On brain and nerve exhaustion (neurasthenia) and on the nervous sequelae of influenza / by Thomas Stretch Dowse.

On BRAIN EXHAUSTION

AND

the Exhaustions of INFLUENZA

T. STRETCH DOWSE

ON

BRAIN AND NERVE EXHAUSTION (NEURASTHENIA),

AND ON THE

NERVOUS SEQUELÆ OF INFLUENZA.

BY

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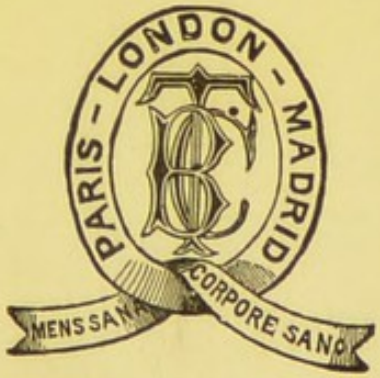

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PREFACE.

THE views on Neurasthenia herein expressed were first brought to the notice of the profession in a paper read before the members of the Medical Society of London some years ago.

The present edition has been carefully revised. The conclusions arrived at are the outcome of careful analysis and comparison of cases from notes made and compiled during a period extending over twenty-five years. A short article upon the Nervous Sequelæ of Influenza has been added, and may perhaps be of interest to those who are not conversant with the nature of the disease from the nerve point of view.

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ON NEURASTHENIA;

OR,

BRAIN AND NERVE EXHAUSTION:

ITS NATURE AND TREATMENT.

INTRODUCTION.

My object in writing a few lines by way of predication to this brief survey of the great clinical problems of Neurasthenia is rather to defend others with myself against the attacks of some who consider the term unscientific and unsound, and a blot upon the canons of science.

It is so absolutely true and so devoid of anything like exaggeration when we say that we live in an age which has never been equalled for progress, development, and rapidity of action, that resistances which at one time stood in man's path of life as huge formidable and indestructible barriers, are now seen to be breaking up and dissolving under the influence of the accumulation and transformation of energies. And so rapid, and indeed insensible, are some of these transformations, so changeable and varying, so conflicting and multifarious, so complex and so composite, that life with its ever revealing processes seems like a never-ending dream. Hence it is that we are approaching the infinite rather than the finite, the mutable rather than the immutable, the indefinite rather than the definite. We think and invariably speak of Nature as associated

with unvarying cause and effect, generated, supported and maintained by immutability of system and uniformity of law, by order and by arrangement, predicting an omniscience and omnipotence and supreme governance beyond the comprehension, reasoning, and judgment of man.

Occasionally a spark of science scintillates in the ever-increasing and heterogeneous detritus which man is vain and pleased and conceited enough to call knowledge. This scintillation is wisdom. The cosmology of nature, the evolution, devolution, and involution of conceptual properties, based upon analytical and synthetical deduction, constitutes an appreciative something which we call 'facts in nature.' The revelation through the agency of perception and reflection by co-ordination and correlation develops faculty; and when such is the outcome of an initial and intuitive potentiality, the giant Genius springs into existence, and illumines by intensity and expansive radiation. Intelligence is the outcome of concentration and attentive faculty, and is capable of cultivation in lines strictly in accordance with known and recognised areas of brain development and physical organization. Hence, if human kind were split up into classes, genera and species according to arrangement by type, we should find a differentiation of intellectualities in strict relationship with the arrangement and groupings of faculty-possessing functioning powers which are present to us in the representation of life manners, history, morals, theology, politics, human experience and character; and if we admit so comprehensive a reckoning of generalized principles capable of division and subdivision in direct ratio with the energies and potentialities of known and unknown cohesive affinities, we shall assign to every individual type specialized forces which are truly and intrinsically its very being. And as in the vegetable kingdom the external so-called characteristics of living individualities are typifica-

tions not only of the place which they hold and occupy in nature, but also of their essential and potential functions in reference to universal organized matter, so in the mundane sphere of humanity we have diversities of potential and psychical functionings in strict accordance with physical groupings and arrangement, which are ill-studied, but which truly exemplify a metaphysical organization in strict agreement with the morphology of physical constitution.

In dealing with human life and thought we have in the plainest possible language to deal with human individualities, 'types of mental and moral consciousness,' no less than types of 'physical form.' The attributes of human consciousness (abstract and concrete) correlate with lines of physical conformation, and common observation, ordinary perception, and even superficial conception, are alone required to make us acquainted with these conditioning factors of existence. But much more, and very much more, is necessary if we would appreciate and profit by the invaluable teachings which the inviolable laws of nature are ever ready to disclose and to unfold. Investigation, aided by comparison, often leads to truer results and nobler ends than do mere theory and invention. Human nature, as the direct gauge of the quantitative and qualitative value of knowledge, can be well expressed by the word 'experience,' which, if rightly interpreted, cannot be dis-associated from wisdom, and which must be looked upon as the fruit of the tree of knowledge, as knowledge itself is the fruit of thought. The aphorism that knowledge comes, but wisdom lingers, is certainly of universal application, and to my simple way of thinking knowledge is the capacity to become wise, and wisdom is the outcome of the right conception of knowledge, just as energy is the capacity for work, and work is the outcome of kinetic energy. In knowledge we stand upon the shoulders of those who have lived before us. But are we truly and indeed wiser? Man

is said to be wise in his day and generation, and youth and inexperience form the happy hunting-ground of ignorance and imagination. True it is that ignorance is preferable to error, and that man is nearer the truth who believes in nothing than he who believes in wrong. Conceit and ignorance are usually twins by birth; and even by culture they are both propagated by the same soil, and nourished by the same elements; they are both intolerant, selfish, cruel, and utterly devoid of reciprocity, sympathy, or charity. The Ego seems absorbed in self-conscious perception, and clothed in mental oblectation, as in the language of the Miltonic Satan, 'Not to know me argues thyself unknown.' Knowledge may be based upon what is apparent, though sometimes false, and upon what is evident and invariably true. It is certainly the outcome of observation and reflection, and as an intellectual product it is the fruit of mental elaboration. It appeals to reason from the sensual and abstract rather than from the concrete. It presents landmarks for acceptance rather than for guidance. It interprets natural phenomena, and nears the haven of omniscience and omnipotence when crowned by wisdom. I would say again, How few are truly wise! Was not Carlyle's opinion of mankind in general a correct opinion? And I ask, would it be well for the human race if all men were bursting with wisdom? Does knowledge of itself bring peace, contentment, happiness, faith, and hope? Does it break the Circean spell, or liberate us from the cave of Trophonius? Does it give us the *Φαρμακον-νηπενθε* or panacea for all human woes, or lead us, on the one hand, into that utopian universe of Pythagoras and Plato, where we shall bask in the eternal brilliancy of pure thought, untrammelled by the commonplace resistances of objective sense, and realize that terrible logic of Hegel where joy, suffering, feeling, seeing, loving and hating cease to affect or influence, and where the human soul, as the organ of consciousness, becomes pure spirit?

Or, on the other hand, does it lead us to realize and interpret with a wholesome, simple, loving faith that there is associated with the materialistic dross of human nature a divine essence which grows by intensification and sublimation to that highest form of spiritual life in whose sphere gravity and resistance are unknown? Where natural law, with its attributes of uniformity, system, and conservation of energy cease to have an existence; where heterogeneity and antagonism, as inherent properties of brute stuff, are disassociated once and for ever; where by the light of revealed truth there are no shadows or shades of doubt, no scepticisms, uncertainties, or disbeliefs, no selfish jealousies or lying mysticisms, no canonization of philosophics or philotechnics, no blind servitude to Church or State, rank or person; where race and creed, type and class, genera and species, are meaningless postulations, and where homogeneity reigns in an atmosphere of mercy and eternal peace? If an answer is to be given to such questions as these, it must be based upon inductive and deductive reasoning, and not upon any form of dogmatism, which is the power of tyranny over mind, and of system over independent judgment, whose very profundity resides in such shallow channels of thought, so obscured by mud, that the bottom ever remains invisible.

As a physician, I should indeed be a dreaming dotard if I failed to comprehend, to realize, to estimate, and to value the significance and the importance to mankind of our constant and progressive accumulation of knowledge; so rapid have been the vast strides of revelation and discovery that men of the deepest thought and subtlest reasoning have been caused to stagger and well-nigh fall under the explosive impetus, speed and development of modern scientific progress, particularly in its relations to the adaptation and utilization of means to ends, and I venture to assert that this onward march of scientific advancement is not only

making its impress felt in every phase of relationship between man and man, but it is imparting a far more enduring and beneficial influence upon man in his social, moral, and intellectual spheres. It appeals to reason rather than to imagination, and to practical achievement rather than to theoretical fabrications. It throttles erroneous and presumptuous doctrines, and leads onwards towards that plane of existence where truth and honour have supreme command, for I take it to be an established fact in psychology, that, in proportion to the advancement and development of human reason, dependence upon instinct is likely to lead us astray. No one doubts the enormous power and self-sufficiency of knowledge, for nowadays man needs it not only as a means of livelihood, but as a means of life, and such is the marvellous ascendancy of mental cultivation, that, like refined manners, it will conquer and propagate and extend itself, by sympathy, by imitation, and, above all, by education, and so enable man to create the taste by which he may be appreciated.

Is there a man who cares to deny that the evolution, expansion, and increase of scientific knowledge is producing, after its own way, a beneficial and salutary influence upon all classes of society. The possessors of knowledge in prescientific times found it to their advantage to shroud their wisdom in mystery, to create the supersensuous, the superhuman, and the supernatural.

At the present time we have no difficulty in finding men of intellectual versatility and subtlety of reasoning, distinguished in their various walks of life, who are particularly amenable to social conventionalities, whose careers have been determined by the merest accident, who have become what men are pleased to call great, when the careers of thousands of others have remained undetermined, the niche in the temple of fame has escaped them by a hair's breadth,

and their lives have been marred by some trifling accident by the smallest of small things.

Such processes in the order of events in the human family are bound up with the great, infinite and unknown problems of evolution and dissolution, and it would be unreasonable and vain to attempt to question their fitness or the necessity for their existence in the natural order of things. But do we find—and this is the core of my argument—amongst the members of the present so-called modern and progressive school, that charitable and kindly disposition, that grace and ease and balance of culture, that love of truth for the sake of truth, that purity of heart for the love of purity itself, which were so markedly characteristic of the great philosophic age of reasoning? Does the cultivation of science, upon its purest scientific lines, ennoble the nobility of human nature, or has it not a tendency to elaborate certain faculties at the expense of others, and thus lead to prejudice, bigotry, jealousy, and conceit? Power, and especially self-acquired power —for power born is vastly different to power bred— has through all ages been attended with vain-glory and a supreme admiration for self. Has science altered this? No. It cometh like the wind and goeth like the wind. It seems as though it were the final links in the great and continuous chain of evolutionary conditions. It is the last to come, and, in the roll of ages, it will be the first to go, and throughout all time we shall be, to quote the language of Newton, like children picking up pebbles on the shore of the ocean of truth. All educated men throughout the world are proud to bend the knee subordinately, and to bow the head with reverent humility and meekness, when in the presence and under the influence of some giant intellect, some unique force, some fountain-head of originality; but if Genius is to have the crowning quality of endurance, it must be the living representative of simplicity,

honesty, purity, justice, and truth. It must be free from assumption and base flattery, of base prejudices, of vague formulas and rhetorical flights of imagery, of word-jugglery, of oracular wisdom, and of self-conscious priority and superiority. Then, and not till then, shall it command now, as it always has done in all ages of the world, the approbation, respect, esteem, love, and even the worship of mankind.

ON NEURASTHENIA; OR, BRAIN AND NERVE EXHAUSTION.

THE more one studies the laws of nature, as exemplified in the mysterious and wonderful processes of life, the more one feels how inadequate is the mind of man to comprehend even the most primitive laws which govern his material being. Scarcely a year rolls round that the world is not surprised by the revelation of some new discovery, which is looked upon as the outcome of the inventive genius of man, and which shows that the forces of nature have been either so elaborated, or correlated, that a hitherto unknown factor has been produced which, in itself, throws all other novelties into the shade; and so it is in the world of scientific and practical medicine. Theories are constantly springing up concerning the nature and treatment of disease, some simple, others elaborate and complex, which have a period of renown, and then fall into disuse and are forgotten; and so far forgotten, in fact, that at some remote period they are reintroduced as something new.

There can be no doubt, however, that the solid advance which is being made in the material sphere of science will aid the biologist in unravelling many vexed questions concerning the special and correlative functions of the mind and body of man. Mental processes are dependent upon neural action, and we are therefore equally justified in speaking of mental neurasthenia as we are of the neurasthenia of a nerve-cell. The interaction is a problem of the pro-

foundest complexity, but the physical basis is unquestionable. Mentation manifestations are indicated by movements either muscular or vaso-motor, and it is only through physical agency that every mental act finds visible expression.

It is entirely out of the question for me to consider any other than the absolute salient points in reference to this the most profound, and, I might add, the most secret enigma of the human entity, the borderland of reason. The greatest learning, sagacity, and knowledge have been expended to unravel, evolve, interpret and arrange the connections which link and bind together the physiological, anatomical, and pathological signs and symptoms which are developed, extracted, and produced by some unknown factor directed in the evolution and dissolution of that strange, wonderful, related, but, to us, exceptional region, which forms an oasis between the physical, the material, the moral, the intellectual, the mental, the ideational, the metaphysical, and the psychical, and which, when viewed from the hopeless belief of the physicist, the materialist, and the scientist, forms a realm entirely subordinate to the great evolutionary doctrine, which at one time was looked upon as the revolutionary, transmitting and metagenetic power which should bring light out of darkness, and convert an unknown problem of infinite omniscience to the level of the sagacity, the intelligence, and the understanding of the mind of man. When we look around and note the feeble, weak, illogical, impotent stuff of which the human mind, even in its most exalted form, is built up, we can well step aside, and allow the express train to pass (as Dr. Wilks so aptly puts it) and smile as it hurls itself and its occupants into an unknown region, traversed, it is true, by lines of demarcation, but leading only to dissolution, irrelative separation, and destructive disintegration.

This may seem a strange introduction to the subject of

nervous exhaustion, but the more we study, analyze, investigate, experiment, and reason upon that state which goes by the name of neurasthenia, the more do we feel that we are approaching an unknown goal, a problem of absolutely unknown quantity, whose very existence is lost in illimitable space, but from which agency arises the transformation of other living forces known only to our occult minds as dissolution. Neurasthenia, as I know it, is inseparably chained to, and indissolubly connected with, every retrograde, deteriorating, and degenerating process which alters the normal constitution of all animate matter, for in those living organisms in whom no nervous system has been detected, there must be its equivalent in an organizing force, which to that living organism is as much a governing and controlling agent as the nervous system to ourselves.

The following propositions relative to the nervous system and neurasthenia are of interest:

1st.—That in neurasthenia there exists a want of correlative integrity between the cerebro-spinal and sympathetic centres, and, in my opinion, this is the fundamental cause, and is often but not necessarily hereditary.

2nd.—That there is defective antagonism between the centres at the various levels, cerebral and bulbo-spinal, by which a process or processes of inhibition are started and maintained. Governing and controlling centres are subjugated by restraint, so that controlling power is greatly diminished.

3rd.—That the normal activity and interaction which should exist between the nerve centres is inactive and atonic.

4th.—That, without doubt, a state of discord reigns supreme, evidenced by instability, irritability, and mutability, functional depression, dulness, and apathy.

5th.—That reflex, automatic, and vaso-motor actions are controlled and inhibited by resistances which they are unable to overcome.

6th.—That the sensory and sensorial side of the nervous system is equally or more involved than the motor.

7th.—That it cannot be conceded that the basal ganglia and the bulb are particularly affected, or that such a condition exists as impoverished nerve force.

8th.—That the tissues and the nerves are incapable of conducting the electric current as in health, their resisting capacity is increased, and the impress is received more slowly by the nerve centres.

As an instance of general vital exhaustion of the nervous system, we will take the man who dies from what is called 'General Paralysis of the Insane,' and, as an instance of local or circumscribed vital exhaustion, the man who, during an attack of diphtheria, dies from exhaustion of the nervous centres, which give motor power to the walls of the heart. The late eminent and gifted Dr. George M. Beard, of New York City, was the first physician who drew the especial attention of the profession to the signs and symptoms of this disease, and he subdivides the term *Neurasthenia* into *Cerebrasthenia* (exhaustion of the brain), and *Myelasthenia* (exhaustion of the spinal cord). Erb, in Ziemssen's 'Cyclopedia of Medicine,' vol. xiii., devotes a short special chapter to what he calls Neurasthenia of the Spinal Cord; and Ross in his very complete work on the diseases of the nervous system treats this subject very practically. *For many years I discarded the term Neurasthenia or nervous exhaustion, for when I was in the midst of pathological work I thought the term vague and unscientific, and I expected the scalpel and the microscope to reveal to me the cause of any arrest of nervous function. I am happy to say, that as I have grown older, so have I grown wiser in this respect; and I am therefore now very glad to have recourse to a term which is in every way most applicable to a number of nervous derangements.* When we speak of the exhaustion of a nerve, or of a nervous centre, or of the exhaustion of the brain, or of the spinal cord, or of the exhaustion of the

whole nervous system, we refer to what must be understood as a diseased condition, although it is, in the strict sense of the word, merely an arrest of function and something more, the precise nature of which *something more*, however, it is ofttimes a difficult matter to determine. Healthful sleep is due to nervous exhaustion, consequent upon an arrest of function in the hemisphere of the brain; and during this temporary arrest of function, the trophic or nutritive elements are still actively employed, and the brain-cells are being recharged with nutritive pabulum in the form of bioplasm. The arrest of function alone would not restore energy to an exhausted nervous centre, and, if nutrition were not going on during sleep, the person would not wake up invigorated and refreshed. In the cases of exhaustion of the brain, caused by excessive pain, which we find associated, for instance, with cancer, or in the exhaustion of the brain which we find frequently accompanies persons suffering from consumption, we see our patients completely exhausted from want of sleep, which is also due to arrest of function in the hemispheres of the brain. Function in this instance, however, is not only imperfectly carried out, but the laws of nutrition are so inactive that the very effort at repair of the exhausted brain-cells produces an irritability of function incompatible either with rest or with repair of the exhausted state. In my wards for consumption at the Central London Sick Asylum at Highgate, I used frequently to observe to the nurse that such a patient was suffering, or apparently suffering, more from an exhausted brain than from disease of the lungs, and the signs of that condition are well known. The eye will be bright, the countenance distrustful and anxious, the temper irritable, delusions and hallucinations not uncommon, and in some cases even self-control will be lost, insomuch that the patient may become violent. If questioned as to his health, he will say that he is quite well, and wants to get up and go for a walk, although, in

fact, he is scarcely able to move. Yet see how rapidly the whole being of this patient becomes changed if we but treat him in such a way as to effect a complete arrest of function in his cerebral centres. Let him take half a dram of the hydrate of chloral,* and note the effect; if it induce sleep, we shall find that when he awakes he is a different creature. The brain-cells have been at rest, and they have been endowed with normal potential energy; they have become changed from a condition of irritability and instability to a state of normal molecular activity. He still feels his weakness and incapacity, but the brain is the least exhausted part of his body. Now let us, please, just consider what is meant by this arrest of function, this molecular inertia, which gives rise to exhaustion in the nerve-cell and the nervous centre. Physicists tell us that, in the inorganic world, matter and energy are indissolubly associated; that we know of matter, only through the transformation of energy, and that we recognise energy, only through its affections of matter. But the especial properties possessed by matter will depend upon the circumstances under which such matter is placed. We know that gold, which is usually opaque, may be made sufficiently thin to be transparent; that iron may be rendered soft and plastic by heat. These changes are called molecular changes, and may perhaps be better demonstrated by the volatilization of æther. Energy, as existing in a material form, may be illustrated by the following experiment. If we pass a strong electric current through water, the electric force or energy is used up in decomposing the molecules of water, and in dividing these molecules into their component molecules of hydrogen and oxygen. If these gases so evolved are collected and mixed, we may by heating the mixture recover the electric energy in the sound and heat of an explosion.

* The late Dr. Anstie proved that chloral excited a toning influence on the arterial web.

The physicists say that matter and energy are more or less strongly united according to their power of resistance, which power the chemist will designate as the forces of affinity and cohesion existing between the atoms and molecules of matter. Now, these varying conditions of matter can be proved to have a definite existence. We will follow this subject a little further, because my object is to lead to the consideration of the highest attributes of energy in the inorganic world, in order that it may be the more readily comprehended how these automatic or mere dynamic changes are influenced by the existence of organized media.

In spectrum analysis it is seen that a free molecule has definite fundamental modes of vibration, which give definite wave-lengths of light just as a tuning-fork gives musical vibrations of a definite pitch, and molecules of different kinds of matter have different periods of vibration, which are distinguished by their characteristic rays. We know that heat is the agent which, in the inorganic world, starts these vibrations and supports their existence.* The inertia of a body is, I conclude, in direct ratio with its resisting power. We pass on now, by way of comparison, to the organic world, and what do we find? We find there a

* Maxwell, in his observations on the 'Theory of Heat,' says that the energy of a body may be defined as the capacity which it has of doing work, and is measured by the quantity of work which it can do ('Theory of Heat,' by J. Clarke Maxwell, 1875, p. 90). I venture to think that we, as biologists and physicians, can, after a manner, account for exhaustion of nervous energy in very much the same way that the physicist explains the energy of an atom or molecule according to its power of resistance in relation to the medium which surrounds it. Dr. Ralph Richardson, in his exceedingly valuable and instructive work on 'The Nature of Life' (1879, p. 13), says: 'To speak of changes of energy or force, and that force shows itself in motion, is decidedly illogical and unscientific. A force, or power, can produce no effect, unless in co-operation with some matter having a susceptibility adapted to such force, and by its reaction giving to our minds the nature of force.'

building up of the same elements as in the inorganic world, and these are, in like manner, composed of ultimate atoms, or molecules; and these atoms are, in fact, as I have stated, nothing more nor less than a material form of energy, but in addition to this form of energy we have a power peculiar to itself, which the late Sir William Gull calls a correlation of forces. This power we know as life or vitality. Sir William Gull, in his Harveian oration at the College of Physicians, in speaking of vitality, said:

'I cannot forbear for one moment asking you to consider again this organization of our bodies in relation to the earth we inhabit, and then say if it be otherwise conceivable but as the expression of the highest correlation of these external conditions.'

The brain, and consequently every individual cell of which the brain is composed, is a factor as well as a nidus for the conservation of energy. Molecular displacement in the nerve-cells means the exercise of disruptive energy, which leads to a failure in the power of resistance, a diminution of vitality, a lowering of tension, a decrease of tone, and an exhaustion of the nervous system; in fact, an arrest of function and molecular inertia.* The energy or force with which a nerve-cell is specially endowed may be said to consist of (1) the active, floating or automatic; (2) the complementary; and (3) the residual, or latent energy, just as in the lungs we have the tidal, the complementary, and the residual air. The one is, in a measure, as much a form of energy as the other, and there can be little doubt that most functional troubles of the nervous system are due to the want of an equable development of stable energy; and this results from abnormal molecular interchange inducing defective correlative integrity of individual cells, or groups of cells. How far this nervous energy or force is essentially the vital force is a question of conjecture; but whatever

* It is a general principle in physics that energy in performing work is expended and finally exhausted.

may be the precise nature of nervous energy, it is, I think, apparent that it governs and controls all other forces, whether these forces be formative or correlative, and that it is only by the united and harmonious action of these forces that health and even life itself are preserved. I may note here that the late Dr. Bence Jones ('Lectures on some of the Applications of Chemistry and Mechanics to Pathology and Therapeutics') held the view that death consisted in the stoppage of the conversion of latent force into active force, caused by some arrest of action in the heart, lungs, or brain. This view of Dr. Jones's appears, to my mind, to be a correct one; and we often note what a wonderful conservation of energy there is in the automatic nervous system, and I might almost go so far as to say in the medulla oblongata itself in some aged people, even at their period of dying: although the hand of death can be seen to be indelibly fixed upon them, yet it will take weeks before the nervous system becomes finally exhausted, and the last spark of vitality becomes for ever extinguished.

I think we have seen that heat and energy are the result of molecular motion, that vitality is co-existent and absolutely dependent upon motion, and that the energy dependent upon either physical or vital motion becomes expended and finally exhausted. The great problem, then, which we have to solve appears to me to be this: In what manner can we best determine that amount of conservative energy in our bodies which shall at all times render the supply of nerve-force adequate to the demand made upon it? Man's resisting power to overcome the exhausting influences which surround him in almost every sphere of life is due and in proportion to the inherent power possessed by his nervous centres to conserve those forces which correlatively make up vitality. In other and plainer words, the soundness of a man's constitution is in direct ratio with his inherent vital capacity to combat the natural tendency to death, and to resist the ravages of disease

which undermine and destroy his conservation of energy. If we but investigate the question of latent force, or reserve of nervous energy, a little farther, we shall then frequently find that, if a continuous demand be made upon man's reserved store of energy, no matter how strong the man may be, his vital powers and force of resistance become unavoidably enfeebled, and in some way or the other, if life itself be not shortened, he becomes prematurely old. I have had many patients under my care who suffered from changes in the brain and spinal cord, such as we meet with in progressive muscular atrophy and the general paralysis of the insane, where the patients have been at one time of their lives notably athletic and exceptionally strong. Now these diseases, I maintain, frequently arise from too great a demand having been made upon their reserve forces. We have, however, to bear in mind that there are two reservoirs of nerve-force, or conservative energy, in our bodies, which, although immediately connected, nevertheless act more or less independently of each other. I refer now to the automatic force as distinct from volitional force. My experience leads me to the conclusion that automatic muscular exertion rarely, if ever of itself, produces such a drain upon the reserve forces of the individual as to lead to any serious or vital consequences, provided the individual in question be leading in other respects a healthful and invigorating life free from any kind of debauchery, worry, or mental strain, and, moreover, provided he has a stable and well-organized nervous system to work upon. On the other hand, we meet with professional and business men, as well as men of pleasure, such as the gambler and the *débauché*, who reach the zenith of manhood with a splendid physique, but who are impelled to lead a life of overstrain, and in consequence of this their reserve forces are constantly being overtaxed, brain function becomes disturbed, and rapid exhaustion of the nervous system is frequently and sometimes suddenly the inevitable sequence.

