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Croonian Lectures. On the Pathology, Morbid Anatomy, and Treatment of Insanity, delivered at the Royal College of Physicians, London, 1858, *by* ALEX. JOHN SUTHERLAND, M.D., F.R.S.

Insanity is a disease at once so interesting, and so important, that it is not surprising that the subject should have been chosen by some who have preceded me in delivering the Croonian Lectures. In 1832, Dr. Seymour lectured upon the Medical Treatment of Insanity; in 1848, Dr. Conolly referred in his Lectures, more particularly to the Moral Causes and the Moral Treatment of the Disease; and in 1853, you, Mr. President, delivered your valuable Lectures on Medical Testimony and Evidence in Cases of Lunacy.

I propose in these Lectures, to speak of the Pathology, the Morbid Anatomy, and the Treatment of Insanity.

The theories of the pathology of insanity are numerous. Some regard the mind, others the body, as the seat of disease. Some think that it is a disorder of the nervous system, others, that it is one of the blood. Some adhere to the theory of nervous exhaustion, others to that of acute inflammation. Some assert that insanity is always an idiopathic disease, others that it is always symptomatic. Hence we have the Somatic theory, the Psychical theory, and the mixed theory; and we have the theory of a deservedly celebrated German psychologist, who thinks that the mixed theory is erroneous, because it considers the body as well as the mind as substrata of psychopathies, whereas these lie only in the relation of both to each other;

and, as he adds rather obscurely, "therefore neither in the body, nor in the mind." (Feuchterslieben.) All these theories have some foundation to rest upon. It is true that insanity may originate in the mind, as well as in the body, but diseased action must take place in the brain, otherwise we have not, as has been well observed, "a true psychopathy." The theory, that insanity is a disease of acute inflammation, has been refuted over and over again; but although the disease is not one of acute inflammation, it is frequently accompanied with chronic inflammation of the membranes of the brain; lastly, the theory that it is a disease of nervous exhaustion, which is a much safer one to adopt, does not apply to all cases, more particularly to those which break out suddenly; nor to those which are the result of congestion, bordering upon apoplexy.

If I refer to the theory of Heinroth, who considered crime and insanity to be convertible terms, it is merely to protest against the injustice of ignoring altogether the works of the metaphysicians, because of such mistakes, and against the error of saying that we have reaped no advantage from their labours; for we ought to remember that we have borrowed the doctrine of forces from Schelling, and the doctrine of relations from Hegel. The theories also of the Hartleian school, and of Charles Bonnet, of Geneva, were greatly in advance of the Cartesians, and of the ancient anatomists, who considered the nerves as hollow tubes, or pipes, within which the animal spirits were included; for both Hartley and Bonnet thought that there was a subtle, and elastic ether, which co-operated with the nerves, in carrying on the communication between soul and body. Bonnet, indeed, considered that this fluid was contained in the nerves, in a manner analogous to that in which the electric fluid is contained in the solid bodies which conduct it.

But to return to what I have said respecting the different theories of insanity, I would ask, how can any one of the above theories account for all the varieties of the disease? In order to arrive at just conclusions respecting the pathology of insanity, the whole subject must be kept in view in all its bearings. We must consider the mental, as well as the physical cause of the disease, and the relation which the one bears to the other. We must neither attribute the symptoms in every case to a special diathesis of the blood, nor, on the other hand, to a peculiar state of irritation of the nervous system; because while some forms of the disease are to be attributed to nervous exhaustion, and are analogous to dreaming, and somnambulism, other forms are the result of errors of primary, and

secondary assimilation; others, again, are due to poisoned and impoverished blood, and are analogous to drunkenness, and delirium tremens, or are the result of fever, gout, rheumatism, syphilis, the poison of mercury, and of lead, a scrofulous or phthisical habit, or of the oxalic acid and phosphatic diathesis. While on the one hand we recognise the effect of excitement upon the nervous system by oxidation, as illustrated by the recent experiments of Brown Sèquard, and as exemplified in cases of starvation, by Liebig's theory of eremacausis; on the other hand, we recognise similar excitement of the nervous system, produced by carbonic acid, as in the cases of the French soldiers who became insane from venous congestion, the effect of cold, in the retreat from Moscow. The question of, where the disease is? is a different one from another with which it is apt to be confounded, whence does it originate? If we ask the first question, we are met by the answer which many give with much confidence, viz., that the disease must be located in the cortical structure; but insanity is a disease of the affections and instincts, as well as of the intellect, and therefore we must assign a place for the disorder in that part of the brain, which is the seat of emotion as well as the hemispheric ganglia. But has physiology proved that the mesocephale is the only channel through which the affections flow? Till physiologists agree amongst themselves upon this important question, it is useless for the pathologist to point to this part of the brain as exemplifying by its morbid appearances the cause of perverted affection.

