not enter here upon the effects of its lesions. You will find them dilated upon in your works on physiology. The interest for us clinically is, that they are not unfrequently involved in cancerous disease which attacks the œsophagus, and, as a consequence, a low form of pneumonia with sloughing of the tissue results; and here the same question occurs which we have already had before us—whether this effect is due simply to a nutritive influence being removed, or whether it does not arise from altogether secondary causes, as in the cases of the bedsore and cornea already mentioned—that is, that the nerve power being lessened, the efforts of expectoration become more difficult, mucus collects in the tubes, and thus the further inflammatory processes are set up.

Diseases implicating this nerve are well worth studying, owing to its numerous relations and the consequent disturbance of more than

one function. Thus, knowing its distribution, you might suspect that an irritation of the stomach would produce cough; or that disease of the lungs would cause sickness. I have seen more than one case of phthisis treated for a long time as a stomach affection, and in one patient the vomiting was so obstinate that a scirrhous pylorus was actually diagnosed. I apprehend that it is through implication of this nerve in disease of the base of the brain that many well-marked symptoms are observed. In arachnitis, for instance, the influence on respiration is seen in the irregular breathing or sighing; on the stomach in vomiting, which is so constant a symptom; while the influence on the heart is apparent in the diminution of its pulsations, producing the slow labouring pulse of cerebral disease which is so well known.

The influence of the pneumogastric on the heart has been made the subject of such laborious investigations that I cannot but allude to them, especially as they have given rise to the opinion that this nerve acts as a regulator to the heart, and even to the suggestion that many organs of the body are supplied by similar inhibitory or restraint nerves. You know that while there are certain influences which excite the various organs to increased action, there are others which tend equally to arrest action—or, at least, so it would appear. If the organic machinery is kept in operation by certain nervous forces, originating in ganglia and distributed amongst its different parts, you can conceive how a diminution of these forces will arrest the action, and with this explanation we have hitherto been content. But experimenters of late have made it appear that there is some direct and active power at work which can restrain the different movements of the animal mechanism. Thus an injury to the spine will often cause a diminution of the number of the heart-beats. This might be explained by the paralysing of the motive nerves of the heart; but the same result is said to arise from an irritation of the pneumogastric nerve in its course. It has been conjectured, therefore, that the heart, with other organs, has two sets of nerves—one to excite it to action, and another to control or arrest it. Certain it is that many organs have more than one supply, not only that proceeding from the sympathetic and the spinal system, as seen in the intestine or uterus, but a distinct supply from an independent source; the one is the motor, and the other the regulator, or the inhibitory nerve. Thus, for example, if you take the heart, this is supplied from the ganglionic or sympathetic system, which, as you know, is associated with certain spinal nerves coming off from the lower cervical and upper dorsal portion; it is also supplied by the pneumogastric. Now, it has been shown that if the sympathetic nerve be galvanised the heart's action is much increased; and, in like

manner, if the pneumogastric be galvanised, the heart's action is retarded, or, as the engine driver would say, "slowed." It is thought, therefore, that the sympathetic stimulates the heart to increased action, and that the other tends to retard or regulate it. Now, if these facts be true, they are of importance in practice, and, as Dr. Handfield Jones has well shown, appear to be to a certain extent corroborated by clinical observation. We find, for example, that irritation of the sympathetic produces palpitation, and it is thought that the remarkable disease, exophthalmic bronchocele, where the eye protrudes, the thyroid enlarges, and the heart beats violently, is due to implication of the sympathetic. At the same time, if true, division of the sympathetic would cause the heart to gradually cease to beat. The phenomenon of its arrested function is probably seen in those recorded cases of sudden death from a blow on the epigastrium, as also in those cases which, no doubt, some of you must have witnessed, where an injury to the spinal cord has brought down the action of the heart. Such an example I saw not many weeks ago, where, from a fracture of the dorsal spine, the heart's beats were reduced to 40. The cardiac plexus was there being paralysed through the spinal nerves. But this, it is said, is not the whole explanation; it is allowing the pneumogastric, whose influence is to arrest the action of the heart, to come into play. It is further said that if the pneumogastric, or nerve which "slows" the heart, be divided, the organ commences to beat violently, not being overruled, until at last it runs wild, and its action ceases from sheer exhaustion. If the divided pneumogastric were galvanised, this would, on the contrary, gradually "slow" it until it stopped. In opposition to this, I have seen it lately stated that Czermak has been able in his own person, by pressure on the pneumogastric nerve at the border of the sterno-mastoid, to produce a decided diminution in the frequency of his pulse. Kuss also relates how a medical student pressed on his pneumogastric, and his heart ceased to beat. He became unconscious, and some time elapsed before he completely recovered. I need scarcely say that this inhibitory action of nerves is by no means satisfactorily proved, for it has been shown that a slight stimulus on the same nerve will excite it to moderate action, whereas an increased stimulus will arrest it. You see, however, into what a large sphere of disease a discussion of such nervous influence might lead us; and if these observations be true, they are surely of practical importance to us. If we have a notion why the heart's action is retarded in one case or accelerated in another, we may be on the road towards appropriate remedies, besides obtaining suggestions as to the *modus operandi* of medicines.

Suppose the inhibitory action of the pneumogastric be true (but

this is by no means proved), it is argued that as this nerve supplies the stomach and heart it can be seen how dyspepsia and flatulence give rise to cardiac disturbance, and how also in heart disease gastric disorders are amongst the most distressing symptoms. Suppose, then, that we have a case of dyspepsia which we believe to be due to a want of tone in the stomach arising from exhaustion of the nervous system, or directly to a deficiency of good nerve force supplied by the pneumogastric, we might expect that the influence of this nerve, being also removed from the heart, the sympathetic would come into play, and a palpitation result. This is certainly what we see, and I might also inform you, as a matter of experience, that such palpitation would not be cured in the same manner as that dependent on organic disease. It would be relieved by a tonic, as iron, or, as a temporary remedy, by a glass of brandy-and-water. Digitalis would have no effect in arresting the irregular or quick action, whereas this would be the drug in organic disease, where alcohol would often aggravate the excitement.

This apparent divergence from my subject arises from my being obliged to dwell upon the functions of the pneumogastric and the symptoms of its paralysis. The result on the lungs is one well known to you, and much dwelt upon by physiologists who follow the experiments of John Reid; but these other results, as seen daily by us, on the functions of the stomach and heart, are, I think, of more practical value, and come into my province as a teacher of clinical medicine. As I have alluded to this regulating action of the nerves, or the inhibitory influence, as it has been called, I may state that the same doctrines have been tentatively applied to other organs.

As regards respiration, the two kinds of nerves, it is stated, are not so well marked. A stimulus applied to the pneumogastric certainly does not arrest the breathing in the same way as it stops the heart's action and causes vomiting; but it is said that galvanising the superior laryngeal will arrest the respiratory process.

I had once the opportunity of seeing a case where the pneumogastric was included in a ligature of the carotid, and found severed when death took place eight days afterwards. The patient was observed to take a deep sigh directly the ligature was applied, and this kind of breathing continued—deep sighing, alternating with long pauses.

As regards the intestines, it is said, in like manner, that the splanchnic nerves are the inhibitory or restraint nerves. The doctrine is carried still further, for since the excito-motor functions of the spinal cord do not come into play until the communication with the brain is severed, it is thought that there are special restraint

nerves under the dominion of the will. Remember, I do not want to teach this dogmatically, for there are some who I know would feel satisfied with the older theories of exhaustion; that is, that an organ is stimulated by the nerves which supply it, and that its opposite condition is simply one of exhaustion. Of late, however, the theory of inhibition by distinct restraint nerves or Hemmungsnerven has been in vogue in some German medical schools. The theory will certainly account for some of the abnormal conditions of stomach and heart which I have mentioned, and it is for this reason that I have thought it right to bring the subject before you.