Diagnosis.

The diagnosis of neurasthenia in acute disease I shall not here refer to, for its signs and symptoms are well known to all practitioners of medicine; but I will endeavour, as far as possible, to draw out a differential diagnosis between a neurasthenia of the nervous system—which for years remains a mere functional affection, and ultimately the patient recovers—and a neurasthenia of the brain and nervous system, which leads on to defective nutrition of the nervous centres, and to incurable organic disease—such, for instance, as we find associated with some forms of mental derangement, and many forms of paralysis. I have no hesitation in asserting it to be my firm belief that many incurable cases of insanity, locomotor ataxy, progressive muscular atrophy, peripheral neuritis, and other diseases of the brain and nervous system, commence as a neurasthenia of the nervous centres; and when in this state they are quite amenable to treatment.* I am extremely doubtful whether it is possible for a neurasthenia of the brain to exist quite independently of a neurasthenia of the spinal cord, although the relative condition of functional impairment may be merely one of degree. For instance, in a case of exhaustion of the spinal cord, we are sure to find some deviation from the normal in the attributes of the mind; and in the case of cerebral exhaustion we find a train of symptoms referable to derangement of the functions of the spinal cord, which may easily be traced by anatomical connections and relationship. There are, however, some distinctive differences which may be noticed. I would rather first draw attention to the symptoms of a neurasthenic or exhaustive condition of the nervous centres as a whole, and we shall then be in a better position to compare local exhaustions

* 'On Nervous Affections associated with the Initial or Curable Stage of Locomotor Ataxy,' by T. Stretch Dowse, M.D. Baillière, Tindall, and Cox, King William Street, Strand.

with organic disease. We are quite willing to admit there are certain people in existence who come under the term 'nervous'; and however much they may try to make others believe that they are not nervous, yet to the skilful eye of the practical physician, the more the effort is made on the part of the patient to dissimulate, the more evident does it become that the absolutely nervous state cannot be disguised. This is characteristic of neurasthenia. Just as the braggart who is admitted to be a coward, so it is with the nervous who are inherently weak, but who endeavour to make themselves appear to be endowed with extraordinary courage and bravery.

Whenever patients walk into my consulting-room in a peculiarly elastic, jaunty style, and with an air of diffidence say that there is not much the matter, and when after putting several questions to such patients they suddenly collapse and complain of a whole category of evils, I conclude that they are suffering from nervous exhaustion or neurasthenia. Then what are the usual characteristics of patients? Can they be described as looking pale, haggard, and careworn? Certainly not; for they may be robust, stout, plethoric, and apparently cheerful. Yet, whether they be pale and thin on the one hand, or stout, and even robust, on the other, we find one marked peculiarity—namely, an evident desire to know why you ask them such and such questions, and whether you are perfectly sure that they are not suffering from disease of the heart or of the lungs, which may rapidly terminate their existence.

These are the kind of patients who not unfrequently fall into the hands of quack practitioners of medicine, and the quack can for the time being make them believe anything he chooses to tell them. Notwithstanding even this, we must not forget that we are dealing with patients who are morbidly sensitive, and who require great moral and even physical help to enable them to overcome a condition

which in many cases is tantamount to the borderland of insanity. In exhaustion of the brain we find:

1. An irritability and instability of the functions of the mind. Thought, memory, and perception are not correlated, so as to give rise to the engenderment of the true co-ordination of ideas. Words will be misplaced in a sentence, and words, or even sentences, will be uttered or written which are totally foreign to the patient's real meaning, as in aphasia or agraphia. 'The same thing has occurred to myself, and after going round my wards at the asylum, I have become so tired, and my brain so exhausted, that I have turned to the nurse when leaving her, and instead of saying good-morning, I have said to her, "Put out your tongue." This has been a temporary arrest of function, which food and rest have immediately rectified.'
2. A marked want of steadfastness of purpose. A character which was notably strong and resolute will become, under the influence of exhaustion of the brain, weak and vacillating.
3. The ego will become intensely exaggerated, and although patients will be, in a measure, shy, yet they seem to labour under the idea that whether they are at church, in the street, or at any place of amusement, they are the observed of all observers.
4. Application to work for any given time is altogether out of the question. Patients suffering from this disease have told me that when in health they could add up three or four columns of figures at one time with the greatest ease, but that they were now unable to do anything of the kind; they soon became confused, and ultimately became so stupid that they had to give up the task altogether.
5. The memory will be markedly defective, yet at times and for a short while it may be brilliant; but

throughout the whole course of this disease we find this especial mark of feebleness and instability to be one of its most prominent features.

6. All the special senses are frequently perverted. The patient may complain of a sour or bitter taste, and he may have subjective sensations of the smell of phosphorus or other odours, whilst his perception of flavours and correct sense of smell is either greatly increased or much diminished. They may be morbidly acute, or they may be morbidly inactive, and they can scarcely ever be said to be quite normal.*

7. Headache and neuralgic pains are of frequent occurrence. The headache is not usually relieved by the recumbent posture. The head pains are usually situated at the top and back of the head; they are rarely to be found over the forehead. They might rather come under the designation 'strange sensations' than under the term 'headache.' There may be a diffused tenderness over the scalp, and the affected part may be exquisitely sensitive even to the slightest touch, such as that caused by the comb, or even by a slight ruffling of the hair over the part; the pain may be relieved by pressure, but sudden removal of the pressure may increase it; even a passing emotion may increase it, and a sense of gnawing or burning may be left a long time after the actual pain has subsided. A sense of pressure is sometimes experienced compared to the feeling that may be excited by a mailed hand being laid heavily upon the head. Although headaches and neurasthenia do not necessarily accompany each other, still, they are frequently to be found in the same subject.

* Some of my patients have complained of the greatest intolerance to light and sound.

8. The patient's manner will be set down by the public, or by his or her friends, as strange. They will be either irritable, moody, or particularly cheerful and good-tempered, and they are not unfrequently beset by imaginary dangers and difficulties which have no possible existence. The sense of fear of disease and the fear of being afraid are very common, troublesome, and distressing symptoms. 'The chronic hypochondriacal patient,' says Dr. Ross, 'who goes from physician to physician and from hospital to hospital with the fixed idea that he has every imaginable disease under the sun is well known, and there are few medical students who at some time or the other of their career have not been haunted with the fear of heart disease.' I have known a medical man the subject of neurasthenia who could not be persuaded for a long time that the mental confusion into which he was thrown on the slightest provocation was not of the nature of an epileptic attack. The fear of being afraid is very distressing : not knowing what he fears, he is full of fears ; knowing that he has nothing to fear, he still fears. A clergyman once told me, without any prompting, that his greatest trouble arose from the dread which he felt beforehand lest he should show evidence of fear and perturbation on ascending the pulpit and in meeting his parishioners. Another fear which haunts the neurasthenic patient is an intense dread of not falling asleep on going to bed, a dread which in many cases becomes the cause of the sleeplessness which is so distressing to the patient. Sometimes the dread of not getting to sleep is so overpowering that the patient sits on an arm-chair the whole of the night rather than risk going to bed. No class of people are so anxious or fearful about the future as neurasthenics.

9. It is a sad misfortune, and yet it is a notable occurrence, for persons suffering from nervous exhaustion of the brain to give way to some morbid craving, until it becomes a vicious and intractable habit. Many dipsomaniacs can assign their mania to have taken its origin from an exhausted brain, and many a man has become melancholic and committed suicide from the same cause.

10. In reference to sleep, we find that patients will be, as a rule, extremely wakeful. They tell us that they awake about two or three o'clock in the morning, and after this they are unable to sleep at all, and that their sleep is invariably disturbed by disagreeable dreams, ofttimes of a peculiarly distressing and harassing nature, the sufferer rising in the morning unrefreshed and often morose, despondent, and full of *unrest*. Startings of the lower limbs upon going to sleep are frequent. Sometimes there is a morbid tendency to sleep, and especially after eating; excessive yawning and sneezing are frequent accompaniments. I believe that many severe cases of exhaustion of the brain are brought about by not paying sufficient attention to sleep and to rest. Excessive fatigue, overwork, worry, sensuality, mental anxiety, shock, grief, are among some of its most important causes.

11. Giddiness, specks floating before the eyes, momentary loss of consciousness, abstractedness, sudden fits of excitement and passion, ringing noises in the ears, sudden outburst of profuse perspiration of the body generally, or of the hands and feet alone, either with or without extreme coldness, are frequent signs and symptoms of exhaustion of the nervous system. The vaso-motor system of nerves are peculiarly mobile and sensitive, and perhaps one of the most common and distressing of the many con-

ditions arising from this cause is blushing, not unfrequently accompanied by transient confusion of ideas, a feeling of rushing blood to the head, dimness of vision, and deafness. During this period the patient is unable to converse without difficulty, so that on this account society has to be abandoned. On the other hand, the converse may predominate, and we find the patient under the slightest emotional excitement become suddenly and deadly pale, the countenance indicating conscious trepidation and anxiety, which it is impossible to conceal ; another sign which is indicative of the involvement of these nerves is the profuse discharge of fluid from the eyes and nose, with great irritability, and sometimes hyper-vascularity of the mucous membrane, especially following changes of weather.

12. Dryness of the mouth and throat, oppression about the chest, inability to take a deep breath, palpitation of the heart, and even a feeling of creeping and formication over the skin in the left mammary region, are not unfrequent ; and so we find similar abnormalities of function in association with the vagus, spinal, and sympathetic nerves. Atonic dyspepsia, loss of appetite, or an inordinate craving for food or drink, irregular action of the bowels as well as an arrest of the ovarian and uterine functions—all these conditions are unquestionably associated with the disease which we have under our consideration.

The symptoms and signs of neurasthenia of the spinal cord alone are made evident to us by weakness and failure of function in the lower parts of the body, and not unfrequently in the upper as well as the lower limbs ; but as I before stated, I question very much if exhaustion of the spinal cord ever exists (excepting in some very acute cases) without an exhaustion of the brain existing at the same

time, although the symptoms of an exhaustion of the brain will require great care in order to effect their elucidation; and again I would say, that the signs and symptoms which are indicative of an exhaustion of the spinal cord require the most searching investigation on the part of the physician in order that he may if possible make himself quite sure that these signs and symptoms are not due to some commencing organic disease of the spinal cord, and that they are not alone due to mere functional derangement: a sensation of burning down the spine, with coldness, numbness, and heaviness of the extremities, accompanied with rapid exhaustion and fatigue after slight exertion, followed by stiffness in the muscles, pain, tremor, and cramps, sometimes in conjunction with numbness and burning sensations and disagreeable feelings of 'pins and needles' and 'creepings and crawlings.' There can be no doubt that numbness along the course of both ulnar nerves, involving the inner part of the arms and little fingers, or even numbness of the whole of the left side, with a special weakness and a tendency to drag the left leg, are frequently associated with brain and spine exhaustion. These symptoms would, if taken alone, be the best evidence to lead us to the conclusion that an ordinary exhaustion of the spinal cord did exist, and the more especially if these signs and symptoms were accompanied with a feeling of general *malaise*, sleeplessness, and extreme sensitiveness to cold; and perhaps even a slight ataxy in locomotion may be experienced, the more especially if the will be brought forcibly to bear in the performance of some special co-ordinate movement. But I feel sure that we cannot (otherwise than in the purely hysterical state) add to the above any more serious signs and symptoms without running the risk of making a most grave and unjustifiable error in diagnosis. There are some physicians who state that the lightning-like and darting pains which we find to be diagnostic of degeneration of the posterior columns of the cord, as well as muscular fibrillations which are so

frequently associated with progressive muscular atrophy, are often connected with spinal exhaustion—pure and simple. For my own part, my practice leads me to an entirely different conclusion, and I would caution all those who have not had large experience in diseases of the nervous system not to follow any such doctrine, unless they wish to run serious risk of losing their reputation.

In neurasthenia, then, we have, as stated, defective will power, defective resisting power, defective memory, defective power of application and attention, and not unfrequently the special senses are defective and perverted; *perversion really reigns supreme.* The following case of neurasthenia will illustrate my meaning:

A strong, athletic, active man, with nerves like iron bands, the head of a large business firm, a man of great capacity and business powers, regular in his habits, temperate, idolized by his family for his social qualities, plays cricket with his boys and beats the lot of them, sleeps well and eats well, can take his twenty-mile walk without fatigue, suddenly becomes desirous to increase his income, and expecting to realize a large fortune he launches out into other branches of trade; he fails in his object, and is crushed by opposing forces. It is ascertained that some members of his family are epileptic, asthmatic, diabetic, or insane. What is the result? Why, the entire being of this strong man is changed. His nights are bad, he turns and tosses in the bed with his head full of cobwebs and confused ideas, a thousand things flash across his mind in as many seconds; still, there is a constant reversion to an ever-present something which cannot be well defined, but which he believes to be the cause of his woes. The terrible stillness and dead of night strikes and palls upon his weak, feeble, irritable, active, and acutely conscious being, and banishes sleep, but not dull care and worry; even the beating of his heart, the throbbing of his pulse, or the call of nature is welcome as a slight diversion to the

stress, the strain, the tension of an overwhelming, but not overpowering, monotony.

The dawn and gray twilight of early morn succeed the fulsome, blank, and dreariness of chaotic darkness, only to find him wakeful, weary, afflicted, and distressed. The hour for rising has come, and our once strong man, chained and shackled by the demon neurasthenia (it is foolish and puerile to call it nervousness), is found weak, impotent, and powerless; his character, which at one time was distinguished by perspicuity, clearness, fixity of purpose, definition, and decision, is now remarkable only for its feebleness, irresolution, indecision, hesitancy, vacillation, doubt, dread, and capriciousness. Just as energy is the capacity for work, as we know it in the physical world, so was this man's nervous *sthenicity* his capacity for action. But where is it now? Can it be absorbed in that effete, old-womanly, *classical*, *clinical*, canonized, and scientific term *nervousness?* No; nothing of the sort. It is sheer nonsense to admit, or to make bold an attempt to admit, anything so utterly vague, unreasonable, and obscure.

I have only drawn attention to a part, and a very small part, of this man's being. Let us observe him in his social sphere, and we find a dislike, a distaste for, and almost a positive aversion to, those very things which at one time gave him the most pleasure. This indifference, unconcern, and insensibility towards his belongings and surroundings are clearly outward and visible signs of an inward and normal volitional effacement. The best, the purest, the noblest and highest instincts of his character have fought the fight for priority and superiority, with the lowest, the basest, and most profane; and the devil for the time holds sway over the spiritual. If we follow this man to his counting-house, we there find an utter distrust in those in whom formerly he had the most implicit confidence. He then tries and forces, cultivates and coaxes, his will, to endeavour to bring it into play, but *he fails in will-power*, and the more he exercises energy to will, the more does

the effort fade away, until finally energy and will seem extinguished.

I hold, and so does everybody else I should think, that defect of will-power is one of the most prominent, if not the most characteristic, signs of neurasthenia. Volition and function go together hand in hand and shoulder to shoulder. The will-link is only part of the volitional chain, and if the latter be impaired, will is comparatively influenced. Movement is the special function of muscle, and is associated with the *lowest level* of nerve-organization. Combined movements relating to complicated and purposive acts are connected with a *higher level*, and if these combined movements are generated, elaborated, and co-ordinated by a process of forethought and inductive reasoning, they then belong to the *highest level* of our nervous organization. And this is not an automatic or reflex condition; it is an accomplishment, will being the imaginary force through whose agency energy is subordinated to act in certain lines of discharge and conduction. Will is a function of the moral side, just as movement is a function of the physical side of our being. Will, volition, force, energy, power, and result are correlated, transmutable, and transformable. The power, force, and will may exist in the neurasthenic, but the capacity for correlation is inhibited.

Will, then, must be the effect of psychic energy. We are unquestionably much less volitional than we would have ourselves believe. Automatism is really and truly our normal state. How seldom do we reflect, seriously consider, and use our judgment—in fact, our reason—to bring about so-called will-effect! The very cause of the neurasthenic state is that the neurasthenic has too much by far of the ideo-volitional, that his normal automatism is subjective to his weak, irritable, and, to him, ever-present volition. It is only when a muscle is paretic that we recognise its normal automatic function, and we then are made conscious of what volition in respect to that muscle really means; and it is only by an effort of will, and

enforced will, that the function of the muscle can be called into action, and not unfrequently the *very effort* to will annihilates will-power. So with the neurasthenic, his consciousness of a desire to will inhibits the power to will, and although the efforts to will are abortive, as long as fixed attention exists, directly this is withdrawn, automatism executes what will is unable to perform.

In my opinion, nervousness is a condition distinct from neurasthenia. That the symptoms and signs of the one merge into those of the other, and that they are allied, there can be no doubt; but, to my way of thinking, rightly or wrongly, we shall, as science advances, find the term 'neurasthenia' accepted by the profession as indicative of certain phenomena which some would have grouped under the banner of sheer nervousness.

Let us follow up the condition of our neurasthenic patient, for we can now dispose of him in a few words. He is, for the most part, one of the most unhappy of happy mortals. Over-sensitiveness and joyousness alternate with depression, and even melancholy. When the latter exists he is called hypochondriacal, and always has a dread or fear of something that may happen; when the former state prevails, he is pronounced excitable, and even hysterical; and so the emotional elements of his nature move in cycles, just as the seasons follow each other in rotation.

From the purely physical side we find a general arrest of function and defective metabolism. The action of the heart is variable, easily excited and easily depressed; the pulse is small, soft, and weak; the skin is usually dry and harsh, but sudden and profuse sweatings are not uncommon; dyspepsia, flatulence, and acidity are frequent; the bowels are irregular, but usually constipated; the extremities are invariably cold, moist, and clammy (dead hands and feet), even in the hottest weather; and tender spots in the spine are easily elicited. These, then, are some of the most common signs and symptoms indicative of neurasthenia.

THE HEREDITY OF NERVOUS CONSTITUTIONS WHICH ARE ESPECIALLY LIABLE TO EXHAUSTION AND FATIGUE.

WERE it possible for us to take a glance at the constitution of man, as man was originally made, we should in all probability find that, in relation to mere anatomical details, there was no essential difference between him and the man existing in the nineteenth century.

We might even go farther than this, and by the most able chemical investigation analyze tissue after tissue without finding the slightest variation or change. We might bring the most powerful and most modern appliances to our aid, and yet as far as human research is concerned, we should be unable to reveal any ultimate difference, which could enable us to arrive at a conclusive estimate as to the reason why we should suffer from diseases which never existed in the body of primitive man. Schlegel speaking of the unanimous testimony of ancient tradition respecting the longevity of men in the first ages of the world, says :

'By a simpler course of life and diet than the very artificial, unnatural, and over-refined modes we follow, there are, even at the present day, instances of longevity far beyond the ordinary duration of human life. In India it is by no means uncommon to meet with men, especially in the Brahminical caste, more than a hundred years of age, and in the enjoyment of a robust, and even generative, vigour of constitution. In the labouring classes of Russia, whose mode of living is so simple, there are examples of

men living to more than a hundred or a hundred and twenty, and even a hundred and fifty years of age. And although these instances form but rare exceptions, they are less uncommon there than in other European countries. There are even remarkable cases of old men who, after the entire loss of their teeth, have gained a complete new set, as if their constitution had received a new sap of life and a principle of second growth. What in the present physical degeneracy of mankind forms but a rare exception, may originally have been the ordinary measure of human life.'*

And it would seem natural enough by inference to conclude that in the earliest ages it was rather the rule than the exception, that man should leave this world by no other means than by what is universally known as decay of nature or by violence.

If it be so—and this we see no reason to doubt—it behoves us to look into and inquire in what consist those changes which, we must admit, are in the majority of instances inappreciable, but which have subjected us to premature death and disease. Is it possible that the modes of living which have raised us, so to speak, to the heights of civilization, have carried with them those aids to early degenerative changes which we meet with in everyday life, and which, it is only fair to assume, have resulted from an hereditary transmission, which has taken its origin from some cause, and at some period in the history of man, of which we are bound to confess our ignorance, but which makes itself manifest in many ways in those multifarious conditions of disease and decline which assail us on all hands? In his address to the members of the Medical Association, August 9, 1873, the late Dr. Parkes said:

'During this time we have learnt partly to know the great class of degenerations with its two divisions, viz.: Degenerations which are simply the result of age, *i.e.*, of

* Schlegel's 'Philosophy of History.'

the loss of the peculiar formative force which first builds up, then maintains, and then finally dies, and leaves behind it a tissue, worn out, effete, and useless; and degenerations which are the slow result of some excessively slight but constant failure in nutrition, fibroid, fatty and atheromatous changes and wastings, especially of muscular fibres, but also of gland-cells and mucous membrane, and nerves come in to complicate the acute maladies, and largely to increase their mortality. It must be confessed that, while they account oftentimes for failure in treatment, the chance of degeneration being present in middle-aged patients is a source of great embarrassment in prognosis; except when attacking the kidneys and muscular tissue they are diagnosed with great difficulty, and slow degenerations of the alimentary mucous membrane, or of the nervous system, are among the most puzzling of maladies. In the means of detecting the presence, and estimating the amount of these degenerations, we have still much to learn, and no greater benefit could be conferred on the human race than a perfect analysis of these causes, and a recognition of how they may be avoided.'*

However, let this be as it may, we must not ignore the fact, that, from the earliest writers on medicine, we find certain conditions of both mind and body alien to what might be called the standard of health, and which might be rightly termed disease. Therefore, it must be taken for granted that, however rude and uncultivated were the means placed at their disposal to aid in diagnosis, and however simple may have been the primitive type of disease, still it did exist independently of mere senile change. Then it comes to be a question in what manner, and in what way, either in origin, type, or formation, these alterations have been brought about, which make the classes of disease to differ, both in character and nature, from those incidental to our forefathers. It is, nevertheless, true that a simple pyrexia, or fever, is made manifest by the

* Professor Parkes 'On Degeneration.'

same signs and symptoms which were laid down by Galen ; yet the treatment then applicable is now rightly decried, for he supposed that diseases depended on similar qualities, and were to be counteracted by opposite medication, as, for example, we were to meet a hot disease by a cold remedy. This, we must admit, is somewhat different to the treatment now usually adopted ; and for what reason ? Because, we say, that disease is altered in type. Yet upon investigation we are much inclined to doubt that this is really the fact. On the contrary, we are led to believe that some alteration has taken place, either by hereditary development, or through surrounding influences, which has produced a molecular alteration in the fluids or tissues of the body, resulting in a change of diathesis or constitution which makes an inflammation to differ in degree and in intensity. This leads us at once to consider, whether we are not right in talking of constitution in reference to disease, and whether the *vox populi* has not some show of reason when the family doctor is preferred, because he is said to know the constitution. It is not more than some thirty years ago, when men of the highest eminence considered it all-important in diagnosis to find out what is called the hereditary tendency or constitutional diathesis, and to base their plan of treatment upon the information elicited. But of late years this has in some degree fallen into disuse, and the so-called nutritive, or stimulant treatment has become the fashion. Dr. Alison recognised the increased necessity for stimulants, as a consequence of the changes he observed in the character of diseases. Dr. Todd, on the other hand, who practised the stimulant treatment to a great extent, did so as a matter of routine, rather than admitting its necessity on account of the altered type of disease ; and it would therefore appear that Dr. Todd had an idea similar to the foregoing statements of the author in regarding the change as being one rather of constitution than of type.*

* Dr. Todd, 'Clinical Medicine,' 1862.

That the stimulant treatment has its advantages, no one can doubt, and in the main perhaps one might say that it is correct, the more specially where we deal with those forms of disease which have to be treated upon what is called the expectant plan. If, for instance, we have under our care a fever, which we know runs a definite course, we can, by careful and almost hourly examination, support the patient under the degenerative changes which must necessarily arise. And in such a case as this it will not perhaps benefit our patient much to ascertain whether or not he is, either by hereditary transmission or by acquisition, the subject of gout or scrofula. But at the same time it might be all-important to be made acquainted with what we understand to be his peculiar constitutional habit of body.

For instance, he may not be the subject directly of any hereditary taint, yet at the same time he may be deficient in that tonicity of mind and body which is so often the result of the too frequent use of stimulants, of over-mental work, or of some other vitiating cause. Here, then, we have open to us two different constitutional conditions—the one acquired, the other hereditary ; without an acquaintance with which it is to be maintained that the physician is powerless to combat the ravages of disease. And a thorough knowledge of this condition will be found so all-important in the treatment of those forms of disease to which this paper especially refers, that it would be useless attempting to make the subject thoroughly clear, unless we explain, with some degree of accuracy and precision, what is generally understood, from a medical point of view, by the term 'constitution.'