Insanity is a disease which is very complex in its nature; it is not only idiopathic, but symptomatic; not only centric, but ex-centric. We have not only to consider the mutual action and re-action between the mind and the brain, but also the relation which exists between the ganglion globule and the blood corpuscule, between the blood and the tissues, between the hemispheric ganglia, and the other ganglia of the nervous system; in short, we have to study the constitutional symptoms with which the disease is accompanied. Having thus considered some of the difficulties with which the subject is surrounded, I shall proceed to examine how far the states of the nerve force and of the blood throw any light upon the pathology of insanity.

First, with respect to nerve force. Nerve force, is probably the highest form of matter, as by it the mind manifests its ideas. The cell-nuclei, found in the nervous centres, and at the extremities of the afferent nerves, are generally supposed to be the sources of nerve force, and it is developed with ani-

mal heat from the oxidizing processes which are going on in the body: this, however, cannot take place without some alteration of the molecular condition. Are we then to suppose that a total and complete change in this molecular condition occurs during every discharge of nerve force. I think that Mr. Paget's observations upon this subject are very instructive; he says, in the modelling of parts during development and growth, such complete changes probably occur, but in mere maintenance of parts, there is no evidence of their frequent or ordinary occurrence, and to assume it is contrary to the fact that we rarely find any rudimental structures among the perfect ones. Nutritive maintenance, probably requires nothing more than molecular substitution. Atoms even of refuse substance may be passing out, and atoms of renewing substance passing into places among the structures of a comparatively persistent framework. "Cell-walls, or their analogues, may be long-lived, while their contents are undergoing continual mutation." (Paget's *Croonian Lectures*, R. S., May 28th, 1857.)

These observations may prove of some use to those who feel disappointed when the minutest investigations of the brain of the insane under the microscope fail to point out anything characteristic of the disease. M. Esquirol, speaking of the examinations of the brain in these cases, says that "nature has refused to reveal her secret;" but surely this ought not to stop us in our investigations; and if morbid anatomy be unequal by itself to solve the problem, we must call in chemistry and physiology to its aid, and study the ganglion globule, and the blood corpuscule in their mutual relations. Not only are the subtle reasonings of intellect manifested by nerve force, but the processes of primary and secondary assimilation in all parts of the body are presided over by it, and the rhythmic actions of the heart, and of respiration, are due to its influence; and as the involuntary movements of the heart are regulated by its ganglia, so are the voluntary movements of the muscular system, under the control of the cranio-spinal nervous system, and the hemispheric ganglia, the seat of volition and consciousness, exert their influence over the muscles solely through the medium of the automatic apparatus.

I was much struck in dissecting the torpedo with the enormous size of the fifth and eighth nerves which supply the electric apparatus, and by the appearance of the medulla oblongata which is highly vascular, and larger than the brain. We have proof here of the necessity of repose, in order to give time for the accumulation of sufficient nervous force to create a shock; we have also a proof of the distinction between electricity and

nerve force; for a most elaborate apparatus is required, in order to convert nerve force into electricity, as we see in the beautiful honey-combed cells filled with fatty matter, upon the walls of which the nerves are distributed. Müller has taken great pains in distinguishing electricity from nerve force, and although his experiments were made before Mr. Groves' theory of the correlation of the physical forces, yet they prove distinctly that, electricity and nerve force are not identical.

In a very interesting lecture delivered at the Royal Institution, Professor Huxley explained the difference and the relation of the two forces. He showed that nerve force is not electricity; but two important facts were cited to prove that nerve force is a correlate of electricity, in the same sense as heat and magnetism are said to be correlates of that force. These facts were first the negative deflection of Du Bois Raymond, which demonstrates that the activity of nerve affects the electrical relations of its particles; and secondly, the remarkable experiments of Eckhard, which prove that the transmission of a constant current along a portion of a motor nerve, so alters the molecular state of that nerve, as to render it incapable of exciting contraction when irritated. Nerve force, like electric force, is probably transmitted by propagation onwards of molecular distribution, into the substance of the transmitting body in a very rapid manner. Helmholt, however, has ascertained, that the velocity of its transmission in a frog does not exceed eighty feet in a second.

Another part of the subject which is likely to throw some light upon the pathology of insanity, is the study of the properties of the ganglionic corpuscules, and of their commissural processes; and I was glad to find in a paper on the mutual relations of the vital and physical forces, published in the *Philosophical Transactions*, that Dr. Carpenter's attention had been drawn to the important subject of the dynamical relations of the nerve force, to mental agency on the one hand, and to the several vital forces on the other.