Paralysis of the ninth or sublingual nerve.—This is partially paralysed in hemiplegia, in bulbar paralysis, &c., but it may be the only nerve affected from various local causes. Under these circumstances the tongue becomes visibly smaller on the paralysed side, the muscles undergoing atrophy. This leads to some difficulty in speaking and swallowing, but actual loss of the tongue does not render a man dumb, for only lately there was a man in the hospital from whom the tongue had been excised, who could speak fairly well.

Sir James Paget has described a remarkable case where there was atrophy on one side of the tongue in connection with disease at the base of the cranium, involving the ninth nerve. An abscess formed over the seat of the disease, and then some bone was removed, the nerve was released, the power in the tongue returned, and it gradually increased until it had reached its original normal size. The furring of the tongue on one side is thought to have a nerve cause, but Mr Hutchinson believes it to be due merely to want of friction from disease of the teeth.

As we pass down the cord we find other nerves affected. Many of these instances I have already mentioned, but occasionally the nerves are the subjects of independent lesions.

The *phrenic nerve* may occasionally be affected. If the nerve be implicated in disease a paralysis of the diaphragm results. About two years ago a man came to the hospital, who said he had had increasing shortness of breath for twelve months. On examining his chest the diaphragm was seen to be perfectly useless, the abdomen sank in during each inspiration, and the lower part of the chest dilated in a most remarkable manner. He attributed it to a blow in the neck from a man's fist. The lungs became congested, and gradually indurated, and in a few weeks he died. You, of course, must be careful to distinguish such a case from disease of the diaphragm itself, where, for example, it becomes useless from fatty degeneration of the muscular substance.

The *long thoracic nerve* may be the nerve especially involved, and

then we have *paralysis of the serratus magnus.* This would no doubt occur to you as the probable cause whenever you saw this muscle inactive, but in many of these local paralyses it is the muscle itself which is at fault. Indeed it would be rare for the thoracic nerve to be injured, but over-straining the muscle is common enough. We therefore find the affection in sawyers and in men who use their arms in a similar manner to them. The diagnosis is easy. The serratus, more usually the right, is seen to be wasted, and its action entirely lost. The patient is unable to lift his shoulder or raise his arm above the horizontal line. When the arm hangs down the scapula sticks out, and seems quite loosely attached to the back, the inner angle being nearer the spine and projecting in such a manner as almost to enable us to pass the hand under the bladebone. From the serratus being paralysed the other antagonistic muscles pull it out of place. A man lately in the hospital was a shipwright; he had found the arm getting weak for two months. On examination, the serratus was found flabby and wasted; he could not raise his arm above the horizontal line. The scapula seemed to be hanging loose on his back, with its under edge projecting outward, and in order to replace it in its proper position it had to be pulled forward and outward and slightly upward. The muscle did not react to either form of galvanism, and but little good was done by their repeated application.

The *circumflex nerve* may be paralysed, in which case the deltoid and teres minor become powerless. This occurs for the most part from injuries and diseases of the joint, especially chronic rheumatic arthritis, where considerable wasting of the muscles takes place. The arm lies at the side motionless, and cannot be raised or stretched out. This is the case where the different effects of the continuous aud interrupted current are well seen. A man was in the hospital lately with wasting of the deltoid and an inability to raise the arm. Faradisation was used without any effect, but immediately a simple galvanic current was used, by placing one pole on the top of the shoulder and the other at the insertion of the deltoid, and contact was broken, the muscle responded and the arm rose from the side. A continuation of this plan completely cured him. I have repeatedly referred to the influence which the nerves have on the integrity of the muscles which they supply, and therefore in any injury to the circumflex nerve wasting of the deltoid might be conjectured; but the wasting of the muscles is often equally marked in inflammation, of the joints, and therefore we might infer that the nerves were here involved. In explanation of this, Sir James Paget suggests that there may be such a thing as reflex atrophy, because he has observed that the wasting is proportionate to the pain, as if it

were due to the disturbance of some nutritive nervous centre irritated by the painful state of the sensitive nerve fibres. In cases, therefore, where the arm is wasted, weak, painful, and not very movable, the diagnosis between local paralysis and commencing chronic rheumatic arthritis is often difficult.

I would wish to remind you of what I have before stated, that the muscles of a limb are not paralysed or wasted according to any special nerve distribution unless the nerve itself be affected, but they are involved according to function, and therefore attacked in groups. It is thought that the spinal cord rules over groups of muscles, and in this way the fact is explained.

Pressure on the *axillary plexus* may cause paralysis of the whole arm, as I have witnessed from the growth of tumours, from injuries, and dislocations. We were therefore justified in supposing that in the case before mentioned, where pain and wasting of the arm had existed for some time, and was subsequently recovered from, a neuritis of the plexus had occurred.

Paralysis of the musculo-spiral nerve I have frequently seen. It occurs most commonly from the patient sleeping on his arm whilst resting on the back of a chair, or, as happened in two patients who were lately in the clinical ward, from heavily sleeping on the ground whilst they lay drunk with their arms under them. When such persons wake they find their limbs quite helpless and often numb; the muscles at the back of the arm, as the triceps, extensors of forearm, and supinator, are flaccid; the hand falls, and the fingers and thumb become flexed on themselves. There is generally a partial anæsthesia of the back of the arm and the hand, as far as the second phalanx; but I have seen paralysis of extensors without any loss of sensation. If the pressure has occurred, as is very often the case, between the biceps and brachialis anticus, the triceps escapes, and it is only the mucles of the forearm which are paralysed. When speaking of lead poisoning, I said it had generally been observed that the supinator longus escaped, and this, therefore, would be one of the diagnostic signs between it and the case where the trunk of the nerve was compressed. On the other hand, the supinator is paralysed with the flexors of the elbow in cases of progressive muscular atrophy, which, again, shows that the seat of disease is not in the nerve. The electro-motility would not be impaired in ordinary cases. If faradisation did not act it would show that the nerve was injured. In slight cases galvanism rapidly cures.

If the *median nerve* is paralysed, it is generally from injury. The flexors and pronators are powerless, and flexion of the second phalanx cannot take place; the thumb is extended and turned in;

there is also loss of sensibility in the palm of the hand, and also on the last phalanx on the dorsal side, owing to the nerve curling around from the front. After a time a wasting of the muscles may ensue. If the nerve be the subject of inflammation or irritation, then, in addition, certain changes on the skin may be observed, such as vesication, ulceration, shrivelling, and roughness of the cuticle, with loss of the nails. There would be also pain along the course of the nerve, and all the other sensations belonging to this painful affection would be present.

The *ulnar nerve* is not infrequently affected, either from injury or growths near the olecranon. Its exposure at this part may perhaps account for the frequency of its paralysis. There would be loss of power in the flexor carpi ulnaris and flexor digitorum, as well as in the muscles of the thenar and hypothenar eminences and the interossei. This is seen in the increased difficulty of flexing the wrist and adducting the hand, also of flexing the fingers, especially the little one; the thumb cannot be adducted, and the difficulty of separating the fingers from one another is very distinctive. After a time all the affected muscles waste, the thenar and hypothenar eminences are flattened, and the spaces between the metacarpal bones become hollowed out. Sensation is also diminished.

I have said that in these local paralyses the continuous current usually effects a cure, but this is not always the case, as in the following example, where faradisation was more efficacious.

Paralysis of the Right Arm

CASE.—George J—, æt. 30, admitted January 12th, 1870. Six days ago, whilst he was attempting to rise from bed, his right arm fell powerless at his side, and he has had no use in it since. He is found on admission to have loss of sensation and motion of the right arm; slight sensation above the right elbow, increasing gradually upwards. He has slight power in the biceps to flex the elbow. Can neither feel a touch, nor the prick of a pin, nor the sensation of heat and cold. There is thus akinesia, anæsthesia, analgesia, and thermic anæsthesia. There is electric sensibility to faradisation, but the continuous current produces scarcely any excitability.

Faradisation was ordered him, and he gradually improved. Left February 10th; arm much stronger.