Dr. Aitken says, in his 'Practice of Medicine': It appears evident that the human body is capable, from causes known as well as unknown to us, of undergoing various alterations, as regards not only its physical, but also what has been termed its medical constitution. The follow-

ing lucid account of hereditary constitutional disease, given by Sir James Paget in the discussion on cancer, at the Pathological Society, will here be read with interest:

'The transmission of cancer accords with the transmission of all other hereditary constitutional diseases—with gout, with syphilis, with tuberculosis, with scrofula; for here I may mention that I think it will be well, if we study the whole matter of the pathology of cancer, not by its accordance with certain verbal definitions of our own, but in its relations with those diseases which we are all of us ready to admit to be either constitutional or local. And I assume that we are all of us quite ready to admit that gout and syphilis, and tuberculosis and scrofula, are constitutional diseases. I say, then, the transmission of cancer by inheritance accords perfectly with what we see in them, not with what we see in local diseases. The gout of the parent may appear in all the possible various textures of his offspring, never, it may be, in the great toe of one of them, but in the joint of one, in the skin of another, the bronchial tubes of another, the pulmonary texture of another. Of all the variety of diseases which we class under the general name of gout, the whole may be derived from one parent who may have gout in what we regard as its typical form. And I need not here speak of the varieties of form in which tuberculosis is propagated by inheritance, or scrofula, or any of those other which we regard as constitutional diseases; and this fact I repeat in regard to the transmission of a disease by inheritance is so all-important in respect of what we call its origin, that I think it is to be regretted if we deviate in the least from holding that the constitutional element of the origin of cancer is one of the most important and considerable things that we have to study. . . . When after an injury there is a deviation from ordinary changes, we seldom or never entertain a question but that the deviation is due to some constitutional defect in the person in whom it occurs. We see a wrenched knee-joint which does not recover after the ordinary fashion, which swells and remains hot, with thickening of the

synovial membranes, perhaps with the formation of abscess. We are as sure as of anything in pathology that that is because the person is scrofulous. We see an injury of a bone, and it becomes the seat of tuberculous deposit. We understand that it is so because the person to whom the injury has happened is one with a constitutional tuberculosis. We see an injury done to a foot, and it becomes the seat of a gouty inflammation ; of another done to joint or bone, and it becomes the seat of syphilitic disease. In all of these cases our pathology is as sure as any piece of pathology we have ; it may be erroneous, but at least it is as certain as any other knowledge that we have, that deviation from the ordinary method of change after injury is because of some constitutional peculiarity in the person upon whom the injury has been inflicted.'*

It will be seen from what has just been stated that we each individually possess a something transmitted from our parents, which can receive with all truthfulness the term hereditary constitution. By this must be understood that diathetic habitude or cachexy, which is included under one of the four conditions—tubercle, scrofula, gout, or cancer. Yet even here it must not be forgotten that what one understands by the term 'delicate constitution,' and which does not come under any special dyscrasy of ill-habit of body, can be inherited by transmission. Again, the parents, either one or both, might be of ill-habit of body from intemperate or vicious courses, and the offspring might be delicate or ill-nurtured, without any special dyscrasy. But yet, more important still, we must not forget the possibility, which amounts to a conceivable reality, that the present generation does suffer from a constitutional ill-habit of body, which has never yet received a definition—the result in all probability of the commingling of constitutional cachexies existing in the bloods of our progenitors.

To make this clear, we will take by way of example a

* 'Discussion on Cancer,' *Lancet*, March 21, 1876.

man of mature years, apparently healthy. All the organs, secretive and eliminative, shall be doing their normal amount of work. He shall not be suffering from any mental anxiety or external depressing agency. Yet he will come to the physician complaining of great weariness upon slight exertion—of palpitation of the heart with disordered bowels upon the slightest mental emotion—headache on rising in the morning, and a feeling of tiredness unrelieved by the night's rest. There may or may not be want of appetite as well as distaste for society, yet there is a total incapability of application to any especial object—in fact, a general want of 'tone' throughout the body. Now, upon the most minute and careful investigation, it is often found that the man may be sound in every sense of the word. Still, upon examination into his family history, we shall in all probability discover that he has descended from an unhealthy stock. The hereditary taint on the father's side might have been that of gout, and on the mother's that of tubercle. And we have in the son a condition of constitution, by hereditary transmission, partaking of the characteristics of the father on the one hand, and of the mother on the other, but which in him is nothing more than what is generally understood to be a weak state of health. The more one studies what might justly be called the natural laws, which govern the transmission of diseased states from generation to generation, the less likely one is to look upon the foregoing as a mere visionary conclusion.

Then, in hereditary transmission, we have to consider what evidence is afforded to us, by which we are assured that constitutional genesis of an essentially congenital type is an established fact. A moment's consideration will without difficulty solve the problem. Granted that the ovum becomes impregnated with the spermatic fluid, by which process of fecundation it does not lose its original condition, it yet, however, takes to itself a diseased life

which in process of time differentiates into the several organs of the fœtal body. That this is really the case is an undeniable fact, and it is brought about by a vital agency whose power is made manifest, but of whose modes of working we must plead ignorance.

It is surprising to find with what method and mathematical precision, this outcome of heterologous growth is maintained and carried on, until maturity becomes complete. And it would be absurd incredulity to question the fact that the primary sperm-cell of the male, and also the ovular cell of the female, did not each carry with them their own inherent and distinguishing constitutional characteristics. This is fully exemplified in every possible way. That 'like engenders like' is an admitted axiom, and demonstrated no less in race than in species, both in mental attributes and in bodily conformation ; even more than this, we find it in mere habit and character.

Dr. Carpenter, in his work on 'Mental Physiology,' says :

'In particular, it is to be noted that while the more general characters are shared by both parents, the more special commonly belong to one only.

He further says :

'A great deal of discussion has taken place as to whether the male or the female parent exerts the greater influence over the character of the offspring ; and while experience does not yet justify any definite conclusion on the point, the question seems to have been entirely ignored, whether the union of two different natures may not produce —as in the combination of an acid and a base—a resultant dissimilar to either of them.

'This much, however, may be confidently affirmed, that where *general constitutional taints*, that is to say, *abnormal* habitudes of nutrition, have been acquired, these tend to propagate themselves hereditarily ; and that they do so with the most certainty when *both* parents partake of them.

It may also be affirmed, that every repetition of such transmission tends to increase the mischief; so that by 'breeding in and in,' the injurious external conditions remaining the same, a very slight original departure from healthy nutrition may become intensified, in successive generations, into a most serious abnormality.'

Thus it seems indisputable that we are the subjects of hereditary physical and mental conformations. There are also hereditary conditions which cannot be called constitutional. For instance, the father might have a clubbed foot, or a webbed hand, and this might be transmitted to the offspring. Or, whilst bearing child, the mother might be so influenced by some external object, producing such shock to the nervous system, that the visual effect is not only impressed upon the mind, but is transferred to the fœtus in utero. This is an inherited abnormality in the offspring which cannot be called constitutional.*

The line can and must be drawn between transmission by inheritance of mere abnormalities on the one hand, and of disease on the other; and the latter alone can claim to be considered as a constitutional condition.

At all events, this is the accepted fact, and yet upon consideration we do not feel inclined to rest here, and the common phrase in reference to constitution must not be lost sight of. For instance, it is often said, 'What a good robust constitution so-and-so has.' 'Yes,' is the answer, 'and so had his father before him.' Surely this is also inherited, and quite as much so as the constitution of so-and-so, who is dying of consumption, of which disease his father died before him, and the one is as equally due to a blood state as the other. Although we do not wish to enter into a lengthened detail of hereditary pschyoses, or conditions of mind, either natural or abnormal, still the idea presents itself with a practical bearing which warrants

* Watson's 'Practice of Medicine,' p. 117.

the conclusion that 'constitution,' whatever it may mean, is made up not merely of blood or tissue elements, but that also these must be taken in relation with those mental states and nerve forces which play so important and vital a part in man's entity and being.

If the morbid condition which is known as gout, consumption, or cancer, exists by transmission in the blood, it is quite possible that it should, and it often does, remain quiescent throughout the lifetime of a whole generation, but it develops itself with tenfold violence in the succeeding descendants. Here we naturally ask ourselves the question, What agency can be at work to prevent the development of so rapidly destroying and fatal a disease as consumption, the seeds of which we feel assured exist in the constitution? It is only by a knowledge of the working of the laws which govern the formative processes of nutrition and maintain the standard tonicity of health that we can explain this problem. How often does it come within our daily practice to be called in by the parent to treat a child dying of consumption, when the parents themselves have always enjoyed robust health, but upon inquiry it is found that one or both of the grandparents have died comparatively young from the same disease!

Again, how often do we find persons come to us for treatment whose condition previously has been that of perfect health, but whom we now find to be suffering from rapidly-spreading tubercle, and whose children have died young, and whose family history shows conclusive evidence of consumptive taint! There are instances on record where the parents have lived to a ripe old age, though all of their children have died from cancer—not of the same, but of different localizations. Perhaps, however, with cancer, as differing from gout and tubercle, we are right in affirming that it does not, as a rule, remain latent in the constitution through a generation, but rather develops itself in a most

marked manner in succeeding offspring. We quote again from Sir James Paget:

'A lady died with cancer of the stomach; one of her daughters died with cancer of the stomach; another died with cancer of the breast; and, of her grandchildren, two died with cancer of the breast, two of cancer of the uterus, one of cancer of the bladder, one of cancer of the axillary glands, one of cancer of the stomach, and one of cancer of the rectus.'*

We thus feel that our knowledge of the nature and propagation of these morbid products is, to say the least of it, attended with some amount of obscurity; and, more than this, the manner of their transmission and seat of location is at the same time, to a certain degree, matter for conjecture.

For a definite morbid material to be constitutional, it must exist not only in the blood, but in the tissues and the fluids throughout the body; and although, as before stated, gout, cancer, and scrofula are blood diseases, it would be wrong to conclude from this that the materies morbi existed in the blood, and in it alone. If we did so, we should be less likely to account for hereditary transmission, because both the spermatic fluid and ovum must be said to be free from blood; still, in the primordial germ, it must be allowed, does exist that inconceivable something which grows as tissue grows, and pervades all. Apart from any absolutely recognised dyscrasy, there is yet another constitutional condition, in which appear to be signally manifest those properties or qualities which go to make up by hereditary descent the nervous temperament, and in which we, in the majority of instances, find that which is commonly called an 'ill-conditioned habit of body.' And here the mind does, to a certain extent, most undoubtedly participate in

* 'Discussion on Cancer,' *Lancet*, March 21, 1876.

the diseased state, in a direct ratio with the bodily conformation or physical development.

Dr. Carpenter truly affirms, that 'breeding in and in' leads in successive generations to a most serious abnormality, as exemplified in cretinism and idiocy. Also in those ill-assorted marriages where there is great disparity of age, we see the evil results in the ill-nurtured offspring, deficient alike in mental as in physical power. I look upon the constitutional condition here in the same light as I do upon that which is engendered from parent to offspring, when the former have been given to the excessive use of alcoholic liquors. In each case there is exhibited the transmission of that imperfection of nutrition, which fails to give to the germ its true formative capacity, and the result of this is exemplified in all classes of society, from the street-arab of St. Giles's to the noble of St. James's.

From an analysis of a very large number of cases, I am perfectly sure we can find a cause for the majority of illnesses in that class of disease which is especially marked out as nervous or neurotic. And I am much inclined to think that in an ill-assorted marriage—say where the husband has passed the years of maturity, and the wife is still in the prime of womanhood—there will be the union in the offspring of an ill-balanced nervous temperament, not only physically but mentally. And here I will set aside, for the time, all consideration of what might be the especial constitutional attributes of either of the parents. Take it for granted that, at the time of marriage, they were both in what goes by the name of good health, yet there can be no doubt, when we consider the laws of senile degeneration, that the male germs, which partake of the father, will carry with them to the formation of the embryo, and thence to the child, a constitutional condition which will develop, if not into actual disease, at least into a state of nervous weakness, as evidenced in that want of healthy vigour so strikingly delineated in the epileptic, the hysteric, the

morose, the melancholic, and the imbecile. Mr. Galton tells us that:

'The bodily and mental condition of every man are, in part, the result of his own voluntary and bygone acts; but experience teaches us that they are also shaped by two other agencies, for neither of which he is responsible; the one, the constitutional peculiarities transmitted to him by inheritance, and the other, the various circumstances to which he has been perforce subjected, especially in early life.'*

Dr. Laycock's words, in his 'Lectures on Diseases of Organs and Tissues as influenced by the Nervous System,' bear directly upon this subject of ill-assorted or unadvisable marriages. He says:

'The hereditary tendencies to diathetic diseases and degenerations defined and fixed on an anatomical basis, are more easily comprehended when we remember that it is the regulative principle, as *vis nervosa*, which in animals endowed with a nervous system must be operative on the sperm and germ cells. Now, a regulative energy manifested as the "nisus formaturis" is the special property of these minute portions of matter, and consequently it must be by a concentration of that energy, as *vis nervosa* on the genetic glands, that the peculiar property is supplied. If, therefore, the innervation be defective in regard to these glands, the regulative or evolutional power will be defective. It is thus I explain how degenerations of structure and defects of function and form take place from deficient *vis nervosa* in the parents; for in these sperm-cells and germ-cells, as in other tissues, the law of degeneration is retrocession to a lower type. The nature and results of that defect in brain nutrition upon which hereditary insanity depends, is a striking illustration of this law of hereditary disease and defect; it is the lower or animal appetites and instincts which crop out in hereditary insanity.'†

So well known, and so patent, were the evil results of ill-

* 'Hereditary Improvement,' *Fraser*, January, 1873.

† 'Lectures on Diseases,' *Medical Times and Gazette*, March 28, 1871.

assorted marriages, even in the time of Socrates, that Plato in his 'Ideal Republic,' after speaking of the good results to be attained by breeding together the best horses, the best dogs, birds, etc., says, that marriages should be arranged by the rulers, so that people should only marry when in the prime of life, and that the best men should marry the best women.*

In a state of perfect health, a condition, I fear, rarely, if ever, to be found in our generation, there will be seen that complete balance or equilibrium, so to speak, between mind and body, that they both act and re-act upon each other with due and only due relative power, which is guided by those vital or formative laws which tend to give man pre-eminence among the races of living creatures. It is well known that some members of the purely psychical school consider the mind to be omniscient, and underrate, indeed almost disregard, the influence of the body upon it altogether. But this cannot be the opinion of the clinical observer of diseased states, or of those who study the physiological anatomy of the even yet imperfectly known nervous system.

If what we understand by mind, namely, feeling, will, and thought, is immediately connected (as we have seen) with and forms part of our physical state, it must be with that portion of the nervous system which is called brain. And more than this—we know full well that the brain substance can be divided not only into white and grey matter, but into centres where motor force is generated and sensory impressions are received, and into areas wherein are located foci for the special senses and intellectual faculties. We are willing to admit that in the cells of the cerebral hemispheres rests that nidus, or tabula rasa if you will, wherein dwells our living consciousness. As physiologists, we know that if we will an act and perform it, the performance is secondary to and consequent

* 'Republic,' Book V.

upon the willing. Hence it is only fair, upon purely materialistic grounds, to infer that the cells, in which we choose to say our ideas are generated, are connected with those other cells to which the ideas are propagated, and from whence emanates the motor force which wills the performance of a voluntary act.

In Professor Max Müller's second lecture on Mr. Darwin's 'Philosophy of Language,' delivered at the Royal Institution, March, 1873, we find the following:

'The new philosophy, priding itself, as all philosophies have done, on its positive character, professed to despise the endless argumentations of the schools, and to appeal for evidence to matter of fact only. Our mind, whether consisting of material impressions or intellectual concepts, was now to be submitted to the dissecting-knife and the microscope. We were shown the nervous tubes, afferent and efferent, through which the shocks from without pass on to the sensitive and motive cells; the commissural tubes holding these cells together were laid bare before us; the exact place in the brain was pointed out where the messages from without were delivered, and it seemed as if nothing were wanting but a more powerful lens to enable us to see with our own eyes, how in the workshop of the brain, as in a photographic apparatus, the pictures of the senses and the ideas of the intellect were being turned out in endless variety.'

I do not think that any microscopist, with the most determined materialistic views, could ever conceive so futile an idea as that which Mr. Max Müller seeks to convey to us in the ironical passage just quoted. Yet as clinical observers of psychological changes, we do not feel inclined to give way to the metaphysicist altogether—the more especially when we have almost daily evidence, in diseased parts of the brain, of pathological changes producing psychological effects.

The great interest that attaches itself to the connecting-

link between the material and the immaterial, the psychical and the physical, the volitional and automatic, is of such magnitude, and fraught with so much profound philosophical research from the early ages of reasoning, that the more its investigation is carried on, the greater appears to be the extent of illimitable space which is opened before us.

Modern writers of a somewhat careless and indifferent mode of reasoning (I mean in a purely philosophical direction) have attributed, and with truth, this state of things to a want of candour on the part of the purely metaphysical school—a want of concession to undoubted physical truths —and an utter disregard of the rapid advance which has of late years been made into the structure of the nervous system, and the seats of propagation and mode of conduction of nerve-force. Here the clinical worker in the field of diseased nerve-states will most assuredly in the course of time, by patient and profound investigation, be able to bring forward such evidence as will materially shape the views of the purely psychical school. But, honestly speaking, this will be no invasion of true psychical philosophy, and for that reason, I hold, and it cannot be fairly denied, that man's entity is made up, not of body and mind or spirit alone, but of body, mind, and a psychos absolutely distinct from either. And I think that, as physicians, we shall do well to leave in the hands of the pure metaphysicist the relation that mind has to soul, while we take up the ruder and, if you will, grosser elements which connect mind with body. And, surely, we can have no better demonstration of the latter than in the play and expression of the various so-called emotions. Therefore I hold that the materialist has a fair field in studying the connection of mind in relation to body, while the metaphysician may plant, if he choose, his standard in the realms of the unknowable, and study the co-relation of mind and soul. For it must be understood that man's entity, after all, consists of, in the words of St. Paul, 'body, soul, and spirit.'

'When man,' says Schlegel, 'is considered relatively to his external existence in the sensible world and Nature, to which by his body he belongs and forms a constituent part, then the three elements of which, as regarded from this point of view, his whole being or essence appears to consist are body, soul, and spirit. There is little or no harmony between the higher and spiritual principle of the inner man and the outer world, to which properly his sensuous faculty belongs. . . . No doubt the external frame of the human body, with its wonderful organization, presents in the prime of its development the corporeal image of a more exalted beauty. . . . But, on the other hand, it is exposed and subject to innumerable injuries, sufferings, disease, and corruptions. . . . Added, then, to the other two elements of man's being, spirit and soul, the organic body forms the third constituent, in which, however, is contained the ground and occasion of conflict and strife.'*

After considering some obscure affections of the nervous system, with an examination into those especial causes which of themselves, without any inherited ill-habit of body, produce a diseased nervous condition with concurrent degeneracy of the intellectual faculties, this chapter will be concluded.

It is impossible to enter into a consideration of this part of our subject without reconsidering for a moment the ego and non-ego, the volitional and automatic; and although I am an advocate for the truth of transmitted hereditary constitutional cachexies, yet I cannot, from my experience, come to a similar conclusion with regard to the habits, or what might be termed mental idiosyncrasies, and intellectual qualifications, excepting as they are connected with the condition of constitution; and there can be no question that temperament, so called, is mainly influenced by the state of bodily health. Transmitted hereditary

* Schlegel, 'Philosophy of Life,' Lecture II.

constitutional cachexies I consider to be the rule, but a transmitted hereditary mental idiosyncrasy, or intellectual qualification, is exceptional. If we take the various professions—divinity, law, physic, engineering, etc.—we shall find it to be an unusual circumstance for the son to attain to the particular individual acquirements of the father, or even to care for the profession to which the father belonged.

I have said that temperament is subjective to constitution ; and it is in many instances not only influenced, but governed by it. In the business of the every-day life of the physician, and especially of the family doctor, this is repeatedly exemplified.

Hence it will be seen that I am sufficiently materialistic to come to the conclusion that our acquired habits, hereditary or otherwise, are in a great measure due to constitutional government. This is not volitional. We know how functional derangement produces certain definite conditions of temperament, or, rather, we are as sure as of anything that certain constitutions are prone to functional derangements of certain glandular organs, both secretive and eliminative, which alter the actual constituent normal condition of the blood ; and this is made manifest, either in an objective manner—as in gout, for instance—or in a subjective, as in an altered condition of temperament ; in some amounting to mania—to epilepsy in others—and, again, to a depression of spirits or hypochondriasis in others, just according to whatever happens to be the individual temperament or special personal characteristic. In fact, it comes to be a question how far a man is really responsible for an inherited tendency of body. We hear it said that 'So-and-so is a confirmed drunkard, or spendthrift, or thief, or miser, or vagabond'; or, on the other hand, an exemplary character —'pious, devoted, loving, unselfish, charitable, even-tempered ; nothing ever puts him out.' Some maintain that the latter are attributes especial to a healthy organization, whilst the former are, for the most part, attendant on

a diseased constitution inducing especial depraved mental characteristics.

It must be remembered that the action of mind upon body, and body upon mind, is co-existent. And if I maintain that the healthy mind or individual character can be, and is, influenced by constitutional causes, on the other hand, I am quite inclined to hold that a previously healthy body, evincing no especial tendency to any functional derangement, can, by excessive mental strain, be so acted upon as to become functionally diseased; then the enfeebled and disorganized body reacts upon the previously diseased mind, leading to the worst form of obscure, and even of readily recognised, nervous diseases. There are accredited conditions of the nervous system which can undoubtedly be said to be acquired; but inasmuch as we are differently constituted, both mentally and physically, and as in one person the balance of the psychical and physical forces is less stable than in another person, I think that we cannot fairly be held responsible for acquired tendencies. Though all persons are *blamable* for *acquired bad* tendencies, yet, from circumstances, one person may be less blamable than another.

BRAIN.—EXHAUSTION FROM OVERWORK AND WORRY.

THIS subject demands some slight consideration apart from the neurasthenia which we have just had under our notice. Exhaustions from overwork, from undue excitement, and from worry, may be considered as essentially attributes of the present age, and they are more prevalent now than they were at any other period in the world's history. Life at high-pressure is the prominent feature of the nineteenth century, and we cannot be surprised when we find that the so-called nervous diseases and exhaustions, dipsomania and insanity, are increasing beyond all proportion to the rapid increase of the population. If it be true, and undoubtedly it is so, that the love and passion for life is inherently bound up with the capacity of organic element to feel agreeably towards, and to respond fitly to, the stimula of its environment, we can, I think, easily understand that the enormous activities with which we are surrounded cannot fail in some measure to engender that instability of the nervous system which we now have under consideration.

The man or woman suffering from nervous exhaustion is to my mind the most unfortunate individual in creation, for such persons scarcely know in what direction to turn for help, succour, and relief. It is a condition which is not sufficiently understood and studied even by medical men, and the public, who ought to know something, really know next to nothing about it. A man, woman, or child with

an exhausted brain is, on the one hand, either stupid, wooden, sullen or morose; or, on the other hand, impetuous, passionate, irritable and insubordinate.

Such persons are invariably nervous, in every sense of the word, and may possibly have inherited a thoroughly nervous constitution. The whole world seems unkind to these people. They are accused of neglecting their duties if they are public men, and in private life they are frequently blamed by those nearest and dearest to them, and so their affliction becomes exaggerated, and ends not unfrequently in confirmed melancholia.

The man who from brain exhaustion becomes vacillating, or doggedly obstinate, irritable and morbidly sensitive, and who shuns the society either of his club, or of his associates in pleasure or business, may be, and frequently is, judged most severely and wrongfully by them, and is often set down as ill-bred, ill-tempered, or proud; and he suddenly finds that he is being cut by those whom he considered to be his friends, and misunderstandings inevitably arise. He retires from society more and more every day of his life, until, in a way, he becomes recluse and reticent even concerning his own suffering. When asked what is ailing him, the answer will invariably be: 'Oh, nothing; I am merely tired: let me be alone.' And if further questioned, he bursts out into a fit of temper, and the questioner, if sensible, retires at once; or, if foolish, takes up the argument, when a downright quarrel is the result. *He who is full of the energy of health, and takes an active and keen interest in life and all its surroundings, is quite unable to realize that anyone can seriously wish to be rid of it, 'any more than he who is in the full vigour and enthusiasm of youth can realize the life weariness of old age, when desire fails and the grasshopper is a burden'* (*Maudsley*). All persons who suffer from exhaustion of the brain are remarkably suspicious of everyone about them; there seems to be a vague idea floating through their minds that everyone is anxious

to cheat or injure them; that wives, or it may be husbands, cease to have that affection and regard for them which they formerly had—that they cease to take that interest in their comfort and their welfare which they formerly did; and these perverted ideas seem to grow as the brain exhaustion increases, and there can be no doubt that cause and effect, and effect and cause, both work together in the production of that unstable and irritable state of the brain-cells which tends to a state of health of the most serious and lamentable kind. I have had men brought to me by their relatives, sometimes by their wives, who have been considered sharp, shrewd, hard-headed, and talented men, either in the business or the profession to which they have belonged, with a history identical with that I have just endeavoured to portray. (It must be remembered that lazy, idle, and indifferent men do not, as a rule, suffer from the disease of which we are writing.) Their friends say that they are so altered in character that no one would in this respect take them to be the same persons; and when we put a series of questions to them, we find that some excessive mental strain, induced by too close application to study or business, or, what is perhaps more frequently the case, some perpetual anxiety (worry), is usually the exciting cause; and nothing more than this mere change of disposition will be noticed for some time, or it may be for weeks, or even months. Yet these changes in character (unless precautionary measures be taken) will continue to grow. The patient's sleep becomes greatly disturbed; headaches, loss of appetite, rapid fatigue upon exertion, and complete incapacity for business, are the result, as also the whole train of symptoms which have been described. Professional men, and especially clergymen and medical men, seem to be more prone to these attacks of brain exhaustion than others. It is quite certain, and I believe it is a generally admitted fact, that the performance of constant routine work, without adequate change,

exercises (although perhaps inexplicably) an undue tension upon the nervous system and the nervous centres, which, in the course of time, leads to instability and exhaustion. Not unfrequently the first indication of commencing nervous exhaustion may be an unwonted difficulty in recalling names. If a neurasthenic patient suddenly and unexpectedly meets one of his most intimate friends, he will find the greatest difficulty in remembering his name, and he becomes confused and annoyed with his own forgetfulness, and the maintenance of a conversation is sometimes associated with so much strain and effort that it is followed by profound exhaustion. Educated men, as a rule, when their nervous system becomes exhausted, have a tendency to brood over many abstruse, occult, and perplexing problems, to unravel which to their satisfaction they are totally inadequate, so that confusion becomes hopelessly confounded.