Minute anatomy is also likely to aid us in our future investigations. The mode of examining the internal structure of the brain and spinal marrow under the microscope has made rapid advances of late years. When I examined the minute anatomy of the brain, with my friend Dr. Todd, I was in the habit of cutting a thin slice, and (in order to make it translucent) of squeezing it between two thin slides of glass. I need not say that this gave a very imperfect idea of the delicate structure which was submitted to such rough treatment. Stilling, Kölliker, Lenhossek, Lockhart Clarke,

Quekett, and others, have shewn us new methods of tracing the delicate fibres of the nerves to their different nuclei. The method which Mr. Lockhart Clarke employed, viz. that of hardening the chord in spirits of wine, and treating the section with acetic acid, has been abandoned, and the section is now made transparent by chromate of lead, according to Kölliker's method, or is steeped in carmine, which makes the minute fibres and nerve cells more distinct. The tubules when removed from the brain of a living animal are delicate translucent fibres, which in a few minutes become opaque, and separate into two parts, viz., the nervous fluid with its nerve-axis and the investing case; very slight pressure renders these tubules varicose. Although the alterations of structure in the hemispheric ganglia must always afford most interest, the examination of the fibrous structure of the mesocephale, and of the spinal cord, are not to be disregarded in our minute investigations. Doubtless, disease at the origin of the nerves is sometimes the source to which the subsequent delusion may be traced. In a patient who fancied that wild beasts were tearing the flesh off his back, I found the membranes of the spinal marrow injected, and the minute vessels of the chord much inflamed in the cervical region. Its cut surface from the situation of the first to that of the seventh vertebra, presented a deep blush of red. In a patient who imagined that snakes were crawling about his arms, there was an effusion of coagulated blood, which adhered firmly to the inside of the vertebral canal, and pressed upon the posterior portion of the chord, from the situation of the third to that of the fifth cervical vertebra.

When we consider that diseases of the lungs give rise in many cases to symptomatic insanity, that disorder in the function of the ninth nerve is one of the first symptoms of general paralysis, and that illusions of hearing are of such frequent occurrence among the insane, it must be admitted that the medulla oblongata becomes a point of considerable interest to us in our present enquiry.

Stilling has traced the pneumogastric, the hypoglossal, the spinal accessory, and the glosso-pharyngeal nerves, through the medulla oblongata to special deposits or nuclei in the floor of the fourth ventricle.

Lenhossek who had the opportunity of examining the internal structure of the brain and spinal chord of the insane who died in one of the large asylums in Germany, has recently transmitted his valuable preparations to the College of Sur-

geons, with a pamphlet and diagrams, which verify Stilling's results.

I have thus briefly alluded to these recent microscopic investigations, because a knowledge of the internal structure of the nervous centres must precede that of the morbid structure, and I hope that these laborious investigations, when applied to diseases of the nervous system, may tend to elucidate their pathology.

We have a wide field open to us in the study of the subject of nerve force in insane patients. I recollect that Dr. Pereira called our attention to this in one of his lectures, delivered at the College, the substance of which was afterwards published in his *Materia Medica*. Speaking of the correlation which exists between nervous force and animal heat, he says, "the nervous force, perhaps, may produce heat, and conversely, heat may excite the nervous force. We know, that heat applied to motor nerves produces muscular contractions, and to sensory nerves, sensations; and numerous facts may be adduced, favouring the notion that nervous force produces heat. Thus the augmented temperature in the lower parts of the body, sometimes consequent on injuries of the spinal cord, and the flushes or topical extrications of heat frequently observed in nervous and hysterical subjects, favour the notion of the generation of heat by the excitement of the nervous force."

In nervous patients, there is great inequality in the distribution of nervous force, owing to irregularities in the circulation. In mania we not only very frequently find that the head is hot, and the extremities cold, but we sometimes meet with variations in the degree of heat in different parts of the head. By a delicate thermometer, I have noted a difference of two degrees of heat between the forehead and the crown of the head. In cases of acute dementia, where there is no external manifestation of the exercise of the intellect, and where there is little expenditure of nerve force, there is a minus quantity of animal heat: and in cases of dementia, when the brain is in a state of partial atrophy, we find patients sometimes basking in the sun, with their hats off, enjoying the stimulus which excessive light and heat gives to their blunted sensations. In these days, when the powers of the mind are overwrought, and when the strength of the body is overtaxed, it is well to remember the proverb, "that we can borrow from the brain, but not steal from it;" and the warning of Aristotle, "Excessive athletic exercises destroy the strength of the body." The ganglionic apparatus is capable of producing a greater amount of nerve force in one man than in another, but there are limits

which cannot be passed with impunity. How many have I seen unfit for the active business of manhood, who have exhausted themselves by over-reading in youth. Not only does excessive mental exercise of comparatively short duration, tend to exhaust the powers of the mind, but daily business without relaxation produces the same effect; thus, I have met with cases of insanity among tradespeople, who would never allow themselves relaxation, but who went on toiling, Sunday and week day, from one years' end to another. Some forms of paralysis, may be distinctly traced to excessive expenditure of nerve force. A lady of my acquaintance, suffered from paralysis of the hands for a year, in consequence of practising some difficult music on the piano during the greater part of a rainy day. A lady was kept up night after night writing imaginary despatches, dictated by her husband just before he was seized with an attack of paralysis of the insane, in consequence of this excess of writing, she lost the use of the index and middle finger, and is now obliged to write with her left hand.