Local Paralyses of the Legs.—We occasionally meet with these without any apparent cause, and we either suppose that the trunks of the nerves are the subject of some morbid affection, or that the paralysis is of a peripheral nature. In the cases of neuralgia of the *sciatic, gluteal, obturator, and crural*, already mentioned, some loss of function accompanies the pain, and if the former symptom prevailed we might sometimes use the term paralysis as an alternative name for the same case. The paralysis is indicated by the

want of power and the wasting of special muscles, such as the glutei. That the atrophy would be the effect of disease of the nerves is seen in those cases where growths have existed in the spine and involved these structures. As regards the leg, both the tibial and peroneal nerves may be affected, causing wasting of the muscles. In a case where enlargement of the head of the fibula pressed on the peroneal nerve, the muscles were flaccid, the foot could not be flexed, and walking was very difficult. In the case of a gentleman who lately consulted me for lameness I found the fault lay in his inability to use the flexors of the ankle. When galvanised they contracted well, and flexed the foot.

I will mention two cases to show that local paralyses of limbs are by no means uncommon, although their causes are very often involved in obscurity.

Paralysis of Leg

Case.—George W—, æt. 36, admitted into Stephen Ward, June 19th, for weakness of the leg, and left July 23rd. This man was the subject of a remarkable enlargement of the veins on the surface of the abdomen, indicating some obstruction in the vena cava. He had observed this fourteen years, but it had given him no inconvenience nor had it interfered with his employment.

Patient stated that in March last he was seized with very acute pains through the left hip and groin, which gradually spread down the leg; and these pains were worse at night. Went to Swansea Hospital, where the knee became contracted and he took to crutches. He was then sent up to Guy's Hospital. He was put to bed, being quite unable to walk, on account of pains and weakness in the left leg. No local cause was discoverable to account for the symptoms; the leg was somewhat drawn up, it was perceptibly wasted, being smaller than the other, and sensation slightly impaired. On testing the limb the muscles were found to respond to both the faradaic and galvanic currents. He was then ordered the continuous current to be applied daily to the front and back of the thigh. After the first application he expressed himself as having much relief from the pain, and in a few days it had altogether left him. At the same time the strength returned in the muscles, so that in a few days more he could walk. The current was still applied with a daily improvement in the strength of his leg, so that on July 10th he was walking about, and on the 21st he had sufficiently recovered to be able to leave the hospital convalescent and nearly well. Patient took no medicine.

Case.—William N—, æt. 50, admitted January 4th, 1871. Two months ago he began to feel difficulty in walking, on account of pain in the right thigh and buttock; subsequently weakness of the limb came on. On admission he is seen to be a healthy man, with the exception of his present complaint. He lies in bed, and is unable to raise the right leg. Tactile sensibility is considerably diminished, points being only recognised as separate when ten inches apart. No tremblings of the muscles. On his chest are two scars, as of diseased bone, and he has also had iritis. He owns to having had venereal disease some years ago. With these hints he was put on the Mist. Hyd. Perchlorid. He gradually improved in strength, so that on the 31st he walked down the ward, and on February 9th was discharged convalescent

Sometimes we meet with cases of sudden paralysis of a limb with rapid recovery, just as in children. The pathology of the two is probably alike.

CONTRACTION AND SPASMODIC AFFECTIONS OF MUSCLES

These diseases, in my experience, constitute the most difficult to explain or to treat in the whole domain of clinical medicine. The physiologist has not yet determined the true relation of muscle to nerve, for we have, on the one hand, evidence of the power of contractility in the muscle when separated from the nerve,[1] and, on the other hand, there is the fact of the muscle losing its tone in paralysis, as seen in the muscles of the face when the portio dura is affected, and in the experiments of Marshall Hall already referred to. If the dropping of the muscles of the face argues want of nerve influence, and the falling of the head in sleep the same fact, how are we to regard the case where a muscle is kept in undue contraction? An over nerve stimulation would be the most reasonable answer, for if the muscle relaxes when we become unconscious in sleep, we seem bound to believe that we are sending a stronger force through the nerve when by a voluntary effort we cause it violently to contract. And yet I have already told you that an exactly opposite theory is held by some, viz. that the contraction is the passive state of the muscle and its elongation is caused by an active process under the influence of the nerve; the effort of the will merely allowing the inherent powers of the muscle to come into play when it immediately contracts. This might be an explanation of the rigor mortis and also of the contraction of an hysterical limb when the patient has lost all power over it, the inhibitory influence of the brain over the spinal cord being lost. We know, however, that during sleep a relaxation has occurred, and therefore we fall back into our old difficulty of hypothetically regarding two opposite states of muscles as evincing passivity. The fact is, as I said before, that the physiological problem of the relation of muscle to nerve has yet to be determined. When this has been done the physician will have no difficulty in making it applicable to epi-

[1] The contractility of muscle by direct excitation is constantly observed in the living subject when percussion is made over it, as in the pectoralis or trapezius. This was pointed out many years ago by Dr Stokes, and is more frequently met with in phthisis, owing to the greater liability of consumptive persons to be percussed. It is not peculiar, however, to this disease, for it is observed in the wasting of cancer and other disorders. An interesting physiological fact may be noticed under these circumstances, that the contraction does not radiate from the point struck, as a centre, but along a line in the anatomical course of the fibres.

lepsy, chorea, tetanus, and all spasmodic and convulsive diseases. A solution of the problem is the great desideratum in nerve pathology.

Cases of spasmodic contraction of the limb I have already spoken of under paraplegia, and they are mostly found in connection with meningitis where the nerves are involved.

Local Spasms.— I use the term for those cases where a few muscles only are affected and there is no evidence of a central cause of irritation. Spasms are generally divided into tonic and clonic, according as the contraction is persistent or intermittent; as, for example, in tetanus and chorea. One of the best known forms of spasm of muscle is that temporary condition known as cramp, which, it may be interesting to note, occurs so often during sleep. This, although local, has usually a general cause for it in the blood, as witnessed in cholera. The forms of spasmodic affection to which I wish more particularly to draw your attention are chronic and persistent; they are, of all nerve disorders which we are called upon to treat, the most difficult to cure. We may still regard them as persistent or chronic, even if they occur in paroxysms, and the muscle has intervals of healthy rest.

Beginning with the head, we may meet with cases of spasm of the ocular muscles, causing *squint;* this may be of a temporary kind, as in the case of the child I mentioned, who was the subject of attacks of strabismus, which lasted a few hours, and then passed off.

Trismus is not a common affection, but, when it occurs, is most persistent in its nature. I was consulted some time ago about a woman who, nine months before, was seized with a pain in her face, and an inability to open her mouth. From this time the spasm continued, varying in intensity, and becoming worse at night. The jaw was drawn down to the left side, and the face looked swollen, from the constant tension of the masseters. She could not open her mouth to eat anything solid; the tongue, as far as could be seen, was covered with a black fur. Sometimes she had rigors and also tremors of the arms and hands. She had no marked hysterical symptoms. Every remedy was tried without avail.

Spasm of the Facial Muscles is also sometimes seen, but it is usually paroxysmal and intermittent. It is also called spasmodic tic. It is often associated with a similar state of the muscles of the neck and head. I know a gentleman who for some years has had this painful affection; his head is suddenly jerked round, and at the same time there is a violent twitching of the muscles of the face. Spasm of the eyelids only is called blepharo-spasm. This may be intermittent or persistent. I knew an old lady with this

affection, who is now well. She used galvanism, which is supposed to have cured her. The clonic contraction produces a constant blinking.