Brain exhaustion from over-study, and so-called cramming the brain, is, perhaps, one of the greatest social evils of modern times, and is simply a blot upon advancing civilization. It is opposed to all biological laws—social, moral, hygienic, ethical, physical, and rational. If every brain were endowed (for we speak of it as an endowment) with the same powers of thought, memory, and perception, and if the volitional attributes of the mind, as apart from the mere automatic, were as purposive and correlative in the one individuality as in the other, then we might perhaps be justified in coming to the conclusion that minds are minds, and brains are brains, and that the brain merely requires physical cultivation, in order to render it capable of doing a given amount of work in a given time, just after the manner of a steam-engine, which consumes a certain amount of coal, and thereby generates a known equivalent of force.

But this is by no means the case with the human brain, and cultivation can never make it so. Yet a careful and

early training of the automatic processes of the brain is one of the most, if not the most, essential factors towards laying down that solid foundation upon which the future structure of the mind must necessarily depend.

This early and automatic training of the brain cannot be commenced too soon, for the reason that it is merely a healthy stimulus, favouring the germination of the purely embryonic mental development, which we know to be co-existent with the perception, and which period of life is so aptly described by Dr. Morell, in his 'Philosophy of Religion.' He says that, at this period in the child, 'A sight or a sound which at first produced simply an involuntary start, now awakens a smile, or a look of recognition. The mind is evidently struggling *out of itself;* it begins to throw itself into the objects around it, and to live in the world of outward realities.'

There is scarcely a man who has ever lived, and had mind superior to that of his fellow-man, whose brain has not received the automatic training to which I now more particularly allude. The brain of a child (and I am now referring to the mass, and purposely excluding individualities of genius) is quite incapable of receiving, or, at all events, ought not to be exercised to receive, more than is conveyed to it automatically through the perceptive faculties, and this even for some time after reason has become developed. Reason is the highest development of perceptive correlation; instinct is Nature's capacity to reason. The faculty to reason, and the instinctive faculty of reasoning, are, however, so closely allied that it is merely a matter of brain development, which renders the power and will to reason a faculty superior to, and distinct from, the reasoning faculty. There would be just as much wisdom in putting an ordinarily developed boy to run a mile race with one of known physical strength and endurance, as to expect some lads, or even children, to compete honourably in the competitive examinations, according to the present

educational system. Mental development depends much more upon the automatic processes of the mind than is usually supposed, and the perfectibility of the mind, as far as we can admit the use of the term, is dependent upon, to speak plainly, the adjustment of the volitional faculty of reasoning to the intuitive faculty of automatic receptivity. There are many men, women, and children who possess the former, but who are utterly destitute of the latter. They have, in fact, the will, and the earnest desire to cultivate their mental faculties. But, in other words, they have not the brain capacity, or the inherent latent activity of the brain-cells, or what I venture to designate the intuitive faculty of automatic receptivity.

Now, in reference to the constitution of mind, what I call the intuitive faculty of automatic receptivity may be governed by the first, or active division of brain force. Secondly, what I would call superficial reasoning, which may be relegated to the class of intuitive selection, may be governed by the second, or complementary division of brain force. Thirdly, what I would call reasoning by volition is governed not only by the second division of brain force, but requires to abstract considerable energy from the third, or latent division of brain force. If there be no rational foundation for my theory, it may still be found useful to elucidate some of the phases of brain exhaustion from overwork with which we are becoming so familiar. We must not forget that any undue taxation which may be made upon the latent brain force immediately produces a mutability and instability of the normal molecular action, and correlative integrity of the active and compensatory forces. Hence we find not only sympathetic depression and exhaustion of the mental processes themselves, but also an arrest of latent nerve energy throughout the whole course of the sympathetic system of nerves, which of course leads to arrest of function (elimination) in most of the secreting glands, faulty nutrition, disease, and possibly

premature death. At all events, I have no hesitation in saying this: that it is a most grievous mistake on the part of parents and teachers to endeavour to make children's brains receive what they are utterly incapable of receiving, without such an effort and such an amount of enforced volition that, should they accomplish the task which has been set them, the expenditure of latent nerve force has been so enormous, and the brain becomes so enfeebled, that it is extremely questionable whether it ever regains even its former equilibrium. I very frequently hear men say, 'Well, I shall go in for such an examination upon the chance of passing, although I do not take very kindly to the subjects.' I condemn this as a bad principle to go upon. A boy or lad has the capacity to pass a certain examination, or he has not. If he has not, he had better leave it alone altogether. But his parents and teachers will say, 'How do we know before he tries?' Of course if the lad is physically strong, and of fair brain power, there can be no objection whatever to his trying. Yet there are many cases, and some such have, in fact, been brought to me by their friends for my advice, when after considering the course of study which has been requisite, and the nature of the examination to be passed, I have unhesitatingly given it as my opinion that it would be as easy to put a quart into a pint pot, as for the lads to pass the examinations which were proposed. In a few cases my advice has not been taken, and my opinion of their brain power has been found correct—too late, alas! when they have signally failed to pass their examinations. If a boy or girl, we will say by way of example, between the ages of twelve and fourteen years, shows an especial and inherent aptitude for any business or profession, it is the duty of the parent to assist the child as far as it is possible, in cultivating and developing this something, which we are inclined to call an intuitive brain faculty; and the more I reason concerning this intuitive—or perhaps I may fairly say instinctive—

brain faculty, so much the more am I convinced of the absolute value and importance of my statement. This faculty is the outcome of an unconscious cerebration, and shows that the intuitive mental processes are developing in a given and definite direction. It is the cultivation of this endowment which, taken at the tide, leads on to fortune, greatness, and renown. But, unfortunately, these mental instincts are not always, as a rule, generated in conformity with the physical organization and development of the body.

I have, however, watched the growth of these two conditions of mind and body very closely, and the result of a large number of observations leads me to the conclusion that there is a common relationship between this mental endowment and the physical organization of the body which is associated with it. But I maintain that parents are often very short-sighted in these matters, and one cannot say that they are always to blame for errors of judgment in this respect; and possibly their determination that their boy shall be a soldier or a sailor, when his physical development is not equal to such a vocation, or a doctor, barrister, or clergyman, when his mind is not capable of grasping the subjects for examination, only shows that they have decided to gratify a personal wish without giving the subject due consideration in all its bearings.

Life is not so long that it may be trifled with, and the nature of the highest class of examinations for almost every profession nowadays is of such an extended nature that very few boys can afford to lose time in advanced youth, which should be spent in training their brains in the class of literature which is most likely to be of value to them in that profession or business which must form the occupation of their lives. If parents and teachers only considered these points with more care, and, when in doubt, if they consulted some physician who was capable of giving them good sound advice, based no less on the brain power than

on the bodily development and the constitution of children, I have no doubt whatever that not only would premature death in some cases be averted, but many a boy would become an ornament to society, and hand down his name to posterity on the banner of his country's fame; but I am sorry to say that training has by inadvertence led many into the paths of vice, to the drunkard's goal, or to a lunatic asylum. With a few words more about worry, I shall conclude this chapter. It is a very common saying, and certainly no less true than common, 'that worry kills.' I have seen worry kill as surely and as positively as a consumption kills; yet, to produce such disastrous effects, it must meet with a soil in which it can produce its destroying and decaying influences, and such a soil is always associated with the nervous temperament, the signs and symptoms of which have been given in detail. Now, worry may act directly upon the brain and nervous centres in two ways—namely, by producing an excess of blood in the brain on the one hand, or a deficiency of blood in the brain on the other hand. By way of example, I quote the following case of Sir Astley Cooper's, showing how mental excitement produces a determination of blood to the brain. He says:

'A young gentleman was brought to me from the North of England who had lost a portion of his skull just above the eyebrow. On examining the head, I distinctly saw the pulsations of the brain, which were regular and slow; but soon after he was agitated by some opposition to his wishes, and directly the pulsations of the brain were increased and became more violent, and more blood rushed to the brain.'

M. Broussais gives the following interesting case, showing how the brain becomes congested through emotional influences. This I copy from Dr. Hammond's very interesting and excellent work on 'Cerebral Hyperæmia':

'M. Thavernier, a captain in the French army, forty-two years of age, moderately stout but well formed, received in the middle of the Palais Royal, ninety days before his death, a letter containing bad news. Whilst perusing it, he remained motionless as if thunderstruck, and the left side of his face became paralyzed and drawn to the opposite side. He was taken to Val de Grace and attended to. At this time he had complete paralysis of the arm, thigh, and leg of the right side, and was unable to speak. After using various remedies for more than two months he began to improve, and became so much better as to be able to stand up and to speak, although with difficulty. In this state of improvement, M. Thavernier received another letter, said to be from his wife. He read it, and instantly there occurred loss of speech, general immobility, abolition of sense, and complete apoplexy. He died in three days after the attack, and on examining the head there was found engorgement of blood in the sinuses, and several abscesses were observed in the substance of the brain, and other marks of organic disease. M. Broussais considered this case to be one of chronic inflammation of the brain, induced by a moral cause.'

I merely quote this case, as I could many others, to show what a wonderful influence overstrain and shock and worry have in breaking down the soundest and most robust constitutions, and in reducing the loftiest and most noble-minded men to effeminacy and second childhood. Again, there is nothing that finds out the *weak point* in a constitution with equal surety and certainty as do worry and over mental strain. We frequently hear people say, 'Yes; it is this dreadful weather that is giving me the gout, or bronchitis, or rheumatism, or making me feel so unaccountably ill;' but they frequently overlook the fact—and a very important fact it is, too—that worry, mental anxiety, domestic trouble, and brain exhaustion, so undermine the natural and healthy tone of the body, and so weaken the vitality of individuals, that they are immediately influenced

by changes from without, as well as by changes from within the body. If the constitutional degenerative tendency of the individual be towards consumption, worry will tend to its rapid development, and so, in like manner, will worry tend to the development of cancer, kidney, and heart disease and gout.

Treatment.

Dr. Beard speaks truly when he says, 'I have seen cases by the dozen that had taken quinine and iron judiciously and faithfully given, and who were still uncured and unrelieved.'

There is, in fact, no routine plan of treatment for these cases. Each case must be studied closely and carefully by itself. I must say that this has been my own experience, and in the proof of the non-value of treatment by iron, I think we have good reason for coming to the conclusion that these exhaustions are rarely, if ever, due to a bloodless condition of the spinal cord, for, in the cases of anæmia of the spinal cord, we find that large doses of iron have the most charmingly beneficial results. All practitioners of medicine who have had these cases under their care must frequently have been perplexed at finding how utterly inefficient have been the usual nerve remedies for the cure of these cases of nervous exhaustion. There are persons who indiscriminately use the galvanic and Faradic currents to the head and to the spine without the slightest good effect whatever; and, as far as my own experience serves me, this mode of treatment has been utterly useless in nine cases out of ten. There is this much to be said for electricity—that it never fails to give great relief during its application, and, it may be, for some hours after; but the good effects soon wear off, and certainly, in many of my cases, the patients have felt worse after than before its application. My experience has been precisely similar concerning the use of the electric bath, and in no

single instance have I found this mode of applying electricity to be of the slightest permanent value in these cases.

The drugs which may be of value, in the curative treatment of nervous exhaustion, may be chosen from those which experience has selected from a long list in the Materia Medica. The chief of all these is opium. The watery extract of opium, in doses of a quarter of a grain three or four times a day, in certain cases acts like a charm; it excites and stimulates for a short time the brain-cells, and then leaves them in a state of tranquillity, which is best adapted to their nutrition and repair. It must be continued for some weeks, and it may be months, and it may be necessary to increase the dose, but a good result is sure to follow its careful administration. I say that there are cases of pure neurasthenia, simulating premonitory consumption and a thousand other ailments, which the practised physician can pick out, and say most decisively that opium will unfailingly cure. I must admit, however, that there are cases of nervous exhaustion which opium does not seem to affect. Among the other drugs which are at our command we find the following, and I give them in the order of their value, namely: arsenic, phosphorus, strychnine, the salts of bromine and iodine, the salts of zinc and iron, quinine, chloral, chloroform, ergot, maltine, grape sugar, cod-liver oil, atropine, sulphur, nitrate of silver, bichloride of mercury, and terchloride of gold.

When opium fails, in the course of three or four weeks, to produce any marked and decided effects, we ought then to have recourse to increasing doses of arsenic, phosphorus, and strychnine. I have gradually increased the dose of Fowler's solution of arsenic to ten drops, three or four times a day, and the same with the solution of strychnine, before the patients have found themselves actually benefited. In the curative treatment of nervous diseases generally, it will always be found necessary to persist in

the continued use of a drug, until some decided effects have been realized, and to gradually and cautiously increase the dose of each drug we employ. If you once submit to the caprices, and try to gratify the wishes of nervous patients, you will be changing their prescription at every visit. Now, this mode of procedure is especially harmful, both in regard to the drugs you are employing and to the patients you are treating. One great part of the treatment of neurasthenics is, to make them feel quite sure that you have the most implicit confidence in the measures which you are adopting for their cure. And it is not unfrequently the case that many drugs are discarded as valueless merely because they are not given in the proper dose, and for a sufficiently long period of time; hence it is that we find our patients resort to mesmerists and unqualified practitioners. The majority of nervous people want building up, for they are invariably below par, and the great success of our treatment will, undoubtedly, mainly depend upon how this process of building up is carried out. The physician has to bear in mind the two cardinal points in the treatment of nervous affections, namely *rest and nutrition;* still, it must be remembered that nervous patients are not, as a rule, liable to acute inflammation, yet they are peculiarly subject to bloodless and congested states of the mucous membrane or of the skin, or, in fact, of any part of the body, so that we have to consider in what way we can best equalize the action of the vaso-motor nerve-centres, and the current of the blood generally. The remedies which will be found best adapted to effect this object are digitalis, ergotine, and the bromide and iodide of potassium. These drugs may be given in small doses, and in combination with any other tonic medicines which we wish to employ. It is also at all times necessary to keep the blood alkaline, to support secretion, and to secure the due elimination of waste products by the skin, the bowels, and the kidneys.

We will now consider how rest and nutrition may be

best brought about. First, with regard to rest. This must be both bodily and mental, and the exciting cause of either mental or bodily fatigue must be sought for (and in some cases it has to be sought for with consummate tact, as it is not always apparent), and if possible removed. I say if possible, because the physician finds that, in a large number of instances, the removal of the exciting cause is not unfrequently attended with the greatest difficulty. The cause of mental anxiety and worry, which are so productive of brain disease and nervous exhaustion, is so often bound up with the mainspring of a man's existence, either from a business or domestic point of view, that I have over and over again experienced considerable trouble in bringing about its removal. Patients say to me : 'I only wish it were possible for me to carry out your wishes ; but don't you think if I do so and so I shall get better ? I really don't see how it is possible that I can do as you wish.' My answer is invariably this : 'Do the best you can to carry out my treatment, and let us be in agreement as far as we can.' In all the cases, which we are now considering, it is infinitely better that the conduct of the physician should be tentative, rather than arbitrary. A fixity and firmness of purpose is at all times imperative, but Abernethian roughness cannot be productive of anything but harm in the treatment of diseases of the nervous system. If the exciting cause has been dealt a death-blow by moral means, and by moral means alone, we invariably find that great good has been accomplished, and an important step has been taken towards effecting a cure. Then, in reference to treatment, we come to the consideration of another cause of neurasthenia, which is, as a rule, secondary to the exciting cause, namely, restlessness and want of sleep. If sleeplessness should be of itself the primary or exciting cause of nervous exhaustion, we have to consider our diagnosis with all the more care, for the reason that we have, in all probability, something

more to deal with than a mere arrest of function. 'It always becomes a matter for anxiety to me when patients say that they pass restless nights without any assignable cause. But in the case of nervous exhaustion and brain fatigue, sleeplessness is invariably secondary to mental anxiety; there can be no doubt, that the one reacts upon the other, and brings about a state of restlessness and discomfort which is truly deplorable, and, as a fact, it will be found absolutely necessary to induce sleep by one means or another. In many of these cases, it will be quite unnecessary to have recourse to opium, morphia, or chloral. I have frequently induced sleep in patients, by means of a draught of stout, or of mulled claret, or of port-wine negus, or hot beef-tea, when sedatives have been tried in vain. Many ridiculous and untrustworthy statements have been made concerning the action of the hydrate of chloral. It has been broadly stated that this drug possesses the especial property of breaking up the newly-formed blood corpuscles, and so interfering materially with the nutrition of the brain. I have no wish to dispute this statement; but the ill effects produced by the hydrate of chloral, as in like manner by opium, or even by an especial form of diet, are of degree only. I have given the hydrate of chloral, for weeks together, with the most beneficial results, and in some cases of sleeplessness a few doses have effected a cure. I maintain that all drugs are either curative or poisonous; but a dose which will cure in one case will be productive of great mischief in another, even in the same disease. If people only knew of the sad results and degenerations, both of mind and body, which arise from the indiscriminate use of medicines, especially such medicines as opium, chloral, and the like, they would hesitate and shrink from their use, unless they felt sure that they were being carefully administered.

There is a state of sleeplessness in nervous people which becomes a mere restless habit on the part of the brain.

They tell you that they awake at a given hour in the morning—it may be three, four, or five o'clock—and that they cannot get any sleep until, perhaps, it is time to get up. They also say that they have taken bromide and sedatives when they have gone to bed, but that they have derived no material benefit from their use.

I have cured many such cases as these by causing the patients to take a full dose of the hydrate of chloral, thirty grains, two or three times a week when they awake, at whatever hour, during the night. This proceeding seems to checkmate the ill habit into which the brain has fallen, and by so doing a good sleep is almost always secured after a few doses of chloral have been taken in this manner. A good night's rest is one of the most important points to be secured in the treatment of brain fatigue. Although it is so vitally important that we should pay particular attention to ensure sound and healthful sleep, still we must be mindful how necessary it is to secure ordinary bodily repose apart from sleep altogether. Restlessness is one of the essential attributes of the neurasthenic, and moral volitional self-restraint must be carefully exercised. Exercise of body, carried to actual fatigue when in health, is an aid to a night's good rest and sound sleep; but the very reverse of this is the case in nervous exhaustion, for too great exercise produces excessive fatigue of body, and irritability of brain then exists in like proportion, and sleep is completely out of the question.

We now come to the consideration of another point in the treatment of neurasthenia, and that is, as to how far travel, change of scene, change of air and so on, are necessary for this class of cases. I certainly have seen many patients (perhaps the majority of cases that I have seen) who have not only been unrelieved by travel, but who have been, in many respects, much worse for the journeys they have undertaken. I quite agree with Dr. Beard's remarks upon this question of travelling. He says :

'I have constantly under my care cases of both forms of neurasthenia, who have spent months and years abroad under advice of physicians, not only without benefit, but in some instances have been positively injured. Cases of myalesthenia especially are very liable to be made worse by the fatigue of travel, by the discomfort of absence from home, by the laborious and oftentimes wearisome and exhausting tasks of sight-seeing. Many are worn out in the picture-galleries and in mountain climbing, and must return home to rest and recover from the effects.'

However, we must bear in mind that change of air and scene and diet, if not carried to excess or to fatigue, is one of the most important aids to the cure of neurasthenia which we have at our command. I condemn entirely the present system, which is rather fashionable just now on the Continent, of herding together in a large building some four or six hundred invalids; but, like all other fashions, it will soon exhaust itself. These institutions are generally the offspring of men who have an eye to business, and there are quite sufficient of the credulous, both amongst doctors and patients, to support their existence, and their greatest charm is novelty. A lengthened sea voyage is *par excellence* the best chance of cure, in a confirmed and protracted case of neurasthenia; but I have never seen any patient who has derived much benefit from a sojourn at the seaside.

I do not wish it to be understood, by my remarks concerning these large Continental hotels, that I in any way undervalue the advantages to be derived from the invigorating and toning influence of the splendid mountain air which one finds, for instance, in the Upper Engadine. The characteristic qualities of the climate of the Upper Engadine are due to its very pure, clear, and at the same time dry atmosphere. Dr. J. Pernisch, of the Tarasp Schultz, speaks very truly of the valley of the Inn, in the following words:

'The different component parts of the climate in this region produce in their unison a strong excitement of the organism, a great facilitation of the vital functions and of the change of substance, a better formation of blood and nourishment, an improvement of the digestion and assimilation, and thereby strengthen and invigorate the functions of the nervous system.'

I can most truly say, from my large experience at the Central Sick Asylum at Highgate, that the effects of a pure, dry, bracing air, no matter how cold it may be, has a most marvellously beneficial effect upon patients suffering from nervous disease. I am attending at the present time a physician, suffering from paralysis of the lower limbs and severe exhaustion of the nervous system. He has been a great traveller, but he declares that the air of Margate contains more ozone, and is more bracing, than any place he has ever tried. Upon one occasion, whilst living in London, he was suffering greatly amongst other things from catarrh of the bladder, with all its attendant troubles and inconveniences ; and he told me that he had not been at Margate for more than a week when in this respect he quite recovered.

We will now consider one of the most important points in the treatment of nervous disease, and that refers to diet. The question, therefore, of food must be studied by us somewhat carefully. Articles of food are usually divided into two great classes, namely : 1. Heat and force producers ; 2. Flesh-formers, or non-nitrogenized compounds and nitrogenized compounds.

Heat-producing Compounds.

Sugar Starch Gum Lignin Oils and Fats	composed of	Carbon Hydrogen Oxygen

FLESH-FORMING COMPOUNDS.

Albumen Gluten Fibrin Casein Legumin	composed of	Carbon Hydrogen Nitrogen Oxygen Sulphur Phosphorus

The various parts of the human body, such as the brain, nerves, muscles, fat, bones, etc., are found by chemical analysis to consist of oxygen, carbon, hydrogen, nitrogen, phosphorus, sulphur, chlorine, fluorine, silicon, calcium potassium, sodium, magnesium, iron, manganese, and copper ; and we have all these elements presented to us in a compound form, in the following tabulated articles of diet, and the table shows pretty accurately the relative amount of flesh-formers and heat-producers, and the amount of heat-producing elements they contain for every ten parts of flesh-formers.

	Flesh-forming.	Heat-producing.
Milk	10	40
Beans	10	22
Fat mutton	10	27
Fat pork	10	30
Beef	10	17
Hare	10	2
Veal	10	1
Wheaten flour	10	44
Oatmeal	10	50
Barley	10	57
Potatoes	10	115
Rice	10	123

But as physicians and physiologists, we must not be carried away, and place too implicit a confidence in these statistics. It is no doubt a very easy matter to make an exact computation of the amount of heat and force which is generated from a lump of coal to drive a steam engine,

and if we merely take this as an example of the latent energy residing in a lump of coal, so far well and good; and we may even go farther, and say that, if a man eats rice, he will have more heat and force-producing power generated in his nervous centres than he would if he took an equivalent of beef or beans. But in dealing with an appropriate dietary for the man in health, as well as for the man in sickness, it would be absurd to follow as a rule the fact that, in consequence of fat pork yielding thirty parts of heat-producing elements to ten of flesh-forming elements, it should, on this account, be given to patients in preference to beef. The physician, if he uses the care and skill which are required of him, will take into consideration many other matters, and matters of great importance in reference, to dietary—such as the climate, the season of the year, and more particularly the nervous constitution of the patient. Again, the physician who treats the dyspepsia of the neurasthenic in the same way that he would the gouty and the purely dyspeptic, will, judging from my own experience, fail in doing the patient any good. The truth of this observation is fully borne out in a large number of epileptic nervous people. These patients frequently consult me, complaining of the most severe forms of flatulent dyspepsia, so that they say they cannot take food without the most distressing symptoms of dyspepsia resulting. They are suddenly, and without any apparent warning, distended with wind, so that they can scarcely breathe, and this flatulent, uncomfortable condition usually subsides as suddenly as it makes its appearance. This is unquestionably a nervous dyspepsia, and all the pepsine and ordinary dyspeptic remedies will be of no avail in relieving the patient; but a full dose of chloroform, opium, and bromide of potassium will frequently prove of immediate benefit. I have had patients consult me on account of flatulent dyspepsia, which is frequently the result of over-anxiety and worry, who have been dieted, with

the most scrupulous and punctilious zeal, without getting in the least way better; I have fed such patients every hour in the day, without paying any heed to the kind of food taken, and in a week they have been perfectly cured. The end justifies the means adopted in nine cases out of ten of nervous dyspepsia; and in such cases I am led to the conclusion that it matters little what kind of animal or farinaceous food be given, so that it be pure in quality, and given to the patient every one or two hours during the day. In nervous dyspepsia, vegetables should be rarely given. The diet for the nervous and neurasthenic should as a rule be chosen from the following:

Soups.—White, barley, à la julienne, macaroni, milk, rice, sago, semolina, vermicelli, calf's-head, oyster.

Fish.—Eels, flounders, mullet, oysters, soles, brill, whiting, smelts, fresh cod.

Meat.—Mutton in any form, beef, lamb, calf's-head, sheep's-head, ox-tails, sweetbread, bacon.

Poultry and Game.—Fowl, pigeons, turkey, pheasant, partridge, etc.

Vegetables.—Asparagus, spinach, seakale, French beans, broccoli, beetroot, stewed celery, Spanish onions, tomatoes, watercress, lettuce.

Wines.—Amontillado, Manzanilla, Latour Carnet, Château Lafitte.

Eggs.—Boiled, poached, raw, yolk, white of.

Sweets.—Farinaceous milk puddings, milk, fruit, and most kinds of jellies.