The quantity of nerve force in the third stage of paralysis of the insane is very small, as there is little capacity in the nervous centres to produce it, and this form of paralysis towards the end of the disease sometimes terminates in complete paralysis. A patient of mine, labouring under general paralysis, fell asleep with his arm over the back of a chair, and the arm was completely paralyzed for two days afterwards.

Sudden shocks, as is well known, frequently cause local paralysis, thus ptosis of both eyelids was produced in a patient of mine, when she heard of the intended marriage of a gentleman to whom she was engaged, under more than usually painful circumstances; the ptosis of the eyelids soon disappeared, but the symptom was followed by an attack of melancholy, with a strong suicidal tendency. I need not say that paralysis of the seventh nerve, is a well-known symptom of disease of the brain from severe mental shocks.

Wherever we have symptoms of atrophy of the nervous centres, then of course there is little secretion of nerve force, as in the idiot, the imbecile, and the fatuous: but nothing expends nerve force so rapidly as venereal excess. Certainly the majority of recent cases of nervous exhaustion which come under my care, may be attributed to this cause.

It is curious that patients whose disease has been brought on by masturbation, after they have allowed their nervous system to lie fallow, or after they have experienced great mental emotion, will wake up as it were, into a state of comparative rationality. Upon one occasion, I very nearly failed

in obtaining the verdict of a jury, as to the undoubted unsoundness of mind of a patient, whose intellect having been disordered by this cause, was for a time partially restored by the excitement of the inquiry.

Examples of the mutual relation between the nervous and sanguineous systems, are to be found in Tabes' dorsalis, the tremor of old age, paralysis agitans, and catalepsy. In Tabes' dorsalis we have atrophy of the spinal marrow, with congestion and subsequent effusion into the spinal canal, the functions of the brain remaining unimpaired. In old age and paralysis agitans we have wasting and exhaustion of the nervous system, producing an anœmic condition of the blood, with a tendency to serous effusion in the encephalon. The brain is no longer able to control the functions of the spinal system, and the involuntary tremors of the limbs are the result of reflex action, upon the same principle as the incessant motion of the ciliary fibrils in the anelida, or the vibratile cilia of the epithelium of the mucous membranes, which being completely independent of volition never tire. That catalepsy is due to a supply of impoverished and poisoned blood, we know from the fact of its being present in certain cases of adynamic fever; and from the statement of Dr. O. Shaughnessy, viz., that an overdose of Indian hemp is accompanied by peculiar delirium, and venereal excitement, followed by insensibility, during which the patient retains any position in which he may be placed. In catalepsy there is very small secretion of nerve force: the nerves of sensation are deadened, at any rate receive few notices from external impressions, and the nerves of motion refuse to obey volition, so that the limbs of the patient remain fixed in any position we choose to place them.

If the soles of the feet are tickled, no reflex action is produced; if cold water be sprinkled over the body, no effect follows; if a patient be placed in a bath, he sinks to the bottom, and remains fixed in the same attitude; at times, the patient makes an effort to exert volition, but the oscillations of the nervous current fail, and the effort ceases. The duration of the cataleptic state varies much; indeed, when it is the result of acute dementia, it may continue as long as the disease lasts. A patient in St. Luke's Hospital laboured under this complication of disease; the pulse was weak, and raised to one hundred in the minute after the smallest exertion; he was constantly obliged to be fed: the saliva drivelled from his mouth, and he was unconscious of the calls of nature—he was washed, and dressed, and put to bed like a child; and was found on the following morning precisely in the same position that he

was placed in the night previously; and yet when he heard that there was to be a ball, he would wake up from his cataleptic state, dress himself, talk rationally, and dance the whole evening. I have generally found that music has a very exciting effect upon cataleptic patients, and sometimes it may be a very valuable adjunct to the treatment, if judiciously employed.

We will now proceed to consider the state of the nerve force in cases of dementia, and of mania. In cases of dementia, there is little disturbance of the functions of the nerves of organic life, because the brain is in a passive state; but in cases of acute mania, the processes of digestion and secretion are greatly interfered with, as is evident from the symptoms of constipation, the unhealthy evacuations, the scanty secretion of urine, and the deposits of uric acid and urate of ammonia. In acute mania, the production of nerve force is very rapid, the increased flow of blood, which is the result, at first stimulates the intellect beyond its ordinary power, and if the progress of the disease be slow, the mental symptoms manifest themselves in the following order.