Spasm of the Sterno-mastoid.—This may be paroxysmal, and either tonic or clonic. I occasionally see a gentleman, when I visit his sick children, who whilst conversing with me is constantly nodding his head forward. The chronic form is, however, more common, and is called *wryneck*, or *torticollis*. It usually affects the muscle on one side, whereby the head is drawn back towards that side, whilst the chin is carried upwards in the opposite direction. Cases are related where the muscles on both sides being affected, drag the head back, and others where the spasms are paroxysmal, causing a constant nodding of the head. One of the most frightful cases of spasmodic contortions I have ever seen began with wryneck; subsequently other muscles of the trunk became affected; the patient had then sudden violent paroxysms, in which the body was twisted round in a most extraordinary shape. At last she died, worn out. The following is an example of wryneck lately in the hospital:

Torticollis

(Reported by Mr Knott)

Case.—Alfred G—, æt. 37, admitted February 28th, and left June 23rd. Works at an oilcloth factory. Always enjoyed good health, and habits were steady and regular. Never had any severe illness. Exposed to cold. About a twelvemonth since he found his head becoming gradually drawn to one side, his face looking to the right shoulder, the muscles of the neck stiff, and some little difficulty in swallowing. This continued until admission.

Patient looks well, and whilst lying on his pillow his complaint is scarcely apparent, as he moves his head from side to side; but, immediately he rises, the left sterno-mastoid contracts, and his head moves to the right side.

Faradisation was used to the left sterno-mastoid muscle, and caused marked contraction. This was continued daily, and after some time the muscle seemed more readily affected by a less strong current. It seemed, indeed, as well as the trapezius, to have greater excitability than the muscle on the other side. The continuous current from twenty Daniell's cells was then tried, and had no effect on the left sterno-mastoid, although it caused contraction of the platysma, whilst it produced the usual effect on the sterno-mastoid and trapezius of the right or unaffected side. The two forms were tried for six weeks, but without any permanent benefit, and were, therefore, discontinued. He was then ordered injections of arsenic for nine days, but without any result. He subsequently took bromide of potassium and then Tr. Cannabis, and on some days he thought he was better and the muscle more supple; but he again became as bad as before. A consultation then took place with the surgeon about the propriety of an operation for dividing the muscle or the muscular branch of the spinal accessory nerve; but the patient, not approving the proposition, left the hospital unrelieved.

In reference to wryneck there is a fact worthy of observation and

further investigation; that in young persons subject to this affection the head and face on the contracted side do not develop as on the other, and in consequence there is a want of symmetry in the countenance when narrowly examined from the front. One eye is slightly lower than the other, and the whole of that side of the face and head is smaller than the other. In a lad lately in the hospital with heart disease a wryneck existed from infancy, and this remarkable want of symmetry was very evident. In a young lady patient, also, who is otherwise well grown, this disproportion of the two sides of the head and face is clearly shown. It may be asked whether this is due to some failure of nervous power having its foundation in the same cause which produced the wryneck, or whether the contracted muscle itself exerts an influence on growth, and, if so, whether the division of the sterno-mastoid would allow development again to proceed. Stretching the nerves has in some cases been useful.

Cases are described where quite independently of wryneck the muscles of one side of the face have become atrophied. This has arisen no doubt from some affection of the nerve, whereby its influence over the muscles has been lessened, probably from neuritis of the fifth nerve with its sympathetic filaments.

These cases have been designated by the name of "facial hemiatrophia." For example, a little girl, when a year old, fell and struck the outer part of her left eye. As the child grew it was observed that the left side of the face was smaller, the muscles wasted, and the skin over the bone like a piece of parchment. The sensibility was normal. A German lately exhibited himself in London, in whom the left side of the face is smaller than the other, the skin is shrivelled, and the bones are smaller; the teeth, too, are deficient, and the tongue on that side less. When a boy he had a swelling of the jaw.

A sudden cramp seizing the muscles supplied by the hypo-glossal nerve is a curious affection, but of which I have now seen several examples.

Spasmodic Contraction of Jaw

Case.—A gentleman, æt. 28, has suffered for four years from a spasmodic affection of the jaw and tongue. When he speaks, and more especially when he reads aloud, he feels a strange sensation in his tongue; this is thrust out of his mouth as his jaw opens. This occurs constantly while he reads; he used to speak in public, but this affection has entirely prevented him. In quiet conversation it does not often occur, but in reading to himself it constantly happens. It seems to correspond to spasmodic affections witnessed in other parts of the body, and is therefore very little more than a bad habit, as shown by the action of reading inducing an attack. He says: "Once I was addressing an audience, when

wishing to refer to the Bible to read a passage, my tongue began to jump about so violently that I was obliged to sit down. Sometimes the sensation comes on suddenly, like a flash of lightning, and shoots my tongue forward so that I have no control over it for a few seconds, and if reading am obliged to miss a word. In bad attacks the lower jaw drops simultaneously with the impulses given to the tongue.

CASE.—Sergeant C—, æt. 43, was sent to me from the Isle of Wight, having suffered from spasm of the tongue for some time. When talking, the tongue curled up, became hard, at the same time his face was drawn, the muscles beneath the jaw being tightend. The attempt to talk immediately brought on the cramp of the muscles of the tongue, preventing his speaking, and therefore giving the word of command. He was forced to give up his duties in consequence. He was ordered galvanism, but the result I never heard.

I have also notes of the case of a lady who is suddenly seized with spasm of the jaw which prevents her speaking. She opens her mouth but cannot utter a word.

Other muscles may be affected spasmodically, as the trapezius, together with the sterno-mastoid already mentioned, and the muscles of the shoulder; sometimes also those of the limbs, in a rhythmical manner, as I shall presently mention. Spasm of the muscles of the abdomen generally implies some source of irritation in the organs within the cavity. Spasm of the diaphragm, or hiccup, is occasionally met with. We have had in the hospital a girl with this affection. The hiccup never ceased unless she was asleep. It continued for some weeks, and then departed. We had in the very same bed, immediately before this girl occupied it another who never ceased to cough. It was thought that it might own some distant cause and that the spasm was reflex, but this was never ascertained. I may observe that the aurists speak of a cough arising from the ear, and which they call ear cough; this may sometimes depart when the wax is removed from the meatus. Cases of involuntary laughter might perhaps be included under spasmodic affections. Sneezing also will continue for a great length of time without any apparent source of irritation. This may sometimes be arrested by forcibly pressing the finger against the upper lip and septum of the nose, at the same time taking a deep breath.

Writers' Cramp, or Scriveners' Palsy.—This is a spasmodic affection of the muscles of the arm and hand, arising from their long-continued use in an unequal or inordinate manner. Particular muscles being employed in one constant and special direction become unduly fatigued. In writing we educate a set of muscles for a given movement, as indeed we do for any other special performance of the hands. This is shown by the fact that if the right hand becomes useless we cannot at once take up the pen with the other. In the act of writing we make use of the first two fingers

and thumb to hold and guide the pen, whilst other muscles of the forearm are employed to steady the hand. After much use in this way these muscles are apt to become contracted, and cease to be controlled by the will; the fingers become stiff, and the pen can no longer be grasped by the hand. As soon as the person so affected begins to attempt to write a contraction of the muscles of the forearm takes place, the fingers become stiffly extended, and the pen falls out of the hand. In some forms the great difficulty in holding the pen is owing to a crampy flexion of the thumb. Where the spasm has given way to actual feebleness of the muscles the hand affected may be assisted and steadied by the other. This I have seen done by a gentleman, who in signing his cheques grasps the wrist of his right hand by the left, and so steadies it. A number of other methods, too, are often resorted to before the patient gives up his occupation. He will hold the pen between the two fingers, and dispense with the thumb altogether; or rest the whole arm on the table so as to move the muscles as little as possible, and then make the movement from the shoulder.

As regards the treatment of these cases, the complaint is sometimes so obstinate that nothing but perfect and absolute desistance from the usual employment will allow of a cure. In the case of a banker's clerk, where all treatment failed, he was obliged to leave his desk and take to an outdoor occupation. The best treatment is by the continuous galvanic current, after Dr Poore's plan of directing the current down the muscles of the forearm, and at the same time making the patient continually contract them by opening and closing the hand. The cold douche to the arm is also useful, and the adoption of any plan by which a regular movement of all the muscles shall be maintained.