I do not wish it to be inferred that no other diet should be taken but that here stated, because everyone must be acquainted with the fact that, as cases differ in type and degree, so will they require exceptional forms of diet. I have (and I feel quite sure upon this point) cured many cases of nervous exhaustion, in the main by diet. For instance, in those patients where the circulation is slow

and the extremities cold, great benefit will be found by the administration of sugar, commencing with one ounce of white sugar, and increasing this quantity until the patient takes as much as six or eight ounces three times a day. Milk is a very valuable article of diet, and it may be taken in the form of Koumiss. Milk is much more digestible if it be kept in a warm place until it becomes faintly sour, and it is in this condition that I frequently recommend my patients to take it. Milk is the most perfect food, in itself, that we can find in nature. It is, of course, the natural food for the young, and many mothers are really responsible for the defective organization of their children through feeding them improperly and injudiciously. Children and young people, judging from the amount of work which their brains are expected to perform in these days, should be fed very much better than they really are fed, even at many of the better-class schools; and if care be not taken, this want of deficient feeding will soon make itself evident in brain exhaustion and weak physical development. Can anything be more absurdly ridiculous than to expect the amount of brain power which I presume (judging from the curriculum) is expected from these half-fed and improperly-fed children of London, who are compelled by law to attend these Board schools, and to cram, as it is called, their brains full of knowledge to pass examinations? Why, the result will be that one-half of them will die prematurely from nervous exhaustion, either in the form of scrofula or consumption. Every child before the age of ten should partake of four meals a day, and drink at least a pint of milk in the twenty-four hours. The dietary should be mixed, and it should vary according to the season of the year: fresh vegetables and fruit, both cooked and uncooked, should always be given in due proportion. The building-up of a child's brain and constitution, generally before the age of fifteen years, is of the most serious and vital importance, and I may safely say

that in no other period of life is it in any degree so important as in this. It is quite true that some children require much more careful feeding than others. There are very few young and growing people whose health remains good if they do not take at least four meals during the day. With my own boys, if their health begins to fail, and they suddenly change colour and rapidly become tired, I alter the condition of things, in a few days, by feeding them freely with eggs and good strong beef-tea. I need scarcely say that wines and fermented liquors should never be given to children. Fish, and especially shell-fish, certainly seems to possess the material which is necessary to reinvigorate the nervous centres in many forms of brain exhaustion, and oysters may be mentioned as possessing this power to a great degree; and it is very possible, that the amount of phosphorus contained in shell-fish may, in a measure, account for their value in this respect.

I sometimes prescribe, and with great advantage, cod-liver oil for my younger patients who are suffering from brain exhaustion. We have before alluded to the fact that everything must be done to remove the cause of brain exhaustion, and in young children this is of the utmost importance; and it is frequently accomplished by a complete change of life, carried out at an early period of the disease. Cases of brain exhaustion in young boys of a highly sensitive nature have come under my notice, and this, upon investigation, was found to be due, not to overwork, but to a system of bullying on the part of the elder boys towards some of the younger, and which constantly worried them, as they were in constant dread of some unjustifiable thrashing. There is another point of some importance for our consideration, and that is this: How far are we justified in advising our nervous patients to take alcohol? It must be remembered that we are dealing with a class of people whose resisting power is of the lowest order—who are liable at any moment to give way to any

idea which is uppermost in their vacillating minds, and to gratify every passion without the power to exercise self-restraint, as we have seen to be the peculiar characteristics of brain exhaustion; and we can readily understand how tempting a glass of champagne or brandy must be to the man who does not *feel himself* until he has taken some kind of stimulant. It is very fortunate that the excessive use of alcohol cannot be borne by many neurasthenics; it either gives them intense headache or increases some of their morbid symptoms. There are others, however, who have been advised, either by their medical attendant or by their friends, to take wine or spirits, and they have suddenly become habitual drunkards. For my own part, I am inclined to the belief that dipsomania is more frequently the result than the cause of nervous exhaustion.

Dr. Beard, of New York, in a pamphlet on 'Nervous Exhaustion as a Cause of Inebriety,' makes the following statement, which so thoroughly accords with my own experience that I give it verbatim:

'It is a fact, which my professional experience satisfactorily confirms, that alcoholic liquors have not only a relieving but a curative effect in the different forms of nervous exhaustion. After all other remedies have failed or lost their powers, alcoholic liquors will sometimes produce satisfactory sleep, relieve depression and debility, bringing about those agreeable results without any apparent evil accompaniments, except danger of this one terrible evil—inebriety; but when inebriety is contracted, then any number of physical evils may follow, the liver and brain may be diseased, and life shortened. Physicians and patients both observe this delightful action of alcohol in the treatment of neurasthenia, and without proper caution on the part of one or the other, one is tempted to use very strong liquors in excessive amounts, just as they would use the quinines or the bromides. Then, again, there are some—and these cases are very interesting indeed—who, so to speak, leap with a single bound into inebriety; without

any advice of their physician, without consideration, and of themselves without reflection, they rush to alcohol for relief, and become inebriates at once with all its symptoms, just as one breaks out with chills and fevers.'

I frequently feel desirous to advise my patients who are suffering from nervous exhaustion and sleeplessness to take stimulants to relieve them of melancholy, to assist digestion, to quicken their circulation, or to procure natural sleep ; but experience has taught me that such a proceeding may be attended with the most dangerous results. I am happy to say that I have less hesitation now than I formerly had of recommending my neurasthenic patients to take stimulants, because practice and observation have proved to me pretty conclusively in what cases I may recommend it with the greatest advantage, and in what cases its administration may be followed by a craving for drink. That many cases of neurasthenia are not only relieved, but absolutely cured, by the judicious administration of wine, is an unquestionable fact.

Exercise.—A due amount of muscular outdoor exercise is essential, and in fact absolutely necessary, to the neurasthenic ; but it must be taken with extreme caution. The man suffering from nervous exhaustion will say that one day he feels able to do anything or walk any distance, and on the following day he is not equal to anything, and the least exertion rapidly exhausts him. This condition of things is quite true of commencing exhaustion of the spinal cord ; but if, on the other hand, the exhaustion has been allowed to continue for some months, or even years, we then find a different state of things to exist, and more particularly so if the brain participates in the exhaustion. When we have a protracted exhaustion of the whole nervous system, the patient seems more or less unconscious of his weakness, and, until he makes the effort to walk or to run, or in fact to accomplish anything which requires a

definite amount of energy, he imagines that he has sufficient power to fulfil anything which he may try to accomplish; but he suddenly breaks down, and finds that he is unable to do what, in his own weakened mind, he thought that he could do without any difficulty. Far different and more hopeful, however, is the case when we know that the patient imagines that he is *unable* to accomplish anything that he may try to do, but which, when he tries, he can do with the greatest possible ease. Yet these are merely phases of the same disease, and differ only in reference to the degree of the disease which we are now considering—namely, nervous exhaustion. We have, therefore, to think over what should be the kind of exercise taken, and at what hour of the day it should be taken, and how much should be taken. It would be unwise to ask a neurasthenic to put on his hat and take a seven miles blow, at the same time cheering him up, and saying, 'It will do you good, old fellow.' The advice of such a friend might be given with the best intention, but it would inevitably, if acted upon, be attended with the most serious consequences—namely, undue *fatigue*, which we have particularly to guard against. In health, *fatigue* is the natural consequence of some accomplished muscular or mental work which calls upon the store of our latent forces, and in health this store is readily and easily replenished.

In nervous exhaustion, however, *fatigue* means that such a demand has been made upon the already inefficient reserve forces that they cannot be well repaired, and nervous exhaustion is thus increased. I have seen patients suffering from nervous exhaustion who, from the bad advice given to them by their friends, had what they called *tried to exert themselves*, and with the result that they perspired profusely; their limbs were in a state of tremor and agitation; they suddenly became so tired and stiff that they could scarcely put one limb before the other; or even raise a glass to their mouths; and yet they were

unable to rest, or remain in one posture, on account of the irritability which this *fatigue* engendered ; and when they tried to go to sleep, the frequent startings in the lower limbs would rouse them, and prevent them from doing so. I would give the following general advice to the neurasthenic : Don't rise until eight o'clock in the morning ; take your bath just tepid ; after this envelop yourself in a sheet which has been wrung out of cold water, and recline with it around you until it is of the temperature of your body ; and then remove it, rub your body carefully and thoroughly with a rough coarse towel until it be dry and warm. After this, dress quickly and take breakfast with fish, or a well-cooked chop or rump steak. Avoid taking too much fluid—a breakfast-cup filled with half coffee and half milk will be quite sufficient ; dry toast at breakfast is to be preferred to ordinary bread ; above all things, do not eat too freely or too hurriedly—let your food be well masticated before it is swallowed. For half an hour after breakfast read the paper, or attend to any little correspondence which may be necessary, but avoid being too deeply interested either in politics or money matters. Then stroll gently in the open air for an hour, or even more, but never give yourself a set task to walk from one given point to another ; gentle horse exercise is much to be preferred to walking. At eleven o'clock take a glass of dry sherry and a biscuit, or a new-laid egg beaten up with a glass of port wine, and after this sit or stroll in the open air, if the weather permit, until luncheon. For luncheon, at half-past one, take oysters three or four times a week if they are in season ; upon other days take a basin of really good soup, which should be followed by a cut of mutton or beef from the joint. Do not take much exercise immediately after a meal. On the contrary, rest in a recumbent posture for an hour. You may drink, at your luncheon, a wineglass of whisky with a bottle of Apollinaris water. At four o'clock a small cup of immediate tea may be taken with some dry

biscuits—avoid the sweet tempting cakes which are now so freely supplied with this meal—and after this either walking, riding, or carriage exercise commensurate with your strength. You may dine at seven p.m., but before dining I would advise the use of the Turkish bath once a week, and at other times a tepid sponging will be found extremely refreshing. The dinner should never consist of more than four courses—namely, soup, fish, joint, and game. Never mix your wines, but vary them every three or four days, sometimes taking a dry champagne, at other times a good well-seasoned sound burgundy; always limit the quantity to two or three glasses. Sleep on a hard bed, and let the bedclothes over the body be light and comfortable; the feet and legs should be kept warm, and well covered during sleep. The bedroom should face the south-west, and the bed should be so placed that the head is to the north and the feet to the south. Before getting into bed, the body, and especially the spine, should be well rubbed with a dry coarse towel. There is another simple, but very important, matter to be attended to. Avoid all draughts of cold air, and have your under-linen thoroughly aired; always see that your bedroom window is closed by three o'clock in the afternoon in the winter, and seven o'clock in the summer, and be sure that your bedroom wall-paper does not contain arsenic. Let your house be in an elevated position, built upon a gravel or loam soil, and, if possible, with cheerful views and a good supply of water. The rooms, especially those which are lighted with gas, must be lofty and well ventilated. Your wearing apparel must be of woollen material next the skin, and your boots thoroughly water-tight. I have not gone so minutely into these details as I could wish; but every detail, let it be ever so small, is of the utmost importance in the curative treatment of nervous exhaustion.

THE EXHAUSTION OF INFLUENZA.

ONE is never astonished or surprised nowadays to hear a very large number of people complain of the exhaustive effects of the influenza.

It is just possible that many ailments are attributed to this disease wrongfully. Yet, as we yearly become more familiar with its results, there is little room for doubt that they are very widespread and productive of grave distress. Patients tell us that they cannot sleep, that they become depressed and despondent, that they are rarely free from pain, and that they fail in energy, and get done up in a manner quite unaccountable, and, in fact, quite unknown to them before.

The brain worker will remark that his memory has become defective, and that he fails in concentration of his powers of ideation.

The neurotic will make all sorts of vague complaints, far too numerous to mention, painful neuralgias being very frequent.

Sometimes we find positive mental derangements leading to suicide.

The most general trouble is failure of the heart's action, and an unaccountable sense of weariness and fatigue, and a feeling of incompetency and inadequacy to the fulfilment of the ordinary duties of life. I shall attempt to analyze these conditions, in order that we may the better comprehend their true meaning and significance and cure.

Every physician is fully alive to the dangerous results

associated with and following all the acute infective diseases when they expend their specific influence upon the central nervous system, and in particular upon the respiratory and cardiac centres in the medulla oblongata. But in speaking of the mental and moral, no less than the physical, changes which are too frequently the outcome of an attack of influenza, we can only conclude that there is undoubtedly in this disease a determining cause at work, which exerts itself in a very large number of cases upon the nervous system of the individual infected by this malady, in a way and after a manner peculiarly its own.

In former epidemics of influenza, as recognised at those times, the symptoms were for the most part of a catarrhal nature, and clearly traceable to some derangement and irritability of function of the trigeminus and pneumogastric nerves, affecting principally their secretory and trophic divisions, as evidenced by *sneezing*, increased secretion of *tears*, *deafness*, and noises in the ears, increased nasal secretion, dryness of mouth and impairment of taste and smell, harshness of voice and hoarseness, bronchial, pulmonary and cardiac symptoms; but the changes in the circulation and the exact degrees of increase in temperature were scarcely defined with the same precision and exactitude that they are at the present time, although it must not be forgotten that Graves and other distinguished physicians referred the pulmonary and bronchial symptoms of grippe to lesions of the nervous system, and if we are now still unable to treat this disease in a more specific and direct manner than hitherto, we certainly can from accumulation of knowledge differentiate the etiology of clinical phenomena upon a more scientific and rational basis, and I think it highly probable that this advancement in knowledge has led many to the conclusion that influenza as we now see it is of a different character to what it was formerly. In a general way we are perfectly justified in speaking of the *virulence* of epidemics, and although we

are ignorant of the prime specific agent which causes those changes known as influenza, we can but admit the possibility—nay, even the probability—that the poison of this disease is allied in some way to that of cholera and malignant fevers.

Our knowledge relative to influenza is increasing day by day, but up to the present time its wizard-like action upon the system generally, and its want of uniformity, have given rise to wide and various opinions concerning its onset, its nature, its progress, and its decline. There does, however, appear to be a growing consensus of opinion that it is an acute specific and infective disease, pandemic and miasmatic, and that the cerebral, cardiac, and other symptoms are very largely due to the presence in the blood and lymph of the products of bacteria. These products, or toxines, of course vary in the virulence of their action in different individuals, according to the toxicidal powers of the cells and fluids of the body. M. Metschnikoff, from his investigations, states that the destruction of morbific microbes may be due to the liberation of bactericidal substances into the serum, consequent upon the breaking down of leucocytes, but the consideration of these questions is foreign to this article. There are some points of interest of a general character which must be referred to in passing, inasmuch as it is my opinion that many of the distressing and disastrous effects following influenza are really due to its inefficient management, and sometimes to its too meddlesome treatment. I am quite sure that in uncomplicated, and even so-called complicated cases, the administration of drugs should be carried out with extreme caution. They should certainly not be given carelessly. Drugs which are useful under ordinary conditions to relieve pain, spasms, and congestion seem to be absolutely innocuous in certain cases of influenza, and even mild aperients will sometimes give rise to violent tenesmus and dysenteric diarrhœa. There is no law for

treatment other than warmth, rest, and a fairly generous diet, with good nursing. Strong mustard foot-baths at night relieve depression and help to ensure sleep, and turpentine stupes are efficacious.

A lady patient of mine, of a weakly constitution and highly nervous organization, in whom the catarrhal symptoms were well marked, with persistent, profuse, and continuous overflow of tears, was suddenly seized with the most violent vomiting. I ordered her to take half a grain of morphia, to be repeated in three hours if the vomiting continued, when by some mistake the two powders were given at once. She slept soundly for ten hours, and awoke really comparatively well, with complete subsidence of catarrh. Doubtless the vomiting in this case was due to an irritable and unstable state of the medulla oblongata. I was so pleased with the good effects of the morphia that I have invariably given it in full doses when from the symptoms I have been led to believe that the central nervous system was chiefly at fault, and even in cases of cardiac and respiratory failure I have not hesitated to administer this drug freely, and with the most excellent results. As a rule, patients, when getting convalescent from influenza, are in no hurry to get about too soon. This is fortunate in reference to their future welfare. In my experience, even in ordinary cases, patients should live in a warm atmosphere, clothe warm, and rest as much as possible for a full month, dating from the commencement of the symptoms. By this means immunity from future visitations is best secured, and many troublesome nervous affections are throttled in their birth or obliterated in their conception.

We are inclined to admit that this influenza is essentially a nervous form of fever, sometimes attacking the centres of all the levels of the nervous system, at other times confining its interest to one level only. Thus we may have the encephalic form, the catarrhal or respiratory

form, and the gastro-intestinal or abdominal form, just according to the level of the nervous system specially invaded by the toxine, and not unfrequently each level may be attacked in succession at varying intervals in the same individual. By this I mean that the primary symptoms may be essentially encephalic, lasting sometimes for three days; secondly, laryngo-tracheal, affecting also the respiration, as well as the heart and circulation; and, thirdly, abdominal symptoms may follow, and be alone present.

I am not quite clear as to the precise meaning of the term nervous fever, if it is not a fever, a rise of temperature, due to some depressing action (exhaustive or inhibitory) upon certain nervous centres (thermotaxic, thermogenetic, or thermolytic), rather than the liberation of heat energy from chemical change in the blood and tissues of the body, and particularly in the chemico-vital processes that are going on in the muscles. The nervous influences concerned in the development of heat are at all times of interest, but this is particularly the case in influenza. The sudden rise and short duration of fever heat is one of its marked features, and is fairly good evidence that, whatever may be the nature of the infective material, it does not greatly influence the 'thermogenic tonus,' or the healthy equilibrium existing between heat production and heat loss, neither does it apparently involve marked changes in the 'thermogenic' stuff of the tissues. Heat production, dissipation, and distribution are essentially under the control of the nervous system, and we may fairly conclude that in influenza the changes of temperature are rather due to the influence of the toxine upon the vaso-motor and trophic centres in association with vascular changes, than to the chemical effects accompanying increased molecular activity of muscular and other tissues. Thus my experience leads me to the conclusion that during the fever stage of influenza, tissue waste is not notably increased, neither are

morbid products formed to the same extent as in the fever accompanying the exanthemata, although the temperature may be equally high.

It may be asked, Why does influenza attack one level of the nervous system whilst it leaves others comparatively alone? The answer to this question is evident. Influenza seems to do its work, which is essentially destructive, in the most matter-of-fact way, and, like other forms of energy, travels in lines of least resistance, the least resistant being naturally the weakest, the strained, and the enervated. It certainly does its best to maintain the survival of the fittest, not only amongst men, but amongst the organs and tissues of men; in other words, the toxine of influenza has the special faculty of picking out and exercising its presence for evil upon the weakest part of the individual coming under its influence, let that be an overstrained brain and nervous system, a weakened state of the lungs or respiratory system, or a weak heart and circulatory system. A patient under my care, about forty years of age, suffering from glycosuria, actively employed, and in moderate health, was seized with influenza, and died comatose in forty-eight hours. I merely mention this case to demonstrate how rapidly the toxic action of this disease may spread, even to absolute dissolution in one whose constitution was weakened, exhausted, and non-resistant. Again, in the aged, we see how readily this disease does its fatal work by its exhaustive effects upon the medulla oblongata, and usually signalized by heart failure and sudden death. Such cases are coming under notice daily.

In fact, the more we know of influenza, the more complex and the more subtle does it appear. We have no other disease like it, for it subjects the organism to some special and peculiar change, requiring for its readjustment unusual processes of treatment.

It is evident that the inmost elements of the organization are lowered in energy and depressed by causes which

hinder function rather than exhaust by excess of function, and the fire of life is choked out or starved out rather than burnt out.

At one time it was thought that young children were exempt, but during the present epidemic they have suffered severely. Nothing is more certain than the fact that epidemics vary in symptoms and manifestations. For instance, last summer they were chiefly catarrhal, but during the present winter the attacks have been remarkably evidenced by sore-throat, harsh dry spasmodic tracheal and bronchial cough, and the usual derangements of the medullary nerves and the circulation, with extreme depression, prostration, failure of nerve power, and sleeplessness. One would think that in a disease like influenza, whose onset is sudden, and the attendant fever of limited and short duration, the powers of recuperation would be rapid and decisive. In a way this is the case, for upon the third day, with the usual subsidence of temperature, there may be, and there frequently is, a departure of all the more severe symptoms, and the patient to his cost declares himself well and makes an attempt to follow his occupation. Vain and delusive is this transitory period of restoration, for within twenty-four hours his troubles return in an exaggerated form, and the cure is greatly retarded, with possibly some risk to life. Here we have again evidence of the vagrancy of this latter-day plague.

Ordinary cases of influenza, unaccompanied or not by local congestions, are invariably attended with pronounced nervous symptoms, which, as before stated, are referable rather to the nervous centres than to the nerves themselves. The centres lose their ordinary power of control, and neuro-pareses are the result. Headache and neuro-muscular pains, varying and variable in intensity and extent, from the crown of the head to the soles of the feet, are indeed usual and ordinary accompaniments. With this brief and very incomplete outline of the more common characteristics

of influenza, I must now draw attention to its *exhaustive action* upon the nervous centres and the nerves (psychical and physical), and the failures in function which result therefrom; but for clearness of comprehension it may be as well if we take a superficial glance at the nervous system, and survey it in relation to its most simple workings.

The component parts of the nervous system entering into the formation of the prime reflex nervous arcs may be called, for the sake of classification and easy definition, *central*, *peripheral*, and *intermediate*. The central parts, or *centres*, are in constant communication with the *peripheral* parts or the sensificatory organs, through the mediation of the *intermediate* parts or *nerves*, which are merely channels for the conveyance of *stimuli* or *energy* created either in the nervous *centres* or in the *peripheral sense organs*. So that we have, in reference to *exhaustion* (which is not always an appropriate word), to consider where in the nervous arc the defect exists. Does it exist in the centres which give rise to the formation of energy, or in the channels for its transmission when formed? Or is the centre so *controlled* or *inhibited* or *blocked* by *superior* centres that it is not permitted to exercise its own will to liberate the energy which it has at its disposal. The nervous system is the *originator*, the *regulator*, and *controller* of bodily activities. The human body is traversed in every direction by streams of energy, not only attacking and overcoming resistances, but continuously and constantly undergoing transformation. We have every reason to conclude that the vital energies are the most delicate and attenuated of all the known forces. The nervous system appears marvellously complex when we remember that, although every centre has its own special part to play in the human economy—it may be to drive the heart or retard its action, to maintain respiration, to check or accelerate the flow of blood to a part, to build up or destroy every form of tissue by the arrangement

or disarrangement of atomic groupings—yet that this or that special centre can only exist to perform its work in the presence of another centre whose sphere of activity is in antagonism to its own. This antagonistic duality in the vast variety of human activities is being recognised as an indisputable law, and any disturbance of the normal balance between these normally opposing forces leads to the championship of the one centre over its defeated (*exhausted*) opponent. However, we must remember that in the *healthy action* of life function a state of balance of power is essential. There is no such thing as anarchy or oppression, and our defeated centre can appeal to and obtain redress from a superior centre by means of induction, and, if need be, obtain compensation from its victorious antagonist. This dependency or subjection in the hierarchy of the nervous centres, as also the well-known antagonistic action of centres, maintaining gravity, balance, and equilibrium, are phenomena most intimately associated with vitality itself, life being the sum-total of an infinite variety of factors. Irritant action is everywhere manifest in developing the energy of function, therefore antagonism is the agent for the development of energy. May not life be maintained and supported, and energy created, by an increasing warfare between functions? This is a doctrine with which the name of Sir William Groves is notably associated, and which was so ably exemplified by him in his address upon the subject at the Royal Institution two or three years ago.

'All thinkers have had to note the existence of continual war throughout creation; death and life, good and evil, charity and malignity, are illustrations of it. Race has been observed battling with and trampling down race. The ravages of fire, the fury of floods, the angry strife of evils, have been marked and deplored by numberless generations of moralists. Darwin traced its invincible and indispensable utility in compelling organized vitality

to ascend through an infinity of stages from imperfection towards perfection. In its *ordinary* character it preserves the current of being in happy and healthy action ; it secures the regular beating of the human pulse, as well as the pulse of the universe. The sense of tranquil comfort, when the physical functions perform their duties accurately and fully, arises from the balanced struggles of opposing forces, *and not from the unchallenged despotism of one.* Antagonism is a law above and beyond gravitation. It holds the stars in their course ; it is that which gives the sensational novel its charm ; it is the secret of the fascination of party controversies. Light, heat, and motion all illustrate its activity. Health exemplifies it, just as disease exemplifies its absence.'

We leave antagonism for the moment to consider the nervous system from the hierarchy and control point of view. The elaboration, complexity, and competency of the nervous system of man takes precedence over that of any other living creature, and it might be looked upon as a consummation of progressive development and elaboration by successive stages from the primitive lump of *excitable* and *contractile* protoplasm as we find it in the amœba. Milton held similar views to these. Raphael, discoursing with Adam, teaches that the *principle* of life and power of the *intellect* develop themselves more and more on an ascending scale from the humblest organized sentient being to the highest spiritual order of creation.

'One Almighty is, from whom
All things *proceed* and up to Him *return*.'

In man we distinguish two sets of centres—namely, those of the brain (voluntary), and those of the spinal cord (reflex). The brain centres, however, frequently act by habit and acquirement automatically. It is questionable if there be an automatic level of nerve centres.

Dr. Waller, in speaking of the general plan of the nervous

system, gives the following paragraph, which conveys in a ready manner some idea of the office of the nervous centres:

'A familiar comparison may help to bring home to some minds a clearer picture of the relation which subsists between brain and spinal shares in the government of the body, and lead to a rational conception of the relative significance of the terms voluntary and reflex. An ordinary business enterprise, a factory, a political party, an army—in short, any body of men gathered together under leadership—is like the collection of *cells* forming the animal body, led and controlled by certain individuals whom we may call *centres*, and characterize as "master centres" and as "foreman centres." The function of a *master centre* in a body, as in a business, is mainly that of *administration*, to initiate proceedings, the detailed supervision of which is delegated to and carried out by *foreman centres*, to actually take part in supervision only of novel proceedings, or proceedings which go awry. The function of a *foreman centre* is mainly that of immediate supervision: to execute instructions received from the *master centre;* to issue instructions in matters of routine without reference to headquarters, but to inform and take instructions from the *master centre* as emergencies arise.'