The intellectual functions are elevated beyond their accustomed, sometimes beyond their natural powers, the conversation is brilliant, and the images which pass in rapid succession through the mind, are described with great clearness and beauty. In this stage of the disease nothing is concealed, all the family secrets come out, and the patient, as it were, thinks aloud. This exuberance of description does not last long; the ideas crowd into the mind in rapid succession, and incoherence of conversation follows. Sometimes great variations are observed in the early symptoms, not only from day to day, but from hour to hour: incoherence, delusion, and glimpses of reason, chase each other in rapid succession and boisterous exhilaration is often followed by the deepest dejection. As I had occasion to observe in a paper published in the *Transactions of the Royal Medical and Chirurgical Society*, vol. xxxviii., the emaciation which takes place during the acute stage of mania, is generally very great; the fat appears to be absorbed from all parts of the body to supply the brain; and our patients at St. Luke's Hospital, sometimes weigh many pounds heavier at the time of their discharge, than when they were admitted. The cell nuclei are thrown into a state of unhealthy activity, there is little repose night or day, and want of sleep, as is well known, is one of the most common symptoms. There is a constant demand upon the blood for the albuminous and oleaginous principles; the whole nervous

system partakes of this activity, and feels its influence, and is thrown into a state analogous to electric tension; not only are the hemispheric ganglia involved, but the fibrous structure conveys the impulse to the peripheral extremities of the nerves, producing hyperæsthesia and pseudæsthesia; the false perceptions of the nerves of special sense and those of sensation are sufficient evidence of this: and the errors of nutrition and secretion prove that the nerves of organic life likewise sympathize. When the disease arrives at its highest point, and a paroxysm occurs, we have then to deal with another force, which becomes equally unmanageable, I mean the force developed by muscular contractions, (which, as Matteucci has shown, is quite independent of the nervous system;) these two forces acting and reacting upon each other, produce such a state of nervous erethism, that I have seen patients with symptoms resembling those of an animal poisoned by strychnine; the fury of the passions, and the movements of the limbs are quite beyond their control, and the muscular force is developed to such an extent that they sometimes perform feats of strength, which they would have been quite uneqnal to, when well.

Professor Huxley, in the lecture to which I have before alluded, exhibited Weber's experiment of passing a series of shocks from an electro-magnetic apparatus, through the pneumogastric nerve in a frog properly prepared for the purpose; when this was done, the pulsation of the heart ceased, and on breaking contact, it remained at rest for a little time, then gave a feeble pulsation or two, and then resumed its full action.

This negative innervation, as Professor Huxley terms it, is the result of the action of the pneumogastric upon the ganglia of the heart, thus proving that one portion of nervous matter is capable of controlling the action of another portion. The shock of the palsy stroke, and those mental shocks which produce an immediate change in the secretion of the different organs, and, as recorded by Dr. Graves of Dublin, even upon their textures, are probably the result of a reversal of the usual direction of the nervous current; but the theory of negative innervation may, in some measure, account for the effect of the excitement of the nervous centres in cases of delirium, and in acute mania upon the nerves of organic life. In his elaborate article on insanity, Dr. Copland has not omitted to mention the effect of impaired nervous power upon the general health of the insane; he says, "the general cachexia often preceding insanity, and still more manifestly attending it, is

the result of the morbid states of the chyle and blood, consequent upon deficient organic nervous energy throughout the digestive and assimilating organs. Many of the structural changes, as well as the scorbutic state of the body which very often takes place in the more chronic cases of insanity, proceed from the morbid conditions of the fluids, consequent upon the impaired state of the nervous power." (Copland's *Dictionary, Art. Insanity.)*

I have stated elsewhere (see *Medical and Chirurg. Transactions*, Vol. xxxviii) from the quantitative analysis of the phosphates in the urine, in cases of mania, monomania, and dementia, that a plus quantity of phosphates exists in the urine in the paroxysms of acute mania, and a minus quantity in the stage of exhaustion in mania, in acute dementia, and in the third stage of paralysis of the insane; and I have recently found that a plus quantity of the phosphate exists also in the urine in cases of acute melancholia. Whether the conclusion to which I have arrived be right or wrong, viz., that the amount of phosphates in the urine, when not due to the influence of diet, and where all the patients are on precisely the same allowance of food, both in respect of quality and quantity, is a measure of the expenditure of nervous force, is not a matter of much importance, but still it is not without interest, that these results should correspond with the analysis of L'Heritié, who found a minus quantity of albumen, cerebral fat, and phosphorous, in the brain of infancy, old age, and idiotcy, as compared with the same substances in the brains of adults; and with the analysis of M. Couerbe, who found a plus quantity of phosphorous in the brains of those suffering from acute mania.