Any other movements besides those of writing which produce a continued strain on the muscles will cause the affection. It is not, however, met with in the ordinary class of workpeople who are using all their muscles equally and in a natural manner, but only in skilled persons who are employing some particular muscles inordinately whilst others are kept in restraint. Thus, I have had as a patient a violin player, who has now been obliged to give up his profession from his inability to hold the bow. Of late, too, we have heard of telegraph clerks' cramp, a complaint where the fingers become stiffened from constant use. In France, it is said, the difficulty is overcome by setting the clerks to work on a different kind of instrument, whereby another set of muscles come into play. Then there is the dancers' cramp, arising from the constant and inordinate use of particular muscles of the leg, which keep the foot in a constrained position so as to enable the dancer to stand on the last

phalanges or toes. I have been reading lately also of the milk-maid's cramp. Duchenne described a case of a writer who struggled with the spasmodic difficulty in his arms so long that the complaint crept higher and higher, until it reached his body. When it became quite impossible to control his arm he leaned his head on his shoulder until his head and neck became drawn down and contracted like his arm. One of the foreign journals lately contained the case of a tailor who, in consequence of sitting in a restrained posture, had not only spasmodic contraction of the arm but of the neck and upper part of the body. If he ceased to work and forcibly bent the arm the whole spasm would be arrested and he would become unlocked. He was at last obliged to give up work, but if at any time he put himself in a sewing attitude the whole spasm would return. The contraction would first begin in the arm, which would become rigidly flexed; then his body would bend forward until his head almost touched his knee, and the muscles of his face would undergo violent contortion. Under any circumstances where particular muscles are kept in a state of over-strain, then spasm and a feeling of fatigue will come on. I have lately been consulted by a veterinary surgeon, in whom I believe a cause of this kind existed to produce his complaint. He had cramps and pains in both his arms, which interfered with his professional work. I found that he was in the habit of driving a very powerful horse in a gig, and for several hours in a day he was holding him in. Besides this he was always trying fresh horses. Occasionally we may meet with cases where there is a tendency to spasmodic affections of the hands, preventing the patient from grasping, where no good cause can be arrived at for its occurrence. You must bear in mind the existence of a local disease produced by contraction of the tendons and fascia.

Several observers have spoken of a "miners' nystagmus," which has been thought to be due to the irregular action of the ocular muscles as the eye follows the flickering light of candles and lamps.

Dr Frank Smith has described, under the name of "hephæstic hemiplegia," or hammer palsy (Ἥφαιστος, Vulcan), a very interesting form of paralysis occurring in the Sheffield workmen, who are constantly using the hammer in making files, knife-blades, &c. He reckons that the hammer weighs three pounds, and that a man during the day must make 28,000 strokes with it. He publishes several cases where, in consequence of this continued exertion, the right arm begins to waste, especially in the muscles of the forearm, and a painful contraction occurs in the flexors and pronators when an attempt is made to grasp any instrument like a hammer. The

remarkable circumstance is, that although the complaint commences after the manner of those already mentioned, yet that, according to Dr F. Smith's observations, the higher centres sometimes become involved; consequently, not only does the arm become weak but subsequently the right leg, and even in exceptional cases the face, accompanied by aphasia. Together with this wasting and cramp, sensibility is impaired as regards touch and electro-action, but thermal sensation remains.

A man, a cooper by trade, was lately in the hospital, who could no longer grasp his hammer, as it produced pain and spasm; but he was effectually cured by galvanism.

Dr Hammond, of New York, has described a form of spasm of the fingers associated with continual movement, so that the patient is unable to retain his hand in any fixed position. To this affection he has given the name of *athetosis*. If, for example, the hand be placed on a table, the tendency is for the fingers to become firmly extended, and then to continue moving on over its surface, the thumb and little finger being mostly affected; the movement is quite involuntary, and it is only by a great effort that the fingers can be again flexed. Sometimes the movements are not so steady, are more of the choreal kind, and occur in paroxysms. This is, however, the exception, for the motion of the hand is not jerky, but quite orderly, and it is only by a very strong effort of the will that it can for a time be controlled. From the almost continuous action the muscular development becomes increased. On investigating the case we often find evidence that the disease is not purely local. We may observe that the feet become paroxysmally flexed, and other nervous disorders are also present, suggesting a spinal or other central cause; in fact, the case might be one of commencing sclerosis of the lateral columns. Occasionally, also, the patient has been epileptic, and these movements constitute only a part of a more general nervous disorder. Dr Shaw has shown how in lunatic asylums, and especially amongst imbeciles, the hands are placed in all kinds of positions; they are constantly moving, and the patients have little control over them. I have seen examples of this. The same may also be observed in old hemiplegic cases.

Case.—Samuel M—, a farmer, said that three months ago he had what the doctor called a low fever; after his recovery he observed that his right hand was continually shaking. Whilst he was talking to me his hand rested on his knee, and I noticed that there was no trembling movement, as in paralysis agitans, but it was continually travelling outwards until it fell off his leg, when he brought it back again, and the same process occurred over again. On asking him to write, I found that he could not hold the pen well; but that when he had it fairly in his

grasp it gradually ran away from him across the paper. There was no alteration of sensation and no wasting of the muscles. He said he was otherwise quite well, but I detected a slight quivering in his lips when he spoke. He was strictly temperate, had had no fits, and had not used his arm inordinately in his occupation or in sports.

Dr Taylor had lately in the hospital a young girl who presented a curious combination of pathological conditions. There was an inequality of growth on the two sides of the body, the left being the smaller, including the arm and leg. These limbs were constantly twitching, with occasional involuntary marked contractions.

Rhythmical Spasms.—Under this name Dr Paget described, many years ago, cases where spasmodic contraction of a uniform kind came on in paroxysms, and sometimes became permanent. The tonic nature of the spasm distinguishes it from chorea, although there may occasionally be a difficulty in declaring to which class of malady it belongs. In true chorea the movements are irregular and ill-defined, and to a certain extent are under the control of the will or are caused by any attempt at voluntary action, whilst the spasms of which I speak are regular and rhythmical. I once had the case of a girl in the clinical ward who was continually bending herself forward and bowing in a perfectly regular and methodical manner. If she were restrained, great distress and agitation were produced, and she expressed herself as feeling much worse than when in movement. A case, probably of the same nature, was that of a girl who had most rapid breathing, each respiration accompanying a beat of the heart; or of another girl, who every now and then repeated the same words with great rapidity. Dr Bright described a case of a girl who uttered a sound like "Heigh ho! Heigh ho!" at regular intervals of three seconds, so that the word was repeated twenty times in every minute. She could check it by great exertion, but it was immediately resumed when she ceased to converse. In men, too, and even amongst the aged, we meet with these strange paroxysmal spasmodic movements. Thus, lately we had a patient who was constantly jerking his head backward; another who performed the same movement and raised his arm, putting himself in a fighting attitude, as if he were about to strike some one. I have also had an old man several times in the hospital who had paroxysmal spasmodic attacks, which lasted during two or three weeks, after which he was free from them for a considerable time. The paroxysms consisted in his raising his arm and violently beating his chest for about a minute, when he would desist. This man subsequently died of pyæmia, but a careful examination failed to

find any visible morbid alteration in his nervous centres. A lady patient of mine had for some time spasmodic twitches in the sterno-mastoid, and subsequently the whole head became turned round and violently shaken. Sometimes during these attacks the whole body would participate in the movements. I have already alluded, under the subject of spinal irritation, to the case of a lad who was thrown into convulsions by touching a particular spot in the neck.

In some case there is probably a hyper-excitability of the cord, and so the body is thrown into spasm on any external stimulus; as, for example, if the legs are touched. Thus, a patient of mine appeared very well whilst lying in bed, but immediately he put his feet to the ground his legs became perfectly rigid, so that he could with difficulty walk. The students used to feel the muscles of his thigh and calf whilst he was standing up, which were then found to be perfectly hard, but immediately he sat down the spasm was gone. It seemed as if he possessed a morbid excitability of the cord, which was set in action by touching the ground. It has been considered of late that this is an early symptom of "lateral sclerosis," already described. Sometimes an affection of this kind begins in one part of the leg. In the case of a patient, a gentleman, he would be walking along the road, when he would be suddenly seized with a spasm which would jerk him off the ground. This continued in spite of treatment, when his arm commenced to jerk as well as his leg. Then his head began to be thrown from side to side, and he was obliged to take to his bed. He at last died maniacal. If both legs are affected simultaneously the patient is forced suddenly to jump, whence it has been called "*saltatory spasm.*"

Where there is a continuous movement of one side of the body I see Dr H. Jackson has suggested the term *hemikinesis.*

GENERAL REMARKS ON REMEDIES

I have already spoken of the treatment of individual diseases under their respective heads, but it is desirable to make a few general remarks with respect to the remedies most in vogue for nervous affections.

