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Theses
On the Nervous System and its influence on the Organic Functions

Thesis

by

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The State of the Human Race being a state of Society, each dependent upon one another, Man is therefore Compelled to Study the Characteristic disposition of those with whom he associates or to far as it is necessary to do so, with a view to his own advantage or to enable him better to perform the Duties belonging to his Calling.

From the mysteries of the Material world to the immaterial Intelligence that regulate the laws of the Universe, there is no object of Study more noble and interesting than the science of the nature of Man himself in the very extensive sense in which it comes under the sphere of the Physician. And the Duties of his profession afford him great advantage above any others of acquiring a knowledge of this Science, when in its most extended Signification, having to deal with every order of Society from the rich man who labours to get an appetite for his dinner to the poor man who labours to get a dinner for his appetite; and having to Contemplate the mind not simply in the abstract as Metaphysicians, but in its connection with the physical structure of the body, viewing the intimate relation between the body and mind, which enables him to trace
Moral effects to physical causes. And a knowledge of this relation enables the physician to attribute to physical causes what others look upon with profound astonishment as being the result of some mysterious agency. The mysterious relation between the mind and corporeal organization, both subject to various agencies from without, both undergoing various changes from disease within, is one of the most arduous difficulties which beset the path of the physician; and the solution of these difficulties gives to medicine its highest character as a science, the agencies and forces concerned are different from any other (with) we meet with in the other sciences. The introduction of the principle of life gives rise to new relations; occult and complex in their nature, to be reasoned and resolved upon by the physician, who alone can adequately study their nature and conceive the complexity of their phenomena. Some of these relations have been determined and converted into use in the treatment of disease; and the further understanding of them is the best augury in the advancement of medical science. Every philosophical physician is bound to acquire a knowledge with due estimate of the law and limits...
limits of scientific inquiry of the relation
between the mental and bodily organization
in order to understand the nature and treatment
of disease. There is scarcely any morbid affection
affecting the body in which some function of
mind is not engaged.

I shall now consider what is known of
the nervous system itself, and a more interesting
feature could not engage the attention, forming
a medium position between those which deal with
matter and those which have relation to the
functions of animal life and mental existence.
This branch of physiology has lately begun
to engage the attention of Physiologists and
Philosophers, and seems at present to be on the
 verge of some great discovery. In this Essay
I shall adhere to those points which regard
the nervous system as it is developed in man.
The nervous system is an apparatus the
possession of which is the peculiar and char-
acteristic endowment of the animal kingdom,
but it cannot be regarded as universally present
in some of the classes which possess the title to
be ranked in the animal kingdom. It is in
the Radiata that nervous matter in its simplest and most rudimentary form has been detected by the aid of the microscope. As we ascend in the scale of animal creation we meet with a progressive development of this system, sometimes by a modification of type and in other by the addition of new organs, according as the uses and necessities of the class of animal require, until it reaches its highest development in Man, in whom it becomes that part of the organism to whose welfare every thing else is rendered subordinate. In the nervous system lies the life of the individual and every organ in the body, and every function performed by these organs and every other organic process from the simplest to the most complex have for their especial purpose the welfare of the nervous system. Many of the organic functions are dependent upon it. But in its relations to those functions we find the nervous system employed in its simplest mode of operation, taking place independent of all consciousness, will or instinct by simple reflexion. Reflex function then by which automatic movements are performed without the participation of consciousness.
What is Vegetative Continuity?
Consciousness is the simplest application of the nervous system in the animal body, and upon it depend the greater part of the movements of the lower animals. It is impossible to say in regard to the action of the lower animals, to what extent they involve feeling and emotion similar to those which we explained. But there is no doubt that they have consciousness of some kind, whether analogous to that possessed by man cannot be said in the present state of our knowledge, but among the higher animals the difference is not so great as is generally supposed, being more in degree than in kind. But among the lower and especially among those in which the system does not exist the difference must be very great; the difference becoming greater as we proceed downwards in the scale of animals, every class possessing consciousness peculiar to itself. Even in those animals where it has not yet been detected we have no grounds to suppose they are destitute of some kind of consciousness, although we cannot understand its nature (but very near the vegetative in its nature). — Although
there are various points still undecided, the refined and beautiful anatomical researches have determined the relation and office of many parts of the nervous system; and the most important points which those researches revealed, are the structure, function, and office of the Cerebro-Spinal axis, in its relation to involuntary or instinctive actions; on the other hand, to the sensations and volitions which compose the mind with the material organisation around it. The Cerebro-Spinal axis consists of the Sensory ganglia Medulla oblongata Spinal Cord. That its automatic characteristics, independent of either the Cerebrum or mind is now fully established; and many actions and functions which were once ascribed to the influence of cerebrum is well known to take place independent of volition or any other faculty of mind, but dependent upon some force inherent in the nervous matter. The transmission of motion in one place by sensation in another, and conversely of sensation by motion. And this takes place under the influence of the Spinal Cord without the intervention of Consciousness, the Spinal Cord having within itself.
itself the instruments requisite to produce those automatic actions which are essential to the well being of the individual. And we find that those functions which are absolutely essential to animal life—respiration, and those various acts which belong to the digestion of food have their origin entirely in the medulla oblongata but subject to some voluntary influence. So we see every segment of the spinal cord, and every one of the sensory ganglia in common with the cerebrum, are independent centres of nervous power, but under the subordination of the cerebrum, the will, if it has its due predominance, can keep in check every other impulse.