It has long been observed that sudden variations in the temperature and weight of the atmosphere exert a powerful influence upon all nervous disorders: and it is not unlikely that further investigations into the subject of the correlation between electricity and nerve force may tend to elucidate some obscure points in pathology. M. Andral says that "we know nothing positive regarding the influence of substances with which the atmosphere is charged upon the production of cerebral congestions; he however quotes a case to prove that electricity, employed as a therapeutic agent, may at least favour their development. M. Foville states that at certain epoques, a general and unwonted excitement is remarked in a lunatic asylum. The patients in different parts of the building, too far separated to hear each others noise, are subject at the same period to a marked exacerbation. Many disposed to

suicide, are more than usually tormented. Many epileptics are then siezed with fits. On the other hand, you observe days in which every thing is tranquil; one is struck with the calm, the silence which reigns in those parts which are inhabited by patients generally excited; the particular state of the atmosphere appears to be the most ordinary cause of these differences." I have observed precisely the same symptoms which M. Foville has described, and I have attributed them to the same cause. The peculiar atmospheric effect upon the nervous system, which precedes a thunder storm, is more than ordinarily felt by insane patients. One of our patients at St. Luke's Hospital was seized with a fit while a thunder storm was passing over the Hospital, and died in a few minutes. On the other hand, it is right that I should state, that the accurate registers of the barometer and thermometer kept at Colney Hatch, have at present failed to show that the fits of epileptic patients are influenced by the mere weight and temperature of the atmosphere. Throughout the months of November and December, great and rapid movements occurred without any very striking correspondent alteration in the number of fits. In connection with this subject, it is interesting to remark the different effects which atmospheric influences may produce during the same period in different countries, thus, (Holland's *Notes*, p.p. 198, 199.) "In 1837, influenza was epidemic during the month of December, in Russia, Sweden, and Denmark. During 1837, cholera was epidemic in Germany, and typhus fever was epidemic in England." Speaking of the influenza of 1733, Arbuthnot says, "there was during the whole season a great run of hysterical, hypochondriacal, and nervous distempers, in short, all the symptoms of relaxation. These symptoms were so high in some as to produce a sort of fatuity, or madness, in which for some hours together they would be seized with a wandering of their senses, mistaking their common affairs. Since this disease has been over, the air has continued to be partially noxious in diseases which affect the lungs, and for that reason occasioning a great and unusual mortality of the measles, at the rate of forty in the week" ("The Air, and its Effects upon the Body," chap. vii., p. 193, quoted in Registrar General's *Report*, 1847.) I have had several cases of insanity after influenza, which have generally been of long duration in consequence of the extreme nervous depression with which the disease was accompanied.

Dr. Hübertz, of Denmark, has endeavoured to prove that the partial distribution of light and heat, on the sides of moun-

tainous districts which have a northern aspect has favoured the production of insanity. It is certainly true that mountainous districts favour the production of idiotcy, as in Scotland, North Wales, and Switzerland, but whether or no the aspect has had any influence, has not been noted. According to Dr. Prichard, a great proportion of the insane, or of those included under that denomination in Scotland and Wales, are idiots. In six of the maritime counties of England, the proportion of idiots to lunatics is nearly as two to one, whereas, in six counties of North Wales there are about seven idiots to one lunatic.

There are anomalies with regard to pain and disease, produced by irritation of particular parts of the nervous system, for which it is difficult to account. In the expedition against Teneriffe, Nelson received a shot through the right elbow while in the act of drawing his sword, the shock forcing the hilt into the left groin. At the time of the amputation of the arm a nerve was included in one of the ligatures, this produced constant irritation and discharge, and he had scarcely any intermission of pain for three months after his return to England. He was attended by Mr. Cruikshank and Mr. Thomas, and whenever they attempted to detach the ligature from the nerve, Nelson referred the pain to the left groin. Sir B. Brodie mentions some remarkable instances of a similar nature in his work on *Nervous Affections*, as the anecdote of the late Dr. Wollaston, who stated that, one day he ate ice cream after dinner, and a short time afterwards he found himself lame from a violent pain in one ankle; suddenly he became sick, the ice-cream was rejected from the stomach, and this was followed by an instantaneous relief of the pain in the foot."

The explanation of these anomalies given by Sir B. Brodie, is the most satisfactory one which I have met with; he says, "you will naturally ask how is this pain produced? To this question I would answer, that in all probability it is in the brain itself that the communication is made, the impression being first transmitted to the sensorium, and from thence reflected to the nerves of the part which is secondarily affected." (Brodie *on Nervous Affections*, 14.)

Instances such as these may induce us to pay more attention to the anomalous sensations of hysterical women, and not to disregard them as unworthy of our notice: and the frequent illusions under which the insane labour, as for instance with respect to the subject of electricity, may lead us to infer that they are derived from real though perverted

nervous sensations, which either have their origin in the brain, or in the peripheral extremities of the nerves.

Besides the symptoms of hyperæsthesia and pseudæsthesia we have to consider those of anæsthesia; as the eyesight is frequently improved in the early stage of mania, so it is often impaired in cases of exhaustion from masturbation, and in paralysis of the insane. Sometimes the nerves of sensation are so deadened, that the patient is insensible to pain. I have seen insane patients undergo operations without evincing the smallest sign of pain; instances of this occur most frequently in cases complicated with paralysis of the insane, in these patients it often happens that the pupil of one eye is less sensitive to light than the other.