This is a true picture of the relations between the cortex of the brain, the bulb, and spinal cord, as far as we know or can conceive them. The spinal cord is credited with eleven centres, whilst the bulb is credited with fifteen centres, and the brain has its own centres or areas for sensation, for motion, for speech, for the special senses, and, as the phrenologists would have us believe, for the attributes of mind and character.

From what has just been stated, it is evident that the *highest* centres alone have to do with conscious and purposive and preconceived action (volition). The *lowest* centres are for the most part concerned with unconscious

acts, and are essentially reflex, so that from the lowest and most subordinate centre, to the most supreme and ruling centre, we have a succession of centres advancing in grade and rank, importance, power, governance, and control. Whatever may be said for or against the bulb of the spinal cord as the seat of a number of centres of somewhat doubtful existence, we cannot conceal from ourselves the fact that the medulla spinalis (bulb) is immediately concerned in the performance of those important functions which are absolutely essential to life, such as respiration and regulation of the heart and vessels, and which, to say the least of it, can act independently of the more supreme and cortical centres, so intimately bound up with volition and the functioning of the mind. It is quite probable that some centres act by association, for when one centre fails to act by default, it unquestionably receives some assistance from its associates, so that we have reciprocity of action. The physiological student of the nervous system, as far as investigations go, has certainly not done much to unravel its mysteries beyond the discovery of phenomena of the simplest kind, in relation particularly to motor and special sense areas; he may use all the latest discoveries in science, and he finds the central nervous system to consist of nothing but cells and processes, endowed with great sensitiveness and activity, receiving messages by afferent stimuli, and transmitting energy or stimulus by efferent nerves to muscular and vascular systems.

Reflex action, and action by induction, is the key to the physiology of the central nervous system, and shows us conclusively that it is almost illimitable and incomprehensible, and that its activity may be influenced by events occurring in any other part of the system, and at any distance from a centre. There is nothing more certain about the function of the cerebral organism than that the centripetal sensory nerves are the keys which wind up the

mechanism connected with the muscles and excite the latter to action. Every action of the nervous system, from the lowest and simplest to the highest and most complex, consists of four parts—namely, the ingoing current, the discharge, and the outgoing current, with other subsidiary currents communicating between superior and inferior centres. Dr. Mercier claims the credit of being the first to put forward the existence of a double current of energy. He says:

'There is in the body a double circulation of nerve energy, just as there is a double circulation of the blood. From the heart to the body at large, and from the body at large back to the heart, flows the greater or systemic circulation, and from the heart to the lungs, and from the lungs back to the heart, flows the minor or pulmonary circulation. Similarly from the sense organs and the skin to the brain, and from the brain back to the muscles, flows the greater circulation of nerve energy, by which the movements of the body are adapted to circumstances in the outside world, and from the viscera and body at large to the brain, and from the brain back to the viscera and other organs, flows the lesser circulation, by which activity of function is adapted to bodily needs.'

This theory is, in a measure, supported by the recognised anatomy and physiology of the pyramidal cell of the cortex, and the multipolar cells of the spinal cord, namely, that these nerve cells have, firstly, in the dendritic expansion and the cell body an apparatus for the reception of currents; secondly, an apparatus for the transmission of currents in the prolongation of the axis cylinder; and, thirdly, an apparatus for a partition or distribution in the terminal nervous ramifications, and, according to Ramon Y Cajal, there is an increased diffusion of currents as the more central organs are reached. Beyond this, however, we have to reckon with fact rather than with assumption, for recent histological investigations have shown that the

outgoing or pyramidal axis cylinder process ends in an arborescence, which merely comes in contact with the spinal cell, or interlaces with its dendritic or protoplasmic processes, so that the relationship is rather that of contiguity than continuity ; and, indeed, from the clinical side it would appear that this is no mere conjecture, for death of the cortical pyramidal cell in the cord area of the brain entails the death of its axis cylinder process, and the utter annihilation of voluntary muscular control, for the reason that the transmission of impulses to the spinal cell is abolished, and this degeneration, as a rule, ceases at the arborescence of the pyramidal axis cylinder, and leaves the spinal cell with its neural processes free from change. On the other hand, as is well known, destruction of the spinal cell not only entails the death of its axis cylinder prolongation, but also that of the muscular fibre to which it is distributed. Independent, however, of these recognised conditions, I am still of opinion that Dr. Mercier's theory has a certain element of truth, but our present knowledge of such matters does not warrant the acceptance of this doctrine beyond the region of hypothesis.

I know of nothing so overwhelmingly interesting as a conception of the multitude and vastness of the reflex activities which are going on in the human body, all, of course, the result of the liberation of energy formed by and stored up in the great centres and ganglia of the nervous system. Nerve cells are for the most part in a state of continuous activity, which in a measure seems to lead to the conclusion that their activity is of a dual nature —first, in reference to that which is induced and excited by stimulation, and, secondly, that which is continuous and the subject of control ; this conception of continuous activity *from the sensory side* is evidenced by some neuralgias. The phenomena of central neuralgia show that the sensory cells can evolve nerve force without stimulation, because the pain may continue after the nerves are divided, and on the

motor side there is evidence of continuous activity by the constancy of *muscular tone*, and, as the so-called thought-readers have shown us, in the normal condition of a muscle there is almost perpetual movement. The hand seems to us quite steady, but the alert and sensitively-excited thought-reader detects vibrations, from the variations in which he gains information as to the state of the emotions. When the nervous system is *depressed* or *fatigued*, the rhythmic movements of the muscles become more obvious. Dr. Alex. Hill writes of the cerebro-spinal axis being worked upon the block system, one impulse restraining, or diminishing, or inhibiting another. He states :

'The nervous molecules are never still ; activity in any part affects the movements in all the rest ; the passage of one set of impulses is accompanied by the blocking of neighbouring routes.'

We can fairly accept any number of lesser systems as being associated with, and contributing to, the nervous system of Man.

Dr. Hill gives the following case as an instance of the blocking system, or blocking action, of the brain :

'It happened to me once at the seaside to see a girl who was bathing, and had wandered some fifty yards from the shore on to a sandbank, overtaken by the tide. The water was too deep for her to walk, it filled her chest, and before anyone realized that she was in difficulties, she was floating insensible, face downwards. Her father had been bathing with her, but had already entered his machine. He ran down the steps, and, holding his towel in front of him, shrieked to the people on the beach to save his child ; but although a good swimmer—although, as he told me afterwards, he loved his only child so dearly that he could not have lived had she been drowned—he made no effort to rescue her. Why not? Because he had taken off his

bathing drawers. The sentiment of modesty in this man —a clergyman—was so strong that it blocked the most urgent impulses to movement, backed as they were by parental love.'

Shock, as in railway accidents, etc., is often the cause of a blocking action of the brain, giving rise to contractures and such-like muscular deformities, which are really inexplicable by any other mode of reasoning, and are too frequently assigned to malingering or to hysteria. In hypnotism or the hypnotic state, we find that the most supreme centres of the brain cortex are cut off from the lower cortical centres, and from lower centres still which are associated chiefly with motion and sensation. By this means volitional control is in great part blocked or held in abeyance, with the result that the sensori-motor processes are quickened and greatly increased in activity. We have before taken notice of this law, which seems to obtain throughout the central nervous system. '*The higher controls the lower, and uncontrolled the lower passes into a state of increased action.*' Now, what do we find in the somnambulistic stage of hypnotism? The senses are not merely awake, but quickened to an extraordinary degree. Subjects feel the cold produced by breathing from the mouth at the distance of several yards; vision may be doubled in range and sharpness; smell may be developed, so that the subject is able to discover by its aid the fragments of a visiting-card which had been given to the subject to smell before it was torn up; hearing is so acute that a conversation carried on beneath the floor below may be overheard; and memory sometimes displays hyper-excitability. This merely illustrates a phase of hypnotism, where the faculties are exalted and where volition is suspended.

This *will-blockage* is well illustrated by the following example: A puritanical old lady, to whom dancing was an abomination, when under the influence of hypnotism,

was sent capering about the room, by playing a real tune upon a piano and telling her to join in the dance.

The following anecdote is interesting, as it seems to illustrate the blockage possibly through funk and auto-suggestion of the supreme brain centres, as well as those of sensation and motion. A French soldier was known to pass a whole night on the field of battle, afraid to move lest he should bleed to death, believing that the lower part of his body had been shot away. He was found standing in a hole made by a cannon-ball, which had simply passed under him, carrying away the earth in its progress. The awful conviction that the shot had cut him in two was so real that, to all intents and purposes, as far as he himself was concerned, he was only half a man, so long as the suggestion lasted.

The late Dr. Braid of Manchester, who certainly knew as much of the physiology of the hypnotic state as we do now, writes as follows *on the physiology of fascination* (Mono-ideology), having a most direct bearing on blockage and inhibition of supreme centres in reference to volition :

'The law upon which these phenomena are to be explained has long been familiar to me, from observations made during my investigations of hypnotic and mesmeric phenomena, and it is simply this : That when the attention of man or animal is deeply engrossed or absorbed by a given idea associated with movement, a current of *nerve force* is sent into the muscles, which produces a corresponding motion, not only without any corresponding effort of volition, but even in opposition to volition in many instances, and hence they seem to be *irresistibly* drawn or *spellbound*, according to the purport of the dominant idea or impression in the mind at the time ; the *volition is prostrate ;* the individual is so completely *monoideized* (one dominant idea) or under the influence of the dominant idea as to be incapable of exerting an efficient *restraining* or *opposing* power to the dominant idea.'

As an illustration he speaks of the bird spellbound by the serpent; it is first curiosity, then wonder, which arrests the creature's attention, and then fear causes that monoideo-dynamic action of the muscles which involuntarily issues in the advance and capture of the unhappy creature.

The consequence of *concentrated* attention becomes intensified in a correspondingly greater degree, whatever influence the mind of the individual could produce upon his physical functions during the waking condition, when his attention was so much more diffused and distracted by other impressions. Moreover, inasmuch as words spoken, or various sensible impressions made on the body of an individual by a second party, act as suggestions of thought and action on the person impressed, so as to draw and fix his attention to one part or function of his body, and withdraw it from others, whatever influence such suggestions and impressions are capable of producing during the ordinary waking state should naturally be expected to act with correspondingly greater effort during the nervous sleep, when the attention is so much more concentrated, and the imagination, and faith, and expectant ideas in the mind of the patient are so much more intense than in the ordinary waking condition. Braid says he is persuaded that the real object and tendency of the various processes for inducing the state of hypnotism is obviously to produce or induce a state of abstraction or concentration of attention—that is, a state of monoideism—whether that may be by requesting the subject to look steadfastly at some unexciting and inanimate thing or ideal object, or inducing him to watch the fixed gaze of the operator's eyes, his pointed fingers, or the passes or other manœuvres of the mesmerizer.

Before commencing the consideration, which I propose now to do, of the signs and symptoms of the exhaustive effects upon the nervous system of the toxine of influenza,

I thought it advisable to make the brief allusion which I have done to some few of the leading points in connection with the central nervous system, in regard to its working and modes of operating.

It is far and away beyond either my desire, purpose, or intention even to endeavour to make an analysis of the varying paretic and paralytic affections associated with influenza ; but during the past three years I have seen a considerable number of nerve conditions, both cerebral and spinal, which have presented features so anomalous that anything like systematic or class-book arrangement has been almost out of the question—that is, from a practical grouping of signs and symptoms. I shall now attempt to deal with their clinical and physiological significance.

The derangements, degradations, and disintegrations or degenerations of the nervous system which are associated in different degrees and in diverse manners with, and following an attack of, influenza, may, I think, be best considered for the attempt at clearness and brevity under the following headings, levels, or aspects, for no part of the nervous system can be looked upon as exempt from its influence :

1st. The purely physical, confined to the muscles, to the spinal cord, with its bulb and its special reflex trophic, vaso-motor centres, and sensori-motor channels, and the medullary and spinal nerves.

2nd. The consideration of some points in connection with defective functional activity in the physical and sensorial and special sense areas of the brain. The cortico-motor or pyramidal tracts leading to, and including the, Kinæsthetic or cord area of the hemispherical cortex, or pyramidal area of the Rolandic zone, where volition and muscular sense first enter the physical field as nervous phenomena.

3rd. The psychical area, which has no limit, and which ranges far and wide over the cortical pyramidal cell area of the hemispheres, determined specially to the Rolandic area, and also particularly to those areas which are more

immediately concerned and associated with the special faculties and ideational and sensorial processes.

By experience and reference to the literature of the subject I have been led to conclude—and in other respects it seems probable and reasonable, and in accord with common observation—that disintegration of nerve structures is by no means so frequently due to influenza as mere functional or dynamic derangements, which are of vaso-motor, sympathetic, inhibitory, reflex, or polar origin, so that we have for the most part to deal with degradation of function rather than disintegration of substance. This condition can be carried to the extreme borderland verging upon organic change, yet in the strict sense of the word no organic change has been effected. The clinical physician is always desirous to avoid as far as possible being hypothetical; but, unfortunately, the most experienced in nervous diseases are compelled at times to make a doubtful diagnosis in apparently functional states, although something more than mere dynamic change in the highly-sensitive pyramidal cell and its axis cylinder, or dendritic or protoplasmic processes, or in fine nerve terminations, may be suspected. It is only of recent years that minute degenerations in these structures have been made conclusively evident by Golgi and Marchi's methods of tissue-staining, and thus a comparatively new field for research and investigation has arisen, presenting features both pathological and clinical of extreme interest and of the highest importance.

To corroborate my foregoing statement concerning the differential diagnosis between functional and organic change—say, for example, in a multipolar cell of the anterior horn of a certain segment of the spinal cord—we now know that lesions, involving the dendritic processes alone of such cell, may give rise to a paralysis of groups of muscles having all the features of a spinal paralysis, but

absolutely without atrophic degeneration or alteration in electrical reactions. This we find to be the case in the course of syringomyelia; and I would like here to make the statement that it has for some time been my opinion that the muscular weariness and paresis so specially diagnostic of the initial stage of certain cases of influenza were due to some dynamic change in the dendritic processes of the spinal cell, whereby its functional activity was seriously impaired. This would, of course, lead to a neurasthenia both of the cell and its axis cylinder; to a dystrophy of the cell and the muscular fibre over which its influence was exerted; to a fitful supply of energy to the muscles, giving rise possibly, although not necessarily, to disorderly action or flaccidity, and to other signs and symptoms—sometimes including sensory defects—which may be mistaken for peripheral neuritis, and which, in fact, may lead on to a degenerative neuritis without destruction of the cell itself; or, again, no degeneration might take place in the nerve, and the cell derangement might be purely dynamic, yet the muscle shall become profoundly altered, and, in fact, undergo degeneration. This was pointed out by Erb long ago, and the hypothesis is to my mind decidedly tenable.

MYOPATHIES.

It is quite an open question as to whether myopathic muscular atrophy has ever originated as a direct effect of the influenza poison, although from the pathological standpoint I should have suspected its more frequent occurrence. Some cases have been recorded, but in these it seems highly probable that the muscular degeneration was due to peripheral neuritis or death of spinal multipolar cells. In reference to this it has been suggested that the muscle fibre is phylogenetically a distinct structure from the nerve apparatus and axis cylinder processes; but it is difficult to quite comprehend how this can in any way seriously invalidate the intimate physiological relationship which is

well known to exist between the arborescence of the axis cylinder process and the sarcous elements of the muscular fibre. The initial stage of influenza is frequently associated with intense muscular or neuro-muscular pain, with attendant dysæsthesia or hyperæsthesia, with ataxy or defective power in locomotion, with an aching sense of weariness, prostration, and fatigue amounting to distress, and sometimes to despondency and despair. What, then, is the condition of the muscle? Is the paresis and dystrophy a primary myopathy? or is it secondary to some general shock to the nervous centres? or is it, as some would have it, essentially a neuropathy? Whatever the prime poison of influenza may be—and this is unknown—the first effect which I believe it has upon the body is to arrest respiration of tissue, and so to produce dynamic change in the finer and more delicate protoplasmic processes of muscle fibre, of nerve, and of nerve cell, involving shock and dynamic change in the respiratory and circulation centres of the bulb. We can readily understand the effect upon the nerve centres if, as I believe, in influenza respiration of tissue is primarily affected, and, if not annihilated, its main influence in the human economy is checked, carbonic acid and heaven knows what beside is poured into the blood, which becomes suddenly transformed from a fountain of life into a stream of death. Micro-organisms are generated in shoals, and by their activity and action upon organic matter give rise to ptomaines, which poison the central nerve ganglia, worrying them to irregular action on the one hand, or deadening and stupefying them on the other.

It is well known that after an attack of influenza the muscular system is frequently, either directly or indirectly, the seat of considerable motor and locomotor derangement. I have before stated that I have never met with actual paralysis *from muscular change, per se*, as the result of influenza; but we find a condition which almost amounts to

a paresis, a purely muscular inanition, or simple uncomplicated dystrophy, where the muscle fails to respond to nervous influence, and which is not due to nervous defects. It is, in fact, an essential dystrophic myopathy, and is specially known by certain characteristic features. They are dynamic and distinct from the true myopathies, which are associated with atrophy and very evident organic muscular degeneration, such as we meet with in the well-known and recognised varieties of myopathic muscular atrophies. The almost unvarying signs of this condition are tiredness, weariness, irresponsiveness, flaccidity, and feebleness, accompanied with a sense of heaviness. The muscles seem to have lost their initial energy, just as they seem indifferent to nerve stimulus from within or electric stimulus from without; the capital of the living material of the muscle seems to have been unduly expended, and there is failure somewhere in the conversion of food products into living capital; and when the muscle is called upon to do work, when it is put into movement, the living capital becomes too freely expended, the run upon it seems too great, and failure follows. This failure of power following action, and which is appreciated by the sense of weariness and even deficiency of muscular sense, may not only be due to the too rapid expenditure of capital, but to the clogging of the machinery with the very products of the activity.

Failure of muscle I shall refer to again in connection with volition and the higher centres.

NEUROPATHIES.

Taking the influence exerted by the influenza poison upon the neuro-muscular apparatus as a whole, one can come to no other conclusion than this: 'That the peripheral ends of the nerves, the arborescence of the axis cylinder processes, and the dendritic or protoplasmic processes of the pyramidal and spinal cells are primarily and chiefly involved.' In the consideration of the neuropathies of

influenza the question naturally arises, Do they possess features in any way distinct from other neuropathies the result of toxic agents? This is a point of sufficient interest for a little reflection.

In the course of time I see no reason to doubt that in the part played by toxines—using the term in its general sense—upon the delicate protoplasmic nerve processes, leading to malnutrition and neurasthenia, will be found the prime basis for all pathological change, either from auto-intoxication, due to poisons generated within the body of man, or to poisons introduced from without. Our knowledge concerning this subject and chemiotaxis is increasing with enormous rapidity, and demands, as it is receiving, the largest share of medical and scientific thought amongst the best minds in all parts of the world. So far we know nothing of the toxine of influenza, and we can only assume its existence, as at one time we had from want of knowledge to assume the existence of the toxic albumose developed by the specific organisms of diphtheria, a subject which has of late received the careful study of Dr. Sidney Martin, who found widespread parenchymatous degeneration of the peripheral nerves—cerebral, spinal, and visceral—when the toxine was introduced into the system of animals.

The neuritis produced by alcohol, lead, nicotine, and other agents, need only to be mentioned to demonstrate the effects of what we may truly call nerve poisons. The neuritis might be isolated or multiple, and, as we know by common experience, the degenerate change seems to follow some special and selective law. It is true that it is sometimes incidental or accidental. But the rule is that a poison or class of poisons expend themselves on certain nerves in definite regions, the expenditure being sometimes progressive.

The best studied, and perhaps the best understood, and certainly the most teaching, form of peripheral neuritis due

to toxic agency is beri-beri, and, furthermore, it has many points of interest in common with influenza. In the excellent work on beri-beri by C. A. Pekelharing and C. Winkler, we have clear evidence that this disease is not only essentially a peripheral neuritis, but that the neuritis is due to a living organism, and that the micrococci found in the blood of beri-beri patients do produce in animals a multiple peripheral neuritis. They say that the nerve degeneration diminishes in intensity and area as the nerve centres are approached. In all their examinations the anterior root-zones were free from change, whilst in some chronic cases the posterior horns had undergone degeneration. In reading this book I was particularly struck with the resemblance between the signs and symptoms of beri-beri and influenza. These authors say that beri-beri sometimes kills in a few hours, and that no disease presents so many and diverse symptoms; that the pulse, which remains within normal limits whilst the patient is at rest, will, upon exertion, increase by twenty or thirty pulsations; that the nature of the symptoms of beri-beri depend upon the nerves attacked; that it kills by paralysis of the organs of respiration or of the circulation. When—as is sometimes the case—the motor, the sensory, and the vaso-motor nerves are attacked simultaneously, paralysis and cramps, anæsthesia and paræsthesia, œdema, vomiting, and diarrhœa, may occur altogether. I am quite sure that the physician who takes the trouble to read this work will be amply repaid by the amount of information it gives relative to the effects of peripheral neuritis, and the resemblance which the signs and symptoms bear to the neurosal affections of influenza. Apart from the nervous affections of beri-beri, but in connection with the question of selective capacity and onward march of the degenerative changes in the peripheral ends of nerves by toxic influence, a very interesting and neat example is presented to us by the important and valuable researches of Langley and Anderson concerning the action

of nicotine on the ciliary ganglion and on the endings of the third nerve, showing that the selective action of the diphtheritic poison and of nicotine are in most ways analogous. Nicotine first paralyses the nerve cells of the ciliary ganglion on the course of the nerve fibres to the sphincter of the iris, and probably the ciliary muscle. Next in order it paralyses the dilator fibres of the iris; and lastly, those of the third, fourth, and sixth nerves to the external muscles, the levator palpebræ being less readily paralyzed than the others.

NEURITIS AND MULTIPLE NEURITIS.

Changes in nerves and the peripheral ends of nerves are certainly not uncommon. On the contrary, as the result of influenza, neuritis is most common, and, oddly enough, in several of my cases it has been symmetrical; sciatic, musculo-spinal, and crural nerves being symmetrically involved, leading one to conclude that possibly the general localized tenderness in these nerves masked a peripheral neuritis, but such was not the case; there was no evidence of sensory defects beyond pain, no paralysis or paresis of extensor muscles. Cases are recorded at societies and otherwise of peripheral multiple neuritis after influenza with muscular atrophy, and on this account the neuritis is said to be associated with anterior polio-myelitis of the cord. This is, of course, quite possible, but somewhat doubtful, for polio-myelitis is certainly not an ordinary nerve affection after influenza; and it appears to me highly probable that in these cases the fact is forgotten that, assuming the normal condition of the muscle depends on the integrity of the multipolar cells of the anterior cornua, the result *quâ* the muscle is the same whether we destroy the multipolar cells or merely sever the muscle from its connection therewith, and the muscles will, in either or both cases, give evidence of the well-known alterations in their response to electrical stimulation, vary-

ing, of course, quantitatively in direct ratio to the extent of change in nerve and muscle up to the well-known total inversion of the normal formula, constituting the so-called 'reaction of degeneration.' These reactions in peripheral neuritis are, I need scarcely say, very variable in quantity and in time manifestation, for both in the muscular fibres and in the axis cylinder of the nerve and its parenchyma there are all grades of degenerations, even to the total extinction of normal elements. Referring to ant-poliomyelitis in comparison with a peripheral neuritis, we have one distinguishing feature independent of neuritis and sensory disturbances—namely, that the distribution of the paralysis does not correspond with that of the peripheral nerves, but is dependent upon the bulbar or spinal segments from which the nervous supply emanates.

As in beri-beri, so in influenza, the lower limbs are more frequently paralyzed than the upper, and the extensor than the flexor muscles, and those muscles become paralyzed and atrophied which are in direct anatomical relationship with the nerve from which they derive their motor supply. Why the atrophy? Are there 'trophic fibres'? I certainly think that, until further proof is brought forward, we must rest content with the opinion upon this subject expressed by Giulio Bizzozero at the last International Medical Congress, held at Rome, in a very remarkable paper which he read 'On Growth and Regeneration of the Organism.' These are his words: 'The existence of trophic fibres has been doubted by many, and after closely following the experiments and discussions on the subject for more than thirty years, I am still unable to convince myself that they really exist, nor does such a hypothesis appear to me to be required to explain the facts which fall under observation.' Nutrition and growth, according to this author, depend mainly upon vaso-motor activity.

Dr. Seguin, of New York, reviewed the question of the 'Relation between Trophic Lesions and Diseases of the

Nervous System' in a very admirable paper which he read before a joint meeting of the Association of American Physicians and the American Physiological Association during the Congress of American physicians and surgeons at Washington, D.C., September 20, 1888, and his concluding words have the ring of gold about them. He said, 'I therefore venture to suggest that disease of the nervous system produces true trophic lesions when it interferes with the associated or interdependent life of continuous tissues.'

I have stated that in peripheral neuritis the extensor muscles are the first to give way. Why is this? Ferrier gives good reasons for its occurrence—in fact, the best with which I am acquainted. He says, 'It is not unreasonable to suppose that the degree of representation, and therefore the trophic strength, of the extensors is less than that of the flexors; while such extensors as have the most numerous connections with the spinal segments would have a greater vital resistance than those whose connections are fewest.'