The drug remedies for nervous diseases are mostly of two kinds. There are those which act directly on the nervous system, and are supposed to cure either by setting up a counter-action, or by producing a temporary soothing effect until time works the result, and there are those which are styled nervine tonics, consisting mostly of the metals.

It is remarkable how little has been accomplished with the first class of remedies—those which have a physiological action on the nerves. It does not seem to follow that a medicine which has a striking physiological action is of any value in a therapeutical point of view. It might be thought that strychnia was the remedy to rouse the dormant nerve centres, or opium to allay their excitability; but the happy anticipation is not realised, for opium seems to have no curative influence on such diseases as chorea or tetanus. Far more efficacious remedies are to be found in simple tonics. There is, however, another class of remedies to be thought of before either of these, and which has no special relation to the nervous system. You must remember that affections of the nervous system need not originate therein, but may be altogether dependent on an external or independent cause, and in such instances our nervine medicines would be useless—as, for instance, in a convulsive attack arising from an intestinal worm. Hence the absurdity of any system which is founded on treating symptoms alone. Suppose a brain or spine disease arose from some affection of the skull or vertebræ whereby an inflammatory lymph or syphilitic deposit irritated the adjacent nerve structure, you would, of course, direct your efforts against the cause. Now, since it often happens that various nervous diseases have such an origin, I should recommend you in all doubtful cases to commence with such remedies as iodide of potassium or perchloride of mercury, for you may by these means actually cure your patient, whilst tonics would be useless. In cases of epilepsy and many obscure nervous affections I usually commence with this class of remedies, knowing that a curable disease has sometimes ended fatally because they have been overlooked. I have seen a case of epilepsy dependent on syphilitic disease treated ineffectually by zinc, and I have seen a case of painful affection of the leg ending in paraplegia treated in vain by strychnia, when, according to the post-mortem revelation, iodide of potassium would have been the effectual medicine. I remember some years ago seeing a case of severe epilepsy treated by Dr Rees with mercury, and evidently with the happiest result. Cases of the same disease apparently cured by the iodide of potassium are very numerous. In epilepsy I often like to try the iodide of potassium, although, as I have told you, there are other remedies, such as bromide, which are supposed to have a specific effect. You must not forget, then, the class of medicines to which I allude in reference to extraneous causes of disease.

Amongst the medicines which act directly on the nervous system there are few which I believe can be regarded as valuable remedies against its diseases. Thus *opium*, which, by its indirect influence on

nutritive processes, is one of the most valuable remedies in the Pharmacopœia, is all but powerless in such diseases as mania, chorea, tetanus, and convulsions of all kinds. An all but poisonous dose may arrest the symptoms for a time, but only for them to recur with the same violence as before. And yet it seems most remarkable that many practitioners know opium only by its sedative effects. In cases where I believe it might have been given with the utmost advantage it was withheld because the patient had no pain and could sleep. Regarding this important drug from this point of view only, they have considered that chloral might take its place. Sydenham, long ago, appreciated the value of opium. He says: "And truly I cannot forbear mentioning with gratitude that omnipotent God, the giver of all good things, has provided a remedy for the relief of wretched man, than which none is so able either to quell diseases or more effectually to extirpate them than opiate medicine taken from some species of poppies. And so necessary is this instrument in the hand of a skilful man that without it physick would be very lame and imperfect and he that rightly understands it will do greater things than can be well hoped for from one medicine; for surely he is very unskilful and little understanding the virtue of this medicine who only knows how to use it to promote sleep, to ease pain, and to stop a looseness, whereas it may be accommodated, like the Delphick sword, to many other uses; and it is really a most excellent cordial remedy —I had almost said the only one which has been hitherto found amongst the things of nature." *Belladonna*, again, may, through the nerves, control the disordered action of a particular part, but I think very little can be said in favour of its influence over diseases of the brain and spinal cord. It is said to contract the capillaries, whilst opium dilates them. I except a few cases where epilepsy has been apparently relieved by it. It seems to have more power over the vaso-motor system, and therefore has been found useful in exophthalmic goitre and in arterial disease. *Hyoscyamine* has been lately used in mania and in other conditions of nervous excitement. *Conium* is said by Harley to act on the motor centres or nerves, producing a paralysis, whilst the reflex action of the cord is preserved. *Jaborandi* produces sweating, and is therefore thought to be antagonistic to belladonna, which checks it. None of these remedies, however, are of much value in purely nervous affections. I should say the same of *strychnia*, a medicine whose value is slight, considering the extent to which it is administered. Its general effects on the nervous system are as disappointing as its direct effects on the stomach are encouraging; for I regard it as one of our best tonics in some forms of dyspep-

sia. I would say the same of *aconite;* it is a drug which, acting powerfully on the nervous system, influences nutritive processes in various parts, but its direct operation on the centres so as to alter their morbid states appears to be very slight indeed. *Chloroform*, which as a temporary remedy promotes such a wonderful stillness of the nervous system, is productive of no permanent effect in its various lesions. In affections of other organs it is useful, as in allaying hiccup, pain in the bowels, &c., or arresting convulsions. *Chloral*, also, in gastralgia, in irritable bladder, &c., is very beneficial, but it cannot be called a remedy in any sense that opium can. It produces sleep, but has no power in arresting the morbid conditions which produce insomnia. I can confirm Dr Savage's opinion that it aggravates all the symptoms of melancholia, and will hasten suicide. We gain, therefore, but little by possessing it, and I am not at all sure that mankind has been much better off for the invention. *Cannabis indica*, which has so powerful an influence over the nervous centres, is a very poor medicine, although I have spoken of its benefit in migraine. *Physostigma* has been found useful occasionally in tetanus; also in "spastic paralysis," and other spasmodic diseases. *Phosphorus* is again coming into use in nervous affections, but is in my opinion all but valueless. *Gelseminum* is our new remedy for neuralgia; and *camphor* is a good thing to play with. Bromide of potassium appears to be useful in a few complaints. Like all medicines of universal application it cannot be regarded but as a very poor remedy. *Chloride of ammonium* is one of our best remedies in neuralgia.

Since in very many nervous diseases a disordered action of the centres has been of long duration, you can see how a temporailry soothing or exciting remedy can be of little use compared with one which shall have a slower but more permanent effect. Thus we find that remedies which act indirectly, it may be, upon the blood-vessels of the centres, such as the metals, have contributed more than any other means to the cure of nervous disorders. Foremost stands *iron*, and then *zinc; silver* has been found useful in some cases, and in not a few *arsenic*. The most striking effects are seen in neuralgia, where iron and arsenic are often found to produce a cure without any possibility of doubt. In this class of affections I should say that arsenic is one of the most important medicines which we possess; it is difficult to foretell a cure, but in tic of the face, sciatica, pleurodynia, gastralgia, and other nervous affections, its beneficial effect is often most marked. There is, again, *quinine*, which has cured more nervous disorders than all the physiological remedies combined. I have also given the Tinct. *Actææ racemosæ*, and should

say that in lumbago, sciatica, and some similar nervous affections, it seems to have some efficacy.