In my lectures which were published in 1843, I said that asynchronous action of the pupil, dilation of one iris, and contraction of the other, are bad signs. My friend, M. Baillarger, has called our attention to this symptom, as being frequently accompanied by paralysis of the insane; there is no doubt that it is so: unequal pupils are, however, met with very often in cases of insanity which do not exhibit any symptom of this form of paralysis. This state of the pupils is sometimes the result of sympathetic irritation from disease of the heart, and indeed it occurs sometimes in persons who are in perfect health.

Patients in a state of dementia do not complain, and apparently do not feel the impressions of cold; indeed the benumbing effect of the disease upon sensibility generally is so great in these cases, that in former times when the insane were badly fed, badly clothed, and badly attended, instances of sloughing of the toes in frosty weather not unfrequently occurred.

Our next subject for consideration is the condition of the blood in insanity. In the opinion of Romberg, more than two thirds of the cases of madness are the result of alterations in the blood. Whether this assertion be true or not it is impossible to say, considering the present state of our knowledge upon the subject, but we know that when a nerve is diseased, two things are necessary to restore it to a healthy state—rest from its particular function, and contact with good arterial blood. As is remarked in Turner's *Chemistry*, "we are still ignorant in what part of the body, or by what organs nervous matter is prepared. This point is worthy of the most minute investigation. In the meantime, according to Chevreul, the fatty matters which occur in small proportion in the blood, are similar to those of the brain." Hittorf and Michea are the only two who have subjected the blood of insanity, to quanti-

tative chemical analysis. From Hittorf's analysis we learn, that the blood of acute mania does not correspond with that of acute inflammation. If we accept his analysis, there was, in seven cases, a very slight increase of fibris in five. If we take that of Becquerel and Rodier, there was a minus quantity in six cases. It should be stated that in one case where a greater increase was found, the attack of acute mania was the result of a miscarriage, and the disease was accompanied with pleuritis and pericarditis. In acute inflammation from four to ten parts of fibris are found in one thousand parts of blood; and upon the authority of Becquerel and Rodier, the blood of inflammation is characterised not only by an increase of fibrin, but by a diminution of albumen, whereas the albumen in Hittorf's analysis was above the healthy standard in five cases out of seven. According to the quantitative analysis of the blood, published by M. Michea (*Comptes Rendus*, Nov. 1847), we find that the albumen in paralysis of the insane is diminished in nearly one third of the cases; he likewise found an augmentation of the blood corpuscules, and an absolute diminution of the fibrin. Becquerel and Rodier found that in symptomatic anœmia, and in patients weakened by typhus, phthisis, hœmorrhage, &c., there was a great deficiency of albumen. If we compare Hittorf's analysis with that of idiopathic anœmia, we shall find that all the cases are deficient in red globules; for in two cases where there is an apparent excess of blood corpuscules, we must take into account the difference of sex, for the analysis of Becquerel and Rodier quoted by Hittorf, is taken from their analysis of blood in females, but if he had compared it with that of males, there would have been a deficiency also in these cases. The amount being in the healthy blood of males 141.1.

From these analyses we learn that the blood of acute mania and paralysis of the insane differs from that of acute inflammation, and that the blood of acute mania corresponds with that of idiopathic anœmia, and the blood of paralysis of the insane, as far as the diminution in albumen is concerned, corresponds with that of symptomatic anœmia.

Although it is satisfactory to have this analysis, as it refutes the notion that insanity is the result of acute inflammation, yet the majority of the patients are recognized at once as being anæmic upon their admission into St. Luke's Hospital, and we frequently find the blood in an impoverished state when we examine our cases after death. In one case I remember the blood was so watery that it oozed out under the finger nails.

We know that whatever interferes with the health of the blood corpuscule is likely to affect the ganglia globule. Over-exertion of intellect makes a constant demand upon the blood for fresh supplies of nerve force, at the expense of the nutrition of other parts, as we observe in the pale and emaciated student; while care and privation prevents the due nutrition of the nervous centres, as we see exemplified in the weavers of Coventry and of Spitalfields. On the contrary, if the blood be deprived of a large amount of serum, and the blood corpuscules be left, the functions of the brain do not materially suffer, as we see in cases of cholera, where the patient preserves his intellect to the last. When cholera affected the female side of the County Asylum at Hanwell, in 1832, Sir A. Morison observed that the nympho-maniacal patients who were attacked with it, exhibited their propensities up to the time of their death.

The demand upon the blood for fresh supplies of nutrition in acute mania over-stimulates the brain, and produces local congestions, while the determination of the blood to the head in cases of dementia has, in some rare cases, produced a lucid interval. The effect of local congestions with poverty of blood are very well marked in some cases, and it is interesting to watch the manner in which the symptoms vary as the patient happens to be in the erect or the recumbent position.