Of all the painful affections following grippe, the most common are those of the fifth nerve. Isolated neuritis of every cranial nerve has been recorded, and most practitioners must, I think, have noted how difficult they are to cure. Time, rest, and change of air being the most efficient agents in bringing about a cure, and of these time seems to hold the first place. I have seen many cases of earache, followed by deafness; of defect of vision, with intense pain of the eyeball; of tic of the second and third divisions of the fifth--each clearly traceable to influenza, and due to neuritis of these nerves respectively. No nerve can be considered exempt; supra-orbital, intercostal, and sciatic affections are certainly of frequent occurrence, and sometimes lead to muscular paresis, if not to atrophic degenerations of the muscles.

Ophthalmoplegias, with and without involvement of the

facial nerve, are occasionally coming under notice. I have seen a few very interesting cases apparently due to influenza ; but I have always thought them the result rather of some nuclear change than of a peripheral neuritis. In the *Lancet* of July 15, 1893, Dr. Hughlings Jackson has called attention to a case under the care of Dr. Ferrier, which might well have been due to influenza, for I have seen such where, in association with the ophthalmoplegia externa, there was paralysis of the orbicularis oculi and facial muscles. It is interesting as a clinical objective of an anatomical state—namely, that the oculo-facial and oro-facial muscles may be affected in central disease quite separately from each other, indicating that the respective divisions of the facial muscles for the orbit and the mouth are innervated from different centres.

Two cases of bulbar paralysis have come under my notice of a somewhat anomalous nature, to all appearance due to influenza, and Dr. Mills, of Philadelphia, records a striking example which he attributes to grippe. Several such have been recorded. Both of my cases recovered, which is very rare in idiopathic bulbar paralysis. I can speak from practical experience, having some years ago given special attention to the subject. If grippe goes straight to the nuclei of the bulb, as some authorities are particularly anxious to make us believe, opthalmoplegias and bulbar paralyses should be much more common than we find them. Possibly such authorities would argue that the upper bulbar nuclei are physiologically and functionally distinct from the lower, and that the lowermost nuclei of the bulb are alone associated, but not functionally related, with those great hypothetical centres which govern and control respiration and circulation. This must unquestionably be so, from the anatomical standpoint, and scarcely admits of argument. But the bulb and its nuclei is still a problem of some complexity ; although a vast amount of research has been expended upon it to unravel

its mysteries, it still remains mysterious. Oppenheim, in the 'Archives of Psychology,' has suggested with, I think, great reason, that many of the discrepancies which are constantly making themselves manifest relative to the morbid anatomy of bulbar paralysis are due to the fact that in some cases the paralysis depends on some change in the terminal arborescence of the pyramidal tracts in which death occurs before the nuclei themselves have undergone degeneration. But the whole question relative to the functional relationship of all the bulbar nuclei is somewhat incomplete, and as I before said, somewhat mysterious, like a good many other things connected with the nervous system. Happy and contented must be that physician who made the following remarks at a neurological discussion: 'The whole of the nervous centres seemed now to be thoroughly mapped out, and a process of reasoning which resembled the integral and differential calculus had made everything clear and comprehensible in the question of paralysis.' We have clinical and pathological evidence that the upper and lower bulbar nuclei consist of groupings of cells which may be affected singly or in combination with each other, or in combination with other systemic degenerations of cerebro-spinal tracts.

There can be no doubt that all the so-called system-diseases of the spinal cord may arise from grippe, and likewise so-called focal diseases; but these present the well-known signs and symptoms according to the columns or gray matter attacked in the segment level of the pathological process. It might be remarked that the parts most generally involved are the cervical and lumbar enlargements, for there is an intumescence of the cord in these regions to meet the synergetic muscular demands of the hands and arms in the former and those for the legs (as well as the reflex centres for the bladder, rectum, and sexual organs) in the latter, and the distribution of the paralysis and sensory defects will depend on the position

and extent of the lesion in the respective segments of the spinal cord.

There is a condition of the spinal cord which I may say is exceedingly common after grippe ; it is in fact a 'Neurasthenia Spinalis,' and I maintain that no other name can be given to it. Dr. Althaus, for one, appears to object to the term 'Neurasthenia,' because its meaning is vague, *and because it is associated with unpleasant recollections!* At the Royal Medico-Chirurgical Society he suggested that it should be supplemented by the term 'encephalasthenia.' This is too funny and too feeble to be taken seriously, for the term 'Neurasthenia' will exist when its opponents have long been forgotten, but I am dealing with what I choose to call 'Neurasthenia Spinalis.' Possibly at no very distant date some clever apostles in the neurological world may call it a 'dendritic polio-myelitis,' but for the time, and to answer my purpose, I am content to use the term which I have chosen. Professor Michael Foster, in his address at the International Medical Congress at Rome 'On the Organization of Science,' in speaking of nomenclature, makes the following observation, with which every student, not only of science, but also of medicine, must most cordially agree: 'How great a help it would be if there were only an international tribunal before whom every name had to go, and who would, as it were, stamp the coin of science before it was allowed to pass into circulation!' If such a process could be acted upon in the nomenclature of disease, what heart-burnings and confusion of thought would be saved to the medical student!' I seriously think that I could write a volume upon the subject of Neurasthenia Spinalis, but a few lines must suffice. By way of definition, let me state that it is essentially due to functional degradation of the anterior horns and anterior root zones involving the central gray matter and fringes of the lateral columns of the spinal cord. There is no direct defect in the kinæsthetic muscular sense, or volitional zones of the Rolandic

area. It should not be associated with hysteria, for it is quite distinct from anything of the kind. I am quite unable to say if the change in the cord is purely dynamic, or whether it is some form of regressive pathological change, therefore I am content to use the words 'functional degradation.' Taking a patient suffering from 'neurasthenia spinalis,' we find the intellect, like the eye, bright and clear, the pupillary reflexes sluggish but normally responsive, the knee-jerk slightly exaggerated, with an absence of ankle clonus. No globus, no aphonia, no ovarian tenderness. Tactile sense normal, muscular sense normal. There may be an occasional dragging of the left leg, but no actual paresis (although this might exist). Common sensation is sometimes, though not often, affected; slight tremors follow undue exertion. The muscles are flaccid and devoid of tone, the wasting is general from inanition, but differing from atrophy. The joints may be painful and swollen. Electrical reactions are normal. Pressure on the spinous processes in cervico-dorsal and dorso-lumbar regions generally give rise to pain. Neuralgias of every nerve may exist at different times, and pains of muscles are frequent, and usually of an aching, tired character. The heart muscle is irritable and participates in the general muscular condition, which is one especially of weariness, and fatigue, and incapacity for more than the most ordinary exertion. Beyond this superficial survey of the leading features, one point of interest must not be forgotten, namely, that in neurasthenia spinalis the cord is not always the seat of functional arrest at the same level, for at one time the signs might be those of bulb implication with attacks not unlike those of megrim. It seems as though the cord might be involved in sections, from the bulb to the cauda equina, giving rise to manifestations not unlike the crises of tabes dorsalis, but of much less severity. There is good reason to conclude that these functional derangements, such as are here referred to, are due to defective

vaso-motor innervation. For the spinal cord regions to carry on their work regularly and rhythmically, the venous as well as the arterial capillary system must be functionally active. It may be said that normal blood of good quality and right quantity is indispensable to the functional working of every part of the body, but particularly to maintain the activity and sustained action of the nervous centres. Sectional degradation, then, in the functional activity of the spinal cord is one of the most frequent concomitants of neurasthenia spinalis, as the result of influenza. For instance, a paresis of the arm of a few hours', or it might be of a few days' duration, passes away, and simultaneously or within the course of a few hours it is followed by a similar condition in the opposite arm, or in one or both legs; and such is the case with regard to neuralgias, for a neuralgia of the fifth nerve may subside, and be immediately succeeded by a similar condition in some intercostal nerve, or in fact of any nerve, either somatic or splanchnic.

With this brief review of myopathies, neuropathies and myelopathies associated with grippe and a low level of the nervous system, we pass on to review in a very summary way the second division, presenting for consideration some points in connection with defective functional activity in the physical and sensorial and special sense areas of the brain in the cortico-motor and sensory paths of the pyramidal tracts leading to and including the kinæsthetic or cord area or direct pyramidal area of the Rolandic zone where volition and muscular sense originate in the physical field as nervous phenomena.

To work out fully the influence of the toxine of grippe upon sections or strands of the parts of the brain just referred to, would be a task of considerable amplitude, especially with regard to the physiology of the subject as applied to the anatomy of the brain, not only in the localization of pathological change, but also in the effects, subjective and objective, of such change.

COMA.

It cannot be denied that infectious or toxic diseases, as well as products the result of defective muscular and gland metabolism, poison the nervous centres, deranging their action, and altering the dynamic relationship which exists between them and the nervous conducting tissues. By way of illustration merely we may take the objective signs of uræmic coma, diabetic coma and opium coma, as well as the coma of the last stage of dissolution in general paralysis, and the coma of supra-dural hæmorrhage, the coma of typhus and the exhaustive coma of typhoid. In each case we have diagnostic signs which are well known. At present we are certainly not fully acquainted with the special features of the toxine of influenza, in the production of coma ; presumably the grades of lethargy and unconsciousness in coma, and particularly in the coma due to auto-intoxication, are the result not so much of the strength of the poison acting upon the nerve cells or conducting tissues as upon the initial resistance or inherent vital property of the tissues themselves. Seeing that the fatal issue of influenza can reasonably be attributed less to failure of the respiratory than to the vaso-motor centre in the bulb, dissolution takes place without any prolonged stage of coma, and is essentially to be attributed to vaso-motor exhaustion ; at all events my own experience has led me to this conclusion. It is the heart that fails !

With regard to the special poisons or toxines of infectious diseases, there is more in the indirect than in the direct evidence of the part which they take in the production of changes in the nervous system ; a cultivated microbe from a diphtheritic exudation when injected into a rabbit may produce a peripheral neuritis, which may be the result of indirect rather than direct action, inasmuch as it may by its depressing or revulsive influence upon the trophic mechanism of the organism so pervert the normal nutritive

processes as to develop new substances which in themselves are the direct toxicidal agents of destruction. For in the normal as in the pathological state the organism is not only a receptacle but a laboratory of poisons. The excellent work which is now being done in this direction will ere-long clear up a great deal that is at the present time a somewhat obscure problem.

VISUAL DEFECTS

are possibly amongst the most common of special sense derangements which may be attributed to the poison of grippe. They may, of course, be due either to a peripheral or to a central cause: to a paresis of the nerve-cells of the ciliary ganglion on the course of the nerve fibres to the sphincter of the iris, or to the ciliary muscle or the dilator fibres of the iris; to a neuro-retinitis or to ischæmia of the retinal vessels; to some change in the optic tract, or optic nerve, or in the cuneus and its immediate neighbourhood wherein it is determined that the visual half centre for retinal sensation is located. Alterations in the ocular field are best known to the ophthalmic surgeon, as they are unquestionably of frequent occurrence, and unattended with any special form of paralysis, but when the disturbances of sight arise from central change they are almost invariably connected with paretic or paralytic conditions, such as a monoplegia or hemiplegia, or defects in speech; and it is quite possible that they may take their origin, during the fever stage of the influenza in a more or less localized inflammatory change in the pia mater and arachnoid membranes, giving rise to adhesions leading to malnutritious and convolutional atrophy or softening. I have seen such cases, and from carefully sifted evidence I have been forced to the conclusion, against my sceptical nature, that influenza was the primary cause.

In ophthalmic practice it is found that all kinds of derangements of sight may arise from influenza, from

photopsia and chromatopsia to partial amaurosis, from mere diminution of vision to its total abolition; but the most common form of diminution of sight after influenza is amblyopia, which probably depends upon disturbances of the circulation caused by direct or reflex irritation of the vaso-motor nerves. Sometimes the affection of sight comes on suddenly in the form of an eccentric, sharply defined defect of the field of vision, a central Scotoma. Diminution of the acuteness of vision after influenza is often very perplexing. The patient sees objects as through a mist, and there is difficulty in distinguishing minute objects, and there might be positive alterations in the visual field, as in Scotoma the dark spot, small at first, gradually extends and assumes a round, oval, or irregular form. I have known cases of influenza ushered in by a form of scintillating scotoma, accompanied by spectral appearances as in severe megrim, the black spot consisting of a luminous border, surrounding the blind area and expanding as the latter widens. The luminous circle, just as in an attack of megrim, may be subject to a rapid oscillatory movement, whilst the border assumes a zig-zag outline. It may also be fringed with gorgeous colours, apparently emitting showers of sparks. Attacks also simulating Ménière's disease may arise from influenza, commencing quite suddenly with giddiness, confusion, and incoherence, embarrassment of speech, paresis, particularly of the lower limbs, nausea and defects of cutaneous sensibility, tingling, numbness, etc., with all the defects of vision just alluded to as associated with megrim. That these attacks are allied to epilepsy there can be little doubt, and it is highly probable that these optic phenomena are caused by a discharging lesion of the cerebral cortex.

The following case came under my care in 1892: A gentleman about fifty years of age, with paresis of the right half of the body, also with some deficiency of normal power of the left half which made its appearance about six

weeks after an attack of influenza. It could not be said that his intellect was impaired, but it was sluggish, and, like his memory, was weak, and in a state of low functional activity. During the onset of the attack of grippe, he suffered from violent headaches and general mental excitement, vomiting, and giddiness, and some rigidity of the left lower extremity. There was no marked deficiency of sensibility or muscular sense, no ankle clonus, and the knee-jerks were normal, the action of the sphincters was normal, but there was a frequent desire to micturate. His movements were slow, purposive, and co-ordinate, but in locomotion he seemed at times to lose his balance. The pupils reacted normally, and there was no decided evidence of retinal change. There was right homonymous hemianopsia, the limit reaching quite up to fixation point. With extreme quiet and enforced rest for over two months, the patient in a way recovered, but the lateral hemianopsia remained. He passed from my care and died somewhat suddenly. I should say that he had softening of the left cuneus, which was, judging from clinical evidence, by no means limited to this special visual area, for experimental and pathological researches in this direction seem to show that the whole of the occipital lobe and adjoining portions of the parietal and temporal lobes are in some way connected with the perfection of vision. The fact that the pupillary reaction was normal with hemianopsia, is in itself fair evidence that the visual defect was due to central change, rather than to lesion involving the optic tracts, in which case the hemianopsia is associated with inactivity of the pupil, and it might be some retinal atrophy also ; and furthermore it is quite possible that the cuneus was not primarily influenced by the initial lesion, but was due to what might be called secondary invasion, for the hemianopsia came on some time after the paralysis.

AUDITORY DEFECTS,

which are well known to specialists in diseases of the ear, are very common as sequelæ of influenza. Those which are due to some material change of the external and middle ear come especially under the care of the aurist, and are visible, but those which are due to some central change of the brain might be said to belong to the neurologist, and are invisible in an objective and direct way, and frequently their diagnosis has to be brought about by reference, comparison, and association with other sensory functional relationships and activities.

Apart from change in the external auditory mechanism, we find following an attack of influenza many phases of defective hearing, due to a functional lowering of tone, it may be, in the sensory centres generally, but in the auditory representative area of the temporal region particularly. This is, of course, well illustrated in some forms of aphasia, and which are associated with defective volition and reason.

There is a condition recognised by the name Hyperakusia, or Auditory Hyperæsthesia, and this may present itself in varying degrees after influenza. It is almost always connected with bodily weakness and prostration. It arises most probably from an over-sensitiveness of the peripheral endings of the auditory nerve, or of the cortical acoustic centre of the temporal convolutional area. I have seen one very marked case in a young man, where the grinding of a street organ or the playing of a band would produce such a summation of painful excitement that he would become almost uncontrollable.

There is another phase of auditory trouble known as tinnitus, of a purely subjective nature, most frequently associated with deafness and 'noises in the head,' as they are commonly called, and sometimes complicated with vertigo. It is ofttimes difficult of precise and accurate

analysis, and it is difficult of cure, 'thus forming a pleasurable hunting-ground for quacks and charlatans.'

The aural sensations of this unfortunate malady are wonderfully cosmopolitan and catholic in their nature. They are unkind, ungenial, and revulsive in their very essence. They might begin in symphony, but by augmentation they end in discord. They are self-creative, and simulate effects of physical phenomena, sounds of all kinds, wearying, perplexing, distressing, and exhausting, and they may be accompanied by other subjective sensations of a still more unpleasant nature, such as auditory illusions and hallucinations.

I have referred to Ménière's disease, the signs and symptoms of which are now so well known, yet so variable, and their etiology so generally received as accurate, although slightly incomprehensive. There can be no question of doubt that this recent epidemic of influenza has increased the train of nervous symptoms, leading up to, if not actually culminating in, Ménière's disease.

Ménière's disease is, in every sense of the word, paroxysmal. The patient suddenly feels as if he were swaying or slipping, gliding or falling away from himself in any or every direction, roundabout, forwards, or backwards, until he staggers and clutches at surrounding objects for support. This is accompanied or followed by a feeling of faintness (rarely unconsciousness), the skin becomes pallid, cold, and covered with sweat ; the pulse is small and weak, almost feeble and flickering ; and the other symptom which is usually or never absent is the intense feeling of nausea, which often terminates the attack in vomiting ; but the chief and primary evidence of Ménière is the vertigo. The attacks may come on at first at irregular intervals ; they may increase gradually in frequency and intensity. The noises in the head may cease during the intervals of giddiness, but they invariably become constant, and the only absolute cure for the patient is the establishment of

complete deafness, when the paroxysms of vertigo and all the distressing symptoms of the disease cease.

There is a form of serious deafness which sometimes follows influenza, and which seems to be associated with a cerebro-spinal meningitis, vomiting, transitory paralysis, and a tumbling gait. The disturbances of equilibrium disappear after a time, as well as the paralytic symptoms, but the deafness continues, and is for the most part irremediable.

VOLITIONAL DEFECTS (CEREBRAL).

I now pass on to the brief consideration of some nervous affections following influenza, and which I believe are due to a 'Cerebral Neurasthenia.' They are of peculiar interest, and present features relative to volition and localization of function of known, as well as of unknown quantities. Some of these are surrounded by a halo of erroneous and ingenious speculation. Others admit of tangible proof, and are within the bounds of logical explanation. All and each constitute an integral part of a complex combination of symptoms of infinite vastness and of subtlety most intricate. Therefore, it is only reasonable for us to speak of brain functions as complex problems about which very little is really and actually known. Men squabble over the priority of being the first to demonstrate the existence of centres which exist only in their own imaginations. To place an electrode over any part of the Rolandic or cord area of the brain, and to conclude that such part is the motor centre for a muscle or group of muscles which are called into activity has been proved by Bastian and Horsley to be mistaken knowledge. An isolated purely motor or sensory *convolutional* centre is *one* of the unknown and unproven quantities, and when we bid good-bye to these so-called motor convolutional centres which some men love so well, and travel into sensory and special sense regions, and endeavour to localize the source of streams of

energy in connection therewith, confusion becomes worse confounded. The origin of localized centres becomes very mixed.

By way of example, let me refer to the centres for sensation, touch, pain, temperature, etc., and here we find heterogeneity becomes simply chaotic. *En evidence* some authorities regard the optic thalamus as a great centre of general sensibility, whilst others assign to it motor functions. 'Our distinguished neurologist and original worker in this line of research, Dr. Ferrier, regards the thalamus as in *some way* connected with sensation, and from it pass tracts which lead to differentiated areas for sensation in the cortex, apart from the purely motor centres in the cortex, which he regards as in *some way* especially related to the corpus striatum.'

The relationship, however, seems tenable from the anatomical and topographical side, for if we take the evolution of the nervous system as a whole from the projection aspect, which is one of exfoliation and differentiation, and correlate precisely upon these lines the tracts for streams of energy issuing from known ganglionic masses or localized convolutional motor or sensory areas, we shall unquestionably be led to the conclusion that differentiation and localization as to motor and sensory cortical zones are by natural law the outcome of ontogenetic diplomacy. But this does not give us the key whereby to unlock and make clear the great question of cortical sensori-motor arrangements. There is a knotty point connected with this of truly Gordian type, and if we judge impartially of the views held by the motor school on the one hand, and the sensori-motor school on the other, of which I am a most confirmed disciple, the latter division can swamp the former by clinical and pathological evidence alone. The game of localization of function is in these days a very dangerous game to play. For my own part, I am not inclined to the views of those who maintain that physio-

logical, clinical, and pathological evidence is growing in favour of general sensation zones in the cortical area, definitely and distinctly separate from cortical motor areas. All are agreed that the so-called Rolandic zone is an area in which muscular movements are represented more definitely than in other regions, and that this region can be sub-divided, each sub-division representing certain muscular activities; that the occipital lobe is the representative area for vision, the temporal for hearing, and so on. These are accepted facts; but, as far as I can see and judge, the growing evidence is not in favour of isolated and single, and focally localized cerebral activities, acting by themselves, of themselves, and through themselves. The geographical representation of muscular movements in the cortex of the brain is simply a revelation and a discovery of unqualified magnitude, with which the name of the discoverer (Hitzig) must for ever be associated, for by it the physician can locate a focus of disease in the Rolandic region with unerring precision and exactitude, and the surgeon in like manner can cut down upon and remove the same. No one would for a moment wish to deny what must be patent to all observers, the tendency which exists in the anatomical evolution of the brain to specialization; but this very specialization does not in itself denote the existence of focalized termini, or a castle surrounded by a moat with one drawbridge drawn. It rather indicates a junction worked upon the block system by any number of active signalmen constantly employed in creating, and lessening, and dispersing resistances, and thus influencing the streams of energy with which representative areas are continuously assailed. These few remarks concerning localization may aid us in the consideration of volitional defects which not unusually follow an attack of grippe; and I might say that any opinions which I may hold in reference to brain localization are not based upon vivisection experiments, but entirely upon clinical and patho-

logical renderings; and it is upon these that I am quite willing to rely for many valuable expositions concerning brain function. Experimentation and pathological investigation must work together upon the same lines to the same ends. They are both attended with considerable difficulties in regard to the strict boundaries of localization of functional areas, but an increasing experience in every direction can lead only to the best and truest results.

Volitional defects are referable essentially, but not absolutely, to the Rolandic area of the brain and to the neuromuscular apparatus. The Rolandic area of the brain, which has been most appropriately named by Bastian the 'kinæsthetic area,' is the representative area not only for purely volitional motor acts, but also for muscular sense, and, in a measure, not quite explicable for common sensation.

If all movements of skeletal or so-called voluntary muscles were the result of volition—that is, if the outgoing impulse were preceded in mental time by a conscious idea or conception of the movement to be performed—the convolutions of this area would soon undergo atrophic change, as we find exemplified in general paralysis of the insane. It is the veritable consciousness of movement which not only creates volition, but is itself created by the necessity for volition, which, to my way of thinking, laps and is overlapped by reason. Thus far I go and no farther; for if there be the semblance of truth that 'muscular sense' and 'volition' are represented in the cortical Rolandic area, it must be held that this so-called, and, as some would have it, exclusively, 'motor' region is of still higher significance, and plays some part in the psychical processes of reflection and ideation.

Let us for one moment consider the volitional as apart from the automatic side of man's being—a very obscure and difficult subject. When the man is in rude and robust, or even moderately good, health, when, in fact, he is under

an equable and unvarying pressure of nerve energy, is he conscious of the ordinary muscular movements of daily life, or even of the sense of movement? Certainly not. Volition plays a fractional part in his motorial life. Where then, I would ask, are the governing centres which control and co-ordinate unconscious movements, which are so essentially associated with his activities, and which are purely automatic as far as man's conscious ego is concerned? I should say they existed either in the corpus striatum or the *lowermost* cells of the cortical Rolandic area. May it not be? And the question is less absurd than at first sight it appears, that the automatic and volitional are both cortical, and that the automatic and the volitional blend together in the cells of the cortex. Consciousness of movement, as I have so often stated, means fatigue or inhibition of the automatic controlling apparatus, which then draws upon the volitional and supreme pyramidal cells of the cortical area. Volition always means strain and high tension, with comparatively low resistances, which soon lead to exhaustion.

In a very interesting book by Mr. Solly on the brain (1836), writing of Marshall Hall's researches on the functions of the spinal cord, Mr. Solly says, 'Marshall Hall imagines that there is a source of muscular action equally distinct from voluntary motion, and from motion resulting from the irritability of the muscular fibre. That there is a series of incident excitor nerves and of reflex motor nerves which, with the true spinal marrow as their centre or axis, constitute the true spinal system as distinguished from the cerebral, through which that muscular action is excited.' It is possible from this that Marshall Hall came to the conclusion that unconscious acts, apart from volition, had to do with the spinal cord alone. This I do not for one instant believe.

Victor Horsley, in an article in the *Nineteenth Century* (June, 1891), proclaims himself a convert to Dr. Bastian's

original postulate of 'kinæsthesis' or sense of movement existing in the 'Rolandic area.' He says, 'It is this postulate which embodies the great importance of kinæsthesis or the so-called muscular sense to psychology and neurology, and it is this relationship which, it is hoped, may be considered to be demonstrated by the facts now to be elicited.' Volitional defects present peculiarities far too numerous for reference, and some, perhaps, of the most interesting have been presented to us by those who have made hysterical states their study, particularly by men of the French school, prominent amongst whom may be mentioned the names of Duchenne, Briquet, and Charcot. Dr. Bastian, too, has very carefully considered the question of volition in these conditions, especially with regard to speech, word-blindness and word-deafness, etc. (*Lancet*, 1891).