I must not forget to mention the novel method of introducing medicine by the skin—the hypodermic method. A small syringe contains the solution, and, having a needle point, is inserted into the skin, the fluid being forced in by gentle pressure or by means of a screw. Many remedies have been thus used, but more especially morphia. When first adopted it was thought to be eminently efficacious by acting directly on the painful part, but further experience has shown that an equally good result is obtained into whatever part of the body it is thrown. The advantages are that it acts speedily, and does not injuriously affect the system as when taken by the mouth. I have seen a gentleman who suffered agonies with spine disease take morphia in the usual way, with the production of sickness, parched mouth, and other unpleasant symptoms, long before the system responded to its influence; but when injected through the skin the drug speedily soothed the system, relieved the local pain, and no unpleasant consequences resulted.

Then, again, amongst the remedies for local nervous affections we have local remedies, and these are of various kinds. There is the class of soothing medicines already named, made into the form of liniments, ointments, &c. These are sometimes useful, but often less efficacious than applications of an altogether different kind, as blisters and hot applications. There are many instances where a blister is efficacious after every soothing remedy has failed, and, as regards hot applications, I cannot speak too highly of them. These are popular remedies, but nevertheless much less seldom used than a particular medicine which can be taken from a bottle, because, indeed, the latter practice entails less trouble; but I know from experience that there is many a sciatica or lumbago which can be cured in a few hours by the constant application of heat. Besides the heat, stimulating lotions are often highly efficacious, as, for example, the tincture of capsicum or mustard. I dislike to hear that a patient has failed to gain relief from the medicine of some eminent physician or surgeon, when some old woman or quack has effected a cure by a simple method. Amongst popular remedies is the Tinctura Arnicæ. I cannot say that my experience of it has been large, but I have seen enough of it not to ignore it, and consider it to be sometimes a useful remedy. In one case of a patient who had a violent neuralgic pain following shingles, we used the arnica, and the patient soon got relief, but at the same time an eruption came out, which is very common after the use of this drug. The lotion was then discontinued, the eruption faded, and the pain returned. In this case it seemed to act as a counter-irritant.

I should say that just as hot applications are useful in many painful affections of the nerves, so is the cold douche in some paralytic conditions. I have seen cases of writers' cramp and similar maladies much benefited by allowing a stream of cold water to run upon the weakened limb.

Then, again, there are the various methods of "massage" (or shampooing), and otherwise rubbing the limbs in various ways. Dr Mortimer Granville speaks of an instrument that he has invented, which produces very rapid percussion.

As regards medicated plasters, they may relieve directly by the influence of the drug which covers them, or by simply producing a new sensation in the place of the old one, or generally, I believe, by the support they give to the part to which they are applied. If the pain be due to what is usually called muscular rheumatism, they prevent the movements of the muscle and its attachments.

Electricity.—After the discovery of electricity as one of the forces of nature, and its remarkable effects on the animal body, it was naturally thought that its services might be commanded for the alleviation of sickness; but it is only of late years that it has been applied in a scientific method. One reason for its neglect by physicians was no doubt the early meddling with it by charlatans, and consequently for a long time the only electricians were the most notorious quacks. There was the mountebank who travelled the country with his electrifying machine made out of an old glass vessel and a Leyden jar, consisting of a bottle with a nail inside, wherewith to "shock" the people, and the cures, of course, were numerous, as, for instance, that of a bishop long paralysed, who jumped out of his chair on the first application. After this, we heard of the wonderful properties of pulverised loadstones, and when the galvanic battery was invented, the effects of this in vivifying weak mortals were marvellous. We can now scarcely credit the fact that the celebrated quack Graham instituted at Leicester Square a temple of health, where, amongst the furniture, was a celestial bed provided with costly draperies, and standing on glass legs, so that married couples who slept in this couch were sure of being blessed with a beautiful progeny. For its use £100 a night was demanded, and many persons of rank were foolish enough to comply with the terms. When, shortly afterwards, Franklin dragged the lightning from the clouds, and showed its identity with electricity, we heard how an old woman, whilst at work in the fields, was struck with the flash, and how her uterine function was restored, and she was blessed with a second family. It can scarcely, then, be wondered at that respectable medical men up to the present day held aloof from the subject of electricity, and regarded it at the best as a pretty plaything for their patients. It has

been quite of late years that the subject has been investigated in a scientific spirit; and I think we at Guy's may be proud that it was at this institution, under the auspices of the late Dr Golding Bird, that it began to be systematically used as a therapeutic agent. The instrument which you now see in our room was the same which this physician used for many years. His instrument was a simple cylindrical electrifying machine, and an insulated stool on which the patient sat. By this means the patient was charged, and sparks were drawn from his back or elsewhere. The Leyden jar was also sometimes put into use. At this time galvanism had not been employed for therapeutic purposes.

If you refer to the 'Guy's Hospital Reports,' you will see that a considerable amount of good was effected in cases of chorea and some forms of paralysis by Franklinism or frictional electricity. It seemed to act favorably in the same class of cases which we now find relieved by the simple current.

You may remember that it is now some eighty or ninety years ago when Galvani performed his experiments on a frog, and made the discovery that electric currents ran through the animal's body; this was supposed to be refuted by Volta, who, placing together a number of pieces of metal separated by wet cloths, gained the same result: the latter believed that the forces were generated in the metals, and that the animal body merely acted as a conductor. That Volta had a force developed by the chemical action of the metals was no doubt correct, but Galvani's surmise was also true that electric currents were continuously passing in the animal body. The well-known experiments made of late years by Matteucci, Du Bois-Reymond, Radcliffe, and others, have sufficiently confirmed his discovery that there are currents continually developed both in muscles and nerves. Just as in unscientific hands attempts had been made to use the electrifying machine as a therapeutic agent, so now the galvanic battery was thought to possess wonderful curative properties on sending currents through the body. It was found, however, to be all but useless in the manner applied, and the machine, together with the galvanic bath, remained in the hands of charlatans almost up to the present time, and even now the bath is scarcely used in a scientific manner. The object proposed by it was to extract metals from the body which had been introduced as medicines or in various trades. The patient sat on a wooden stool in a bath containing some acid, and, by his holding one pole of the battery whilst the other was attached to the outside of the bath, the metals were said to be drawn out of him. The method is now being more thoroughly tested.

The subsequent discovery of electro-magnetism gave a new im-

pulse to the use of this agent in medicine. You know how a current of galvanism in the conducting-wire of a battery induces a current in another wire, and how, if the latter be made into a coil and a piece of iron be inserted in its midst, the iron becomes a magnet, and how, by this means, if the current is applied or cut off, very rapid minute shocks are felt. You know also the counter-discovery by Faraday of the magnet giving rise to an electric current whenever contact is made or unmade with one of its poles. Now, whether there be any difference in the physical effect of the current induced by the galvanic battery and that induced by the magnet I am uncertain, but the latter is more painful and little used by experts. The magneto-electric machine, however, is much used by the public, because more convenient.

This induced or intermittent galvanism, when employed for the treatment of disease, is usually styled faradisation, in distinction to the constant galvanic current from the simple battery.

On the discovery of this form of galvanism, and its striking effects on the muscles of the body when the poles were applied to different parts of the limbs, the method of treatment by faradisation came at once into favour, and we are indebted especially to Duchenne for the stimulus which he gave to its use. This physician made long and careful experiments on healthy and diseased persons, and thus not only supplied us with new methods respecting the cure of disease, but with new facts as to the action of particular muscles in the body. If you read his works, you will see that if dry metallic points were applied to the surface, the skin was merely affected, but that if wet sponges were firmly pressed on a muscle it was excited to contraction, and more especially if the poles were applied to certain spots towards its edges. This was thought to be due to the nerves entering at these places. The electro-magnetic apparatus, owing more especially to Duchenne's writings, thus came into general use, and it is the instrument which we were formerly solely employing. Every ward had one, and if a patient was recommended galvanism this was used, the poles of the battery being applied to the muscles in the manner mentioned; its efficacy, however, was very uncertain when used indiscriminately in all cases. In those instances where a set of muscles were inactive from long disuse, its value was great. Thus, in the case of a girl who had hysterical paralysis of one leg, which, in consequence of her having been long bedridden, had become much smaller and weaker than the other, the induced current effected an entire cure; so also in some cases of facial paralysis. In progressive muscular atrophy, also, as in the remarkable case of the girl already mentioned, it was very useful. On the other hand, we found it quite inefficacious in the infantile paralysis, and

in a similar class of cases, sometimes met with in the adult, where a limb, without any apparent cause, becomes wasted and useless.