It is only through the sensory ganglia that the individual becomes conscious of any objective impression, and objective impression is directly conveyed to the cerebrum, wherein the individual becomes cognisant of it and to this impression the name of sensation has been given, when the change thus produced is conveyed further upwards to the cerebrum from the sensory ganglia it gives rise to the idea, and thus becomes the subject of intellectual operation.
operation and the action of the will is finally produced which may exert itself according to its own prompting. If the impression be interrupted in its course upwards it ceases to its power to continue producing reflex action the nature of which depends upon the part of the cerebral-spinal axis where it meets with the interruption. When the impression does not reach the sensory ganglia we have an action without sensation (cerebro-motor) when it reaches the sensory ganglia we have the action produced by the prompting of sensation and the intercession of consciousness. But when the connection with the cerebrum is not cut off, the impressions, which have produced the sensation in the sensorium, do not reach immediately upon the motor apparatus, but transmit their influence up to it, giving rise to ideas and reasoning processes which operate upon this motor apparatus either emotionally or rationally, and the sensory motor action take place only when the upward transmission of the impression is checked. We thus see that the operations of the sensorium is in the normal state, under the subordination of that of the cerebrum, and in the connection between
between it and the organs of sense and motion, by the combination of which the mind is brought into relation with the external world. For all mental acts must have their origin from the stimulus of sensation. Now the sensory ganglia transmit the sensorial changes produced by the impressions brought to them, to the Cerebrum, and are the instruments by which voluntary movements are directed and controlled by the guiding sensations which they furnish. The sensory ganglia are also the Centre of Voluntary Motion which is produced in obedience to the impulse transmitted downwards from the Cerebrum; for it is now proved that the nerve forces generated in the Cornubations are directed towards these centres so that the same result is produced as if the impression was conveyed along a sensory nerve, so that the Cerebrum calls the Motor apparatus into action by idea, emotion, or voluntary determination. In what we call voluntary movement, the will is limited to the determination of the result and the production of the result is dependent upon the Concurrence of guiding sensations.
Sensations furnished from the muscles called into action; there must, therefore, some intermediate agency which executes the actions determined by the will, which is the automatic apparatus, and those movements differ from each other only in the different source of the stimulus by which they are exerted. The relation which the mind bears to the nervous organization which has been the subject of controversy in every age of philosophy, but an explanation of the relation between the two is wholly unapproachable by human reason in our present state of existence. There is a closer relation between mind and force, we have mental agency giving rise to nerve force and also nerve force giving rise to mental activity. The power of will, which is a mental faculty, gives rise to nerve force, and nerve force giving rise to mental activity. There must be a correlation between those agencies, which is not unlike that between electricity and nerve force. In a physiological point of view the cerebrum is the instrument through which nerve force is transformed into mind force, and mind force into nerve force, and before this metamorphose can take
place there is produced a change in the state of the material organism through which it is affected, and this is the Cause of the exhaustion produced by mental labour; it being Consequent upon the disintegration of the nervous matter. This nervous power, whether produced by subjective or objective impressions, is produced along the nerves to fulfil its function in the internal parts of the body to which they Conduct, establishing the relations between the mind and the material organism. We have grounds to suppose that it is an element of simple nature, capable of similar relations of quality and intensity but when transmitted to different organs will produce different results. It is certain that the amount of this nervous force undergoes variations, in different and even more striking, in the same individual. The terms Exhaustion, Deficiency, Reappearance are familiar in medical language, to express our bodily state or fulness. Deficiency in the quantity of the force is what we more frequently recognise which we express in ordinary language.
by the terms fatigue and exhaustion of which every one must occasionally experience; sometimes produced by state of the atmosphere, sometimes without obvious cause, sometimes from over exertion or disease. This deficiency may be produced from defective production of the power and from expenditure of it; and this is a physiological fact very interesting to the physician in so far as it has relation to the whole economy of life, this deficiency being sometime the most Centrical symptom in some diseases. Mental and bodily labour are concerned in expenditure and reparation of it; that a feeling of fatigue and inability is produced by excessive mental or bodily labour is a fact well known to every one.