I have seen several cases of paralysis of cerebral origin due to functional failure attended with marked defects in will power, and which were traceable to the degrading influence upon the nervous system of the toxine of influenza ; some with loss of power, and with slight defect in sensation ; others with hemi-anæsthesia, without loss of power, or only in a slight degree. The latter cases presented conditions in every way resembling those of hysteria, due to some functional defect of the posterior third of the hinder segment of the internal capsule—namely, that part of the foot of the corona radiata which lies between the optic thalamus and the posterior part of the lenticular nucleus. The paralyses were more or less of the flaccid type, with loss of muscular sense. Bastian has pointed out and analyzed in a very satisfactory manner some interesting cases of defective volitional power, due to an associated arrest of functional activity in the sensory segment of the internal capsule and in the cortex. He has referred particularly to cases of Duchenne and Charcot, such as 'hemi-anæsthesia with paralysis only when eyes are closed'; 'hemi-anæsthesia when eyes are opened and closed.' Of

course, these cases abound in the voluminous writings of Charcot, Briquet, and others, particularly of the French school. It would be interesting to know, but it seems almost impossible to arrive at a correct estimate, how far the influenza has given rise to functional central palsies, hysterical or otherwise.

Apart from anything like scientific hypothesis, I can scarcely leave the consideration of volitional defects without a little more practical reasoning. The whole of the brain neuro-muscular system, and of course the cord as a compound nerve being included, consists of the batteries or nerve-cells for the generation of energy, the nerves for the to-and-fro transmission or conduction of energy, and the motor end-plate in the muscle for the diffusion and distribution of the energy, and the muscle itself, which becomes impressed for volitional contractility, and stimulated for ordinary automatic and reflex movements. (It must, I should think, be admitted that, from shock to the nervous centres, the liberation of energy is greatly retarded, not only on account of central inhibition, but also on account of increased resistance in the tissue of the muscle.) Streams and currents of energy are constantly flowing at a low potentiality from nerve-centre to muscle, and from muscle to nerve-centre, and according to the activity of the centre, so should be the activity of the muscle, and vice versâ. The nervous arc, as we have seen, must be complete and continuous (nerve-centre, nerve, and muscle), and the nervous process must be made up of an ingoing current, passing along the nerve to its centre, and the discharge of energy from the centre forming the outgoing current to the muscle. In speaking of a current of electrical energy, we speak of its tension being high or low, and we speak in like manner of nervous energy, which in passing along a living nerve increases in intensity so long as the axis cylinder be healthy, and insulation complete. Cortical sensori-motor areas are representative of muscles in movement, and are the centres

in which muscular movements are arranged, so that each motor nerve-cell probably represents a series of muscular fibres, each producing the same effect by its contraction, and each motor nerve-cell in the cortex may be said to represent a primary element in movement, and certainly in *volitional movements* and *muscular sense*. Anyone who takes the trouble to study the nervous system as a *simple apparatus* for the conduction, transmission, manufacture, and evolution of energy, will readily perceive from the foregoing statements why it is that in influenza we have such an infinite variety of functional defects, some serious, and others less vitally important. When the *muscular sense* area of the motor cortex is in a state of positive or irritative lesion, through the toxine of influenza, we find decided interference with ordinary normal *muscular control*, in combination, of course, with defective *voluntary* or *purposive* movement, normal muscular sense being, as we have seen, a conscious sensory impression, preceding in point of time a voluntary muscular movement, and determining the precise amount of muscular effort.

Although physiological investigations have not as yet given us a direct clue to the mode of connection between the functioning mentation process of a conceptual ideation of voluntary movement, and the functional activity of a kinæsthetic centre, still, we have every reason to conclude that such connection does exist. It is therefore fairly reasonable to infer that a paretic condition of the kinæsthetic centres, producing as it must do volition distress (strain and tension), may, and in fact does, lead to a similar state in the evolution of what should be the normal and correlative integrity of mental ideational processes, and the thoughtful, intelligent powers of reasoning. We are certainly not quite clear concerning the psychological definition of volition, and we are unquestionably at a loss when we endeavour to define by lines of demarcation the differentiation between a volitional or purposive, and reflex or automatic, act.

To this I have just referred.

What evidence have we to come to the conclusion that the sensori-motor area of the cortex of the brain has undergone derangement by the toxine after influenza? It is true that we have not always muscular paralysis, but it must be borne in mind that paralysis does ensue after this disease by recurrence. I have seen it in a few cases, and the following are instances: A lady, about thirty-eight years of age, consulted me for an ordinary condition of writer's cramp, with which she had been afflicted and *cured* about two years previous to the attack of influenza. When the attack of influenza had subsided, she found, to her surprise, that the writer's cramp had returned, and she was unable to write more than a few lines. A gentleman, fifty-three years of age, consulted me for a weakness in his right arm and leg. He had suffered from a complete right hemiplegia when forty-four years of age; but the paralytic condition rapidly subsided, and at the time of the influenza coming upon him he could move the arm and leg with perfect freedom; after the influenza, the right side was so weak that his power of grasp was exceedingly feeble, and he could not put his hand to his head. A gentleman, thirty-seven years of age, consulted me for a partial paralysis of the right third nerve, with some symptoms of locomotor ataxy. He said that he had suffered from tabes for twenty years, but the symptoms were never very aggravated. He had a similar condition of the eye when his condition was first diagnosed, but it passed off in a few days, and had not returned until after the attack of influenza. Now, we often find after influenza defective *muscular sense*, defective *muscular control*, defective *purposive* and *voluntary power*, and defective *ideation*.

I cannot, of course, enter minutely into these conditions, and give evidence of these states by cases, etc., but any medical man in large practice must have seen numerous examples. Take a good billiard-player who, after an attack

of influenza, fails in making an average break. I have seen several such men, and they invariably say, 'I cannot feel the cue properly; my muscles don't seem to act, and the more I try, the more ridiculous it seems.' These patients have for the time lost their normal power of control, their *muscular sense*. I have also seen similar failures in players of tennis and golf. With regard to volition, from its psychic aspect it is at times peculiarly defective and deranged, of which I have seen several interesting examples. A gentleman who had recently recovered from influenza had some important business to attend to in Liverpool, and, although in apparently good physical condition, nothing could induce him to undertake the journey; his *desire* was to go, and he made several attempts, but failed.

A gentleman habituated to extensive correspondence, after recovery from influenza, was unable to write a line, from defective volition, certainly not from muscular fatigue, and his powers of ideation were fairly active.

A physician who had just recovered from influenza commenced to visit his patients, and upon writing the prescription found his brain an absolute blank, and he could neither think nor write. Physiological investigations into the functions and functioning of certain areas of the brain have helped the clinical physician very greatly to unravel these somewhat mysterious manifestations.

This brings us now to the consideration of some mental defects due to the influenza, to that part of the brain known as the 'psychical area,' which, to my way of thinking, has no limit, and which ranges far and wide over the cortical pyramidal cell-area of the hemispheres, determined specially in some, but not in all, cases, to the Rolandic area, and also particularly to those areas which are more immediately concerned and associated with the special faculties and sensorial processes.

The question arises, Is there a psychic area, and if so,

does it exist by itself? Some would have it prefrontal, others post parietal, but in the recently-delivered Morrison Lectures on Insanity by the most careful and practical alienist of the day, Dr. Batty Tuke, we are led by his conclusions, and which, by the way, I have for some time myself held, that the primary incidence of insanity is upon the pyramidal cells of the Rolandic area. Hence this kinæsthetic zone of Bastian is every day becoming of more importance. I have previously expressed some views concerning the function of this area by Bastian and Victor Horsley, and now we have one of the greatest living psychologists claiming for the Rolandic area psychical representative 'motor manifestations.' No man can have studied the clinical phases of the general paralysis of the insane through its outward objective and motor expressions without looking upon them as the physical exposition of some psychical change existing in the same or closely-associated central region, and this view must be held by Dr. Ferrier, for in his work on the 'Functions of the Brain,' he writes: 'We have many grounds for believing that the frontal lobes, the cortical centres for the head and ocular movements (with their associated sensory centres), form the substrata of those psychical processes which lie at the foundation of the higher intellectual operations.' It therefore seems an established certainty that there is a very distinct physical basis to mental phenomena. Dr. Batty Tuke has established this almost beyond doubt. He says — and this is a well-known anatomical fact: 'The focus of diseased action round the Rolandic fissure sends downwards from certain of its zones of cells axis cylinders which are in connection with fibres from the pyramidal tract which can be traced through the inner capsule to the crusta.' These are connected with the skeletal muscles, and the movements of the eyes, mouth, face, tongue, pharynx and larynx, and he further points out that there were the strongest reasons for believing that

kinæsthesis, transmutation of sensory stimulus into motion, occurred in the pyramidal cells of the Rolandic area. Many a neurologist will breathe with feelings of delight at these words, for he will find upon this basis a hard high-road upon which he can travel.

Thus far we may fairly conclude that the toxine of influenza, or not unfrequently some poison the result of auto-intoxication, or other toxines of a vegetable kind find in the Rolandic area an active region, the cells of which are ever ready to develop some elective function, and to be incited to derangement in their natural elective capacity when their normal nutritive influences have been greatly interfered with, and when, in truth, they are in a state of neurasthenia. By such a mode of reasoning, thanks to Dr. Batty Tuke, we are without doubt enabled to account for the mental derangements following grippe. The most thorough and thoughtful observers and workers, like Ramon y Cajal and Meynert, are inclined to the opinion that the psychical functions are inseparably associated with the presence of the pyramidal cell. In his Croonian Lecture, Ramon y Cajal made the following statement: 'In my opinion, it is very probable that, besides the complexity of their relations, the pyramidal cells possess an intraprotoplasmic structure which is peculiar to them, and which in intellects of the higher order is still more elaborate, a structure which does not exist in the corpuscles of the cord or of the ganglion.' He further says: 'If I did not fear to abuse the methods of comparisons, I might support my conception by saying that the cerebral cortex is like a garden full of innumerable trees, the pyramidal cells, which in response to intelligent cultivation can increase the number of their branches, strike their roots over a wider area, and produce even more varied and more exquisite flowers and fruit.'

MENTAL DEFECTS.

From defect in the normal activity of the mental processes, we find a partial absence of that natural

vividness and healthy tonus concomitant with the intelligent functioning of the sensitive areas of the gray matter of the convolutions; the tide of nervous energy seems continuously to be at the ebb, and its expenditure, slow and fitful, is attended by marked depression of the mental faculties which characterize the virtues and the attainments of man's understanding. *Distrust* and *disgust* frequently reign supreme; *self-confidence* is known only by its absence; and the domains of space, time, and matter are questions of no moment. The patient seems to be dreaming in an atmosphere of dim twilight, unawakened by the ordinary impressions which usually charm, or gladden, or excite the heart of man. Consciousness and feeling and thoughtful life are for the time in a state of arrest or inertia.

A patient under such conditions is incapable of adapting himself to the ordinary environments of life. There is clearly defective appreciation, and the powers of control and resistance are alike defective. That this is no theory or myth is well known to physicians who give their attention to mental alienation. This state somewhat resembles that of old age, where the nervous structure has lost its plasticity; and free energy is not only diminished, but resistances are created which, when acted upon by diminished forces, fail to yield, and blockage is the inevitable consequence. This diminished physical inactivity has its mental equivalent in lessened activity of mind as well as of body, formative, secretive, eliminative, and motorial. It is well to bear in remembrance that, in the majority of cases of exhaustion from influenza, the nutritive processes are in part retarded, so that a man may have the appearance of being robust where there is a decided want of vigour and sustaining power. But we do not always get that loss of weight which usually accompanies distinct melancholia. We infer, therefore, that the metabolic processes are in like manner sluggish with the universal functioning of all

tissue. It is not common to find delusions of a pronounced and positive kind; still, if sought for, they will not unfrequently be found, although the patient will readily enough admit that they are merely passing results of temporary derangement of his imagination. By gradual and appropriate stimulation, by peripheral excitation of the visceral and vaso-motor nerves, reacting upon the spinal and cerebral centres, these patients rapidly recover. On the other hand (and I have no doubt most physicians will agree with the assertion), I have seen many sufferers from influenza presenting anomalies of mind which may be called *mental ailments*, existing one or two years after the original attack; and although I am willing to admit that time and change are potent factors in the cure of these cases, still, we must not forget (and experience proves this) the longer they last, the more likely they are to become chronic, and lead on to absolute and confirmed mental derangement.

This is, of course, a mere shadow-like fragment of this important subject, and it is not meant to be anything more.

DEPRESSION.

In a very large number of cases of influenza one of the most marked features is depression, leading to dejection and despondency, which in some take the form of profoundest misery and despair really painful to witness, and the most robust are not unfrequently the victims to this state of supreme unhappiness. For the time light seems to have gone out of life, and everything is seen in blank. They are unable to react rightly to fit impressions, and that which should be pleasing is labour and pain to them. The condition of the nervous system here is not altogether unlike the state produced by shock the effect of accident, which we know frequently causes so much disturbance of the nervous system. In each case we find *defective will-power*, *sleeplessness*, *troublesome dreams*,

and a temperament *capricious* and *explosive.* I have seen men, within twenty-four hours of taking the influenza, sob like children for hours together as though their hearts would break. I have not taken the trouble to examine such patients for hysterical stigmata, but it is quite possible such would be found if sought for. This emotional depression is most probably due to some disorder of the working of the highest nerve processes, owing to the low tension of the energy, which not only obtains there, but which exists throughout the whole of the nervous system, and with this diminished tension is associated a slackened activity of normal function everywhere. It is impossible for the nerve elements to receive impressions with zest and react to them with vivacity when they themselves are dormant, blocked, and inhibited. The feeble, flagging, and irresponsive cell and groups of associated cells are no longer representative of individual functions, which build up healthy individuality, and which give to man a hearty hold of the things of the world. Nature is unnatural to such beings, and their very bodily gait, and countenance, and movements, are the outward exponents of the sluggish molecular processes of the wearied soul within. This sense of gloom and dejection is a conscious living entity, as sad as Hades, where joy and tranquillity, and peace and love, are unknown. The afflicting and conflicting ideas of this moral state of depression and oppression are varied, sometimes by intensity of self-interest, and at other times by vagabond self-abnegation, and there are moments of self-reproach which exasperate the misery, and produce and pile up feelings of sadness, unutterable, and sometimes uncontrollable, without the conception or knowledge of wherefore or why. Woful indeed are this man's woes, and although to him they are vividly active and accentuated, they are so bewildering and inexplicable that what he apparently feels and realizes himself he cannot for the life of him make known to others. He is chain-bound

and spell-bound. By this I mean that he is physically and morally bound. The sacredness of life is seen only through a flimsy veil of conflicting emotions of doubt, of dread, and of determination to burst these bonds by one fell swoop of severance from the mortal to immortality, for hope never gladdens his heart, neither does good counsel enter his soul. He is painfully conscious of his dissolution and of his mental wreckage, and he has sufficient reason to perceive that he is not what he was or what he should be. His sufferings are those of painful distress and sorrow, intensified by his own woful and fulsome deadness to the joyousness of the world around. It is a true saying that if he were more mad he would be less sad, and less would be his burden of wretchedness, not only to himself, but to those about him. The complete loss of appetite, with loathing of food and a furred tongue, are almost constant accompaniments of this state.

Many a man with an active intellect has gone to bed with influenza, and at the end of a week has been unable to collect his ideas to write a letter ; I mean, without his having suffered from any manifest grave lesion.

In such as these we certainly find suicidal impulses arise ; but they are not common, and when they exist the patients have generally suffered from continuous brain strain and stress for some time previous to infection.

Cases of this kind require careful and special treatment, as they are essentially the subjects of nerve exhaustion and brain fatigue, with their accompanying troubles and ailments.

SLEEPLESSNESS.

I have stated that these patients suffer from disturbed sleep and absence of sleep, which must be corrected, or the feeling of utter helplessness and prostration will continue. I have no hesitation in saying that from eight to ten hours' sleep, profound sleep, effected by

morphia, acts like a charm in these cases, removing depression, *whilst any form of stimulant or tonic treatment is worse than useless, and very frequently harmful.* If it be needful to give the body complete physical rest, surely it must be still more important to secure physiological rest for the brain; and this is a point in treatment which never ought to be lost sight of; nothing recuperates the nervous system like a good dose of genuine, dreamless, unadulterated sleep. There is an accumulation of potential energy during sleep; and the freshness and vigour of body, the clearness, brightness, and activity of the intellect, after a *good* night's rest, are indicative of power and capacity for work. In health, fatigue and sleep go hand in hand; in disease, fatigue and unrest also go hand in hand. Sleep is looked upon as the diastolic phase of cerebral activity, and during sleep there is diminished excitability of the whole nervous system, the lessening of all functional activity. Heart, respiration, gastric, intestinal heat, secretion, point to this; and the same holds good of corresponding nerve-centres, and of the reflex excitability of the spinal cord. There is all the difference between superficial and deep sleep; the deeper and more wholesome the sleep, the longer it lasts.

In the treatment of sleeplessness, when due to the exhaustion of influenza, we should be careful to make a proper selection of the drug to be employed. I prefer opium and its preparations to all others, because drugs of the class of phenacetin have a tendency to produce the slow liberation from the brain-centres of a continuous and prolonged flow of energy of low tension, leaving the cells pretty well deficient of activity, so that in physical phraseology 'the human battery gets run down'; and so long as sleep endures, this running-down process continues, and may lead on to exhaustive delirium, coma, and dissolution. Even sulphonal, which under ordinary circumstances is a very simple and non-deleterious drug, has sometimes in

the sleeplessness from influenza produced the most utter fatigue, and prostration of an alarming nature, and it is interesting to find that many observers have noticed like effects. Dr. John Grant, of the United States Army, sends to the *Boston Medical and Surgical Journal* two instances of inconvenient and alarming symptoms where twenty grains of sulphonal had been administered. The first patient, a married lady, suffering from influenza with chest symptoms, after a week's illness considered herself convalescent; but, as she was still sleepless, twenty grains of sulphonal was given in hot water. In a few minutes profuse perspiration followed, and the patient sank into what appeared a profound sleep. Next morning, however, she awoke unrefreshed, and in such a state of prostration that she was unable to turn in bed without help, on account of muscular weakness. The patient was unable for some days to leave her room, but ultimately recovered. The second patient, who was also convalescent from influenza, but suffered from slight excitement and sleeplessness, was given twenty grains of sulphonal at bedtime, with the same almost immediate effect, and the next morning he was in a condition of similar prostration, almost unable to move a limb, and suffering severely from a feeling of constriction in the head, with a weak, compressible pulse. I think cases like these are of great teaching value, both from the scientific and clinical aspects, and serve as lessons for our practical guidance, and they certainly bear out the truth of Professor Huxley's remarks, namely: 'That it would be simply manslaughter for a doctor to treat his patients on the new and undigested principles of physiology.'

HEART AND CIRCULATION FAILURE

is the most unfortunate of all the exhaustions of influenza, and its consideration is of the most intense interest—in part, because the heart-muscles are, so to speak, the connecting-link between the volitional and the automatic.

The whole subject is of some complexity; its literature is vast and ever extending. My allusion to this matter must be brief: 'The *force* by which the blood is made to circulate is supplied by the heart-muscle (systole and diastole).'

'*The normal beats of the heart depend partly upon the maintenance of a due tonic condition of the muscular tissue. That tissue is capable of "variation" between "two extreme" conditions: that of extreme "atonicity," which gives rise to the phenomenon known as "diastolic," or I should prefer to call it "atonic standstill"; and that of extreme tonicity, characterized by the "systolic" or "tonic standstill."*'—Gaskell, Roy. Soc. Proc.

Each cardiac motor cycle consists of contractions and relaxations. The movements of the heart may be retarded or accelerated through nervous channels. This is a point for attention. The nervous supply of the heart is derived from the medulla oblongata and cord, through the vagus and sympathetic. The atonic, or relaxed, or exhausted condition of the heart is that of variability, and degree of variability of diastole over systole. The force of each contraction is diminished, whilst the cavity of the ventricle is no longer closed. Exhaustion and failure represent hyper-diastolic 'activity,' which is the reciprocal of hypo-systolic 'inactivity'; and woe to the heart which is found to 'stagger' between these opposing states of vaso-constriction and vaso-dilatation, for failure is too frequently the result.

The experimental physiology of the day, and clinical observation, leads pretty well to the same conclusion—that the beat of the heart is the result of stimulation from intrinsic cardiac ganglion cells acting upon the excitable muscle plasma and contractile tissue of the heart-muscle.

'The vaso-*inhibitory* and the vaso-*motor* cardiac nerves leave the central nervous system, the former among the fine medullated nerves which characterize the formation of

the cervico-*cranial* rami vesicuales into the *distal* ganglia, the latter among the fine medullated fibres which characterize the formation of the *thoracic* rami vesicuales into the proximal ganglia of the heart.'

It is a question for consideration in heart-failure whether it be due to defect in the strength of the stimulus coming from the central nervous system, or whether, on the other hand, it be due to some defective or resistant agency in the normal receptivity of the heart-muscle.

In the heart-failure accompanying an attack of influenza, we are naturally led to conclude that the toxine exercises its influence upon the vaso-inhibitory cardiac nerves, and that the vaso-motor cardiac nerves being in this way uncontrolled, rapid action ensues, leading to failure and exhaustion with characteristic frequency, rapidity, and compressibility of the pulse, a state similar to that produced by the administration of atropine, which in effect is equivalent to an interruption between the vagus nerve and the heart. It is just as possible for the toxine of influenza to paralyze the intra-cardiac inhibitory apparatus, as it is for atropine to do so ; the former, however, being cumulative in serious cases, the paralysis is so profound and continuous that the vaso-constrictor centre becomes finally and completely arrested.

From the clinical point of view, there are two cardinal signs of vital importance which commend themselves to our notice relative to the diagnosis of what is, and what is not, an attack of influenza. During an epidemic the diagnosis is unattended with difficulty ; but sporadic cases are constantly occurring at the present time which are not always recognised, and which are set down and relegated to some inflammatory affection. In influenza the fall of temperature is sudden, and synchronous with it is the fall in blood-pressure, and a commensurate lessening of arterial tension at or about the third day of the attack. I am led to make this and the following statements entirely from

my own observation and experience, which may not, however, coincide with the experience of others: I have frequently founded my prognosis in these cases almost entirely upon the pulse, and I have rarely been mistaken. *If arterial tension falls with temperature, provided there be no serious complication, the prognosis is sure and decisive.* If the temperature *again* rises, it is clear evidence of some complication existing. *But no matter what this complication may be,* the tension of the pulse never regains its former level of acuteness. The shock to the nervous system, and particularly to the vagus nerve, has so depressed its activity that it seems incapable of exercising the power which it unquestionably possesses of influencing and controlling the different functions of the muscular tissue of the heart. The special effect of the toxine of influenza is to invade the domain of the vagus nerve, and to diminish its power as the trophic nerve of the heart. This is now an accepted doctrine, which is based upon both physiological and clinical reasoning; and, furthermore, it does seem that, in ordinary cases of influenza, the engendering agent, whatever this may be, exerts its initial influence upon the peripheral rather than upon the central portion of the vagus. I would submit that, in contradistinction to peripheral inhibition and subacute neuritis which we meet with especially in the vagus and trigeminal nerves in ordinary influenza, we have also another condition where the *toxine* exerts its influence specially upon the central and ganglionic parts of the nervous system, producing those changes which are the outcome of vasomotor and trophic disturbances, and which result in inflammatory states in the lungs and nervous system, as well as in the heart and circulatory apparatus. But when death takes place from influenza, no matter how severe the pulmonary complications are, it is not due to failure in the respiratory centre, but it is sequential to, and dependent upon, exhaustion of the heart and circulation.

The increase of blood-pressure on the arterioles, as evidenced by the increased tonicity of the pulse, is in this disease, according to my way of thinking, of exceptional clinical interest. I have never observed in influenza the strong bounding pulse with exaggerated tension, high pressure, and difficult compressibility. It is perfectly true that there is a decided increase of tension, but this never exhibits itself beyond the range of 'high tonicity,' and the pulse-beats are rarely more than five or ten per minute beyond the normal. This pulse is often to be found with a temperature of 102 or 103° Fahr.; it has not the increased firmness so characteristic of high arterial tension. The circularity in outline of the artery shows, however, complete fulness, but its elasticity and compressibility are at all times self-evident. Yet it has always appeared to me indicative of a strained, ill-sustained, and laboured circulation, *somewhat* akin to the pulse of aortic regurgitation, without its physically collapsing characteristics and impulsive systole. I have often thought that in this pulse, which is so special that I have no hesitation in calling it the 'influenza pulse,' we have the best clinical evidence of the great value of physiological research in leading us to a knowledge of the immediate determining nerve factors of such a condition, which are credited to the governing fibres of the vaso-constrictor and vaso-dilator nerves, *when equally energized*, both being in an equal state of tension energy, such a view leading, on the one hand, to the conception of the causation of the tonicity of arteries and of the rhythmical beat of the heart, and, on the other, to the action of the vaso-dilator nerves and the vagus. During the height of an attack (or febrile stage) of influenza, it is reasonable to assume that not only the vaso-motor centre, but the ganglia of the heart and arteries, are, for the time being, in a state of irritability and high tension energy; that they are labouring under conditions of stress and strain, and that both control and subjection are

in states of aggravated antagonism; that the normal stimulus of constancy and continuity which are essential to bring about the perfection of rhythmical action is not lost, but intensified, with the result either that the opposing forces will exhaust their strength equally, and remain for a time in a like manner exhausted, or that the one will defeat and overpower the other. Clinical experience verifies this observation, and in justification I could adduce cases in proof; but suffice it to say, and this is my own testimony: 'The heart and circulation are proximally and sequentially the greatest sufferers from the action of the toxine of influenza upon the nervous system;' that if we find a *coincident* and rapid fall of *blood-pressure* and *temperature* with greatly increased rapidity of pulse, it is evidence of great nervous exhaustion, and the prognosis is of the most grave and serious nature. On the other hand (and I make no exception even when complications exist), if with the rapid fall of temperature the tonicity of the circulation remains relatively unimpaired, a hopeful prognosis may be given, even when other conditions are sufficiently serious to give room for anxiety.

THE END.

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