Thus we went on until other observers, and especially Remak, informed us that in the supposed efficacy of the induced electric current we had overlooked the effects of the constant or continuous current as produced by the simple cell; moreover, that the effects of the two forms of galvanism were different on the human body, and that consequently they had their own special curative properties in different diseases; that not only was faradisation or the induction current of the magneto-electric and galvano-electric machine useless in some forms of paralysis, but actually injurious; and that diseases which could not be remedied by it could be so by the other. Remak undertook many elaborate experiments on the human body, in order to prove that the constant current was often the much more useful agent. Its application produced also a soothing influence on the nervous system in cases of hyperæsthesia.

Since I first gave these lectures much has been ascertained respecting the relative action of the continued and induced currents. You will observe that both galvanism and faradisation produce contraction of the muscle, but that the former will only produce this effect on making and breaking contact, whilst the latter will excite the muscle so long as the sponge of the rheophore remains on the limb. It is believed that the faradaic current does not act directly on the muscular fibre, but only on the nerves that supply the muscle, and that therefore it is only through these that the muscle is excited. The fact was first suggested by the experiment made on animals with woorari, which has the power of paralysing the whole of the motor nerves; under these circumstances faradaism will no longer produce any reaction on the muscles, whilst they contract still to the galvanic current. This latter, therefore, alone acts directly on the muscular tissue as well as on the nerves. The experiment is confirmed by watching the effects of electricity in cases of paralysis. In those instances where the nerve is injured, or the spinal cord whence the nerve arises diseased, no reaction occurs when faradaism is applied; for example, in infantile paralysis, which has its origin in inflammation of the grey matter of the cord, reaction to faradaism very quickly subsides, whilst that to galvanism remains until the muscles are far degenerated. I think it is too much to affirm, as some do, that in all cases where these peculiar reactions exist the spinal cord and its nerves are diseased; for if this were true lead paralysis and some other forms of paralysis must always have a spinal origin. It is to Erb, how-

ever, who suggests this, that we are indebted for most of our knowledge on the subject, and for the thorough investigation of the different reactions of muscle and nerve. If the nerve be diseased, neither galvanism nor faradaism will act upon it, and if the muscle be affected through the nerve, or directly or indirectly from the spinal cord, then it ceases to react to faradaism, whilst the contractility to galvanism remains, although in a new form. This change in the excitability of the muscle the author has styled the "reaction of degeneration."

In using galvanism we apply one pole, usually the positive, above, and the negative below, and on making and breaking contact, or, more correctly, on closing and opening the circuit, a contraction takes place. A very usual plan is to place the anode on the spine, and then the cathode may be placed on various parts of the limbs or continually stroked down them. We find there are distinct laws which regulate these contractions, as, for example, the greater contraction on closing the cathode, and the very minute contraction on opening the anode; but the rule may be variously altered in disease. It has been found useful, therefore, in testing the effects of galvanism, to use certain symbols, and the effects may thus be shown in three letters, the first being represented by anode or cathode, the second by opening or closing, and the third by contraction. We have, therefore, formulæ of this kind:

1. Cathodal closing contraction (C. C. C.).
3. Cathodal opening contraction (C. O. C.).
3. Anodal closing contraction (A. C. C.).
4. Anodal opening contraction (A. O. C.).

As the cathodal contraction is naturally the strongest, an abnormal reaction might be as follows:—A. C. C. > C. C. C.

Galvanism, therefore, is useful, not only as a remedy, but as a diagnostic agent, and we find its varying effects in different forms of paralysis. Thus, there is the remarkable reaction in the case just mentioned, whereas in cerebral paralysis or hemiplegia the reaction to either form of galvanism would not be affected. Again, in a case of facial paralysis arising from cold, there would be a reaction produced by either form applied to the nerve, but if applied to the muscle there would be reaction only to the continuous current. This would show that the peripheral nerves were at fault, as when the paralysis arises from cold, and not from a central cause.

In cases of paralysis of a limb from pressure on a nerve faradisation would be useless.

The various other applications of electricity have already been spoken of under their respective headings. I have also spoken of the electric bath. It might be thought that very different thera-

peutic effects would be induced according to the position of the poles, but at present no observations of importance have been recorded in this respect. It might be as well, however, to remember the experiments on frogs as regards the direction of the current. When this is down the limb the function is increased, but an opposite effect is produced when the current is reversed. Whilst it passes down, the hind legs are moved; if the poles are reversed the front legs are moved and the animal cries out. Much, however, has been done with respect to the effect of electricity on nerves, and this is called *electrotonos*. Dr Morgan, of Manchester, has found that he could act more directly on the muscles and nerves by thrusting needles into the skin and operating through them.

It is as well to know in using galvanism that sufficient power is being used, and this can be generally told by the patient feeling the effects through the system, as taste in the mouth, flashes in the eyes, vertigo, &c.; not that this amount, however, need be always used.

I have already spoken of the use of galvanism in neuralgia, as tic or sciatica; also in lumbago, where I have seen the secondary current sometimes do as much good as the simple continuous one. Even in the pains of organic disease it is beneficial. In a case of spinal meningitis, with painful contraction of the legs, galvanism acted as a soother, and enabled the patient to sleep.

I have spoken of the popular views respecting electricity because very similar opinions are held about it now as in former times. You will be constantly asked as to its value in particular forms of complaint, and you will find they are generally those in which the profession knows nothing of its uses; in fact, although we and the public both regard electricity as a very potent remedial agent, we look upon it in a totally different light. The popular notion of electricity is that it is a life restorer, and invigorates the system in all forms of depression; it is therefore had recourse to by hypochondriacs and others, who seek from it some tonic influence for their weakened nerves; or at least they think they are making use of it by wearing galvanic chains, belts, rings, and breast-plates. We know little or nothing of electricity in this sense. We are not even aware that a current continually passing through the system has any effect whatever. We employ it for producing a molecular change in the spinal centres, in the nerves, or the muscles, and we find that by a succession of shocks of different lengths and intensities a commotion is set up in the organs, and that in this way an alteration in their functions ensues.

I might also allude to the fact that when you enter upon practice you will find that persons have very different susceptibilities as re-

gards the action of medicines upon them. These idiosyncrasies, however, are probably not nearly so frequent as are supposed, since the patient feels a pleasure in asserting that he possesses some peculiarity of constitution which renders him or her more susceptible than other people; and yet this is entirely imaginary. Every practitioner must have observed how pleased patients are to say they have a very weak pulse, and that doctors have told them so. So often is this the case, that unless I have good evidence of it I totally disregard the statements of the patient in this respect. What, however, is far more common is the extreme susceptibility to medicines of all kinds which we find in some persons. Just as there are those who with tolerably strong bodies always respond to treatment, so there are others who appear never to be benefited by it. This is due also to the mental attitude towards medicine which each class of patients presents; the one seeks the doctor's advice with confidence, intending to be better for it, whilst the other approaches him with scepticism, feeling sure that medicine will avail him nothing. The character of mind and body in the two persons being different, it becomes absolutely true that the incredulous patient has good grounds for his doubts. The doctor, therefore, soon finds that in treating his patient the practice of medicine is not only one of physic, but of psychology, and that the effect of his drugs depends as much upon the constitution of the patient's mind as his body. I know several persons, amongst others two notable examples in our profession, who say they cannot take physic; they mean that two or three grains of rhubarb will violently purge them, that a few drops of opium upset their livers and stomach for several days, that three grains of iodide of potassium will cause coryza and headache, and so on through the whole list of drugs. These very unpleasant people and unsatisfactory patients are counterbalanced by our old and steadfast adherents, who ask for a prescription with confidence, and declare that whatever you give them does them good. You therefore have much to learn when you get into practice as to the individual peculiarities of your patients.

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