The quality of the blood is sometimes so altered by affections of the mind, that it becomes unfit to nourish the nervous centres; thus the wasting of the brain in old age and fatuity and a deficient supply of nerve force, produce deterioration in the red corpuscules. Change in the condition and structure of the arteries is also produced by the quality of the blood—the tonicity of the vessels is much altered, *e. g.* in melancholia after long refusal of food, the conjunctiva becomes minutely injected, the vessels let out their contents, and ecchymosis frequently ensues. What takes place in the blood-vessels of the conjunctiva, may be supposed to bear some resemblance to that which occurs in the vessels of the brain; and thus we meet with effusions of serum, not only on account of the wasting of the brain, but also because the blood is so poor that it escapes from the minute vessels.

In examining the minute vessels under the microscope in cases of effusion of serum into the ventricles, or cellular texture of the arachnoid, it must be borne in mind that they become dilated in health whenever it is necessary to lubricate the adjacent structure, as in the vessels of the choroid-plexus, and in those of the joints.

The condition of the blood, which gives rise to the so-called atheromatous and bony deposits of the arteries, has a direct effect upon the nutrition of the nerve globule, and produces atrophy of those parts of the nervous centres which are most affected by the disease.

Again, the blood may become unfit to nourish the nervous centres by being both impoverished and poisoned, as we see in the depression of jaundice, and in the suicidal tendency of small-pox. Or there may be a poisoned condition of blood with congestion, as in many cases of recent mania; the incoherence of which disease is closely imitated by excess of alcohol, which does not, as has been asserted, produce its effects merely by congestion of the blood-vessels, but as M. Andral says, by acting directly upon the brain: in illustration of which he quotes two cases of persons who died from the effects of intoxication, and whose brains he afterwards examined; and he refers to the case mentioned in Dr. Cook's work on *Nervous Diseases*, where the body was opened immediately after death, and a clear fluid was found in the ventricles, which had the taste and smell of alcohol, and which took fire when brought near a burning candle. (Andral's *Clin. Trans.* p. 78). The effects of chloroform also resemble in some respects the symptoms of insanity; under its excitement faded ideas are often recalled to the memory, and what appeared to have made but a slight impression is sometimes recollected with much vividness; just as accomplishments are sometimes brought out in a wonderful manner during the excitement of mania, which the unlearned view as supernatural. An analogy between the effects of chloroform, and some of the symptoms in different forms of insanity, may be traced in the alteration of feeling, impairment of volition, the insensibility to pain at first diminished, and afterwards completely destroyed, the automatic movements, the total unconsciousness, and the reduction of the patient to a state of vegetative existence. Dr. Prout mentions the fact, that some patients cannot bear the exhibition of alkalies in any form. He says that he had met with several instances of this inability, in which great nervous disturbance was produced, more particularly of the cerebral functions; in one case the excitement produced by alkalies was so great as to border on delirium, or mania. Dr. Prout also pointed out that which is now generally recognized, viz.,—the peculiar nervous irritability which exists in the oxalate of lime, and phosphatic diatheses, displayed in different ways according to the idiosyncracy of the patient. We should however bear in mind what Dr. Owen Rees says, in reference to this subject;

he states "that alkaline urine is not necessarily connected with severe nervous irritation, with wasting, and other symptoms of vital decay. Many cases in which we observe the secretion of such urine with phosphate deposits, shew no such condition, the debility not exceeding that which characterizes many forms of dyspepsia; while on the other hand, we often see great dyspepsia, and loss of vital power with wasting, as when oxalate of lime appears, and no tendency to alkalinity."

Well known causes of mental derangement are to be found in errors of primary and secondary assimilation, the non-elimination of poisonous substances from the kidneys and skin, habitual discharges when suddenly checked, and the too rapid healing of an ulcer.

It has been asserted by Feuchtersleiben, that a mixture of wine and salt produces insanity, but I never heard of a case which was the result of taking brandy and salt, a nostrum once so generally employed as a remedy for all diseases.

The local action of certain narcotic poisons upon different parts of the nervous system has been well ascertained, but whether opium, as has been asserted, acts chiefly upon the cerebrum, belladonna upon the tubercula quadrigemina, and alcohol upon the cerebellum, has not been sufficiently demonstrated. The particular seat of epilepsy, and of paralysis of the insane, has in a similar manner been pointed out by some authors, but there still exists much difference of opinion upon this subject.

If there be so much difficulty in ascertaining the effect of particular poisons on different parts of the brain, although the physiologist has such ample means at his command for investigating the matter, and although how accurately soever he may make his experiments, his results must always be open to doubt when applied to disease, and that too in the human subject, where idiosyncracy baffles results which have appeared almost reduced to demonstration, how much more difficult is it for the pathologist to point to any particular part of the brain, and to say that it has been the seat of monomania.

The next subject which I ought to bring before you is that of the different forms of congestion which exist in the different species of insanity; but as I have spoken of this subject in my lectures which are already published, and as Dr. Bucknill has entered fully into this branch of the enquiry, in some able papers upon "The Pathology of Insanity," published in the *Journal of Mental Science*, I the less regret that the time allotted to me does not allow me to touch upon it.