Excess of sensation causes exhaustion of the power, as is well known to every medical man, being exemplified by the Collapse frequently following surgical operation. The effect of the excess of the amount of nervous power has not been attended to so far as it should have been.
in the theory and treatment of certain affec-
tions, the cause of which can be as plainly
ascribed to this anomaly as fatigue
from deficiency. An instance of which
we have in Epilepsy, Chorea, and other
parasitic disorders and probably in
forms of Mania.

It would be vain presumption
in me to enter upon any discussion of
on the nature of the nervous power to
which I have been referring in the preceding
pages. It is a topic which has fur-
thished material for discussion to many
eminent Physiologists, but as yet remains
among the enigmas of physiology, waiting
solution from the researches and investiga-
tions of a future generation, and if at any
time successfully solved it shall rank
foremost among future discoveries. It
may be identified, with those surrounding
us in nature, or it may not have any
type elsewhere in Creation. Before leaving
the inquiry into the nervous system I
must draw attention to another question
involving a topic of great interest in the
Economy.
economy of life; not the close relation of the nervous system and blood vessels and muscular contractility to which I shall have to refer afterwards. The co-operation of the nervous and vascular system is so essential that no function can be perfectly performed without them. They have a material action upon one another which is necessary to exist in order to maintain their respective powers.

After the preceding remarks we shall do better now to enter upon the influence of this great system upon the functions of the animal economy in maintaining health and producing disorder and disease.

The ways in which disease may originate are very various and the condition of which they consist are as various. The causes according to Dr. Henderson of disease may act 1st as admixture of foreign substances with either the blood or tissues. 2nd as mere adynamic agents disturbing the conditions of tissue without becoming incorporated with them. 3rd as acting through the nervous system. 4th as chemical agents. It is the 3rd of these causes
Causes alone that came, specially under the domain of this essay, and to it principally I am to confine myself. The nervous system is concerned in providing the mechanical conditions either immediate or remote under which the organic functions are performed, so that its activity is essential to the maintenance of their functions and its influence is not confined entirely to the motor or contractile tissues of the body but also extended to the molecular change which constitute the function of nutrition, secretion, &c., but these processes are not altogether dependent upon nervous agency although to a great degree under its influence, as is seen when the vagus nerves are cut the gastric juice still goes on secreting, but that the function of secretion is influenced by the state of the nervous system is sufficiently evident. They may be not only increased to superabundance, but also may be changed in their Character by impressions on the nervous system, as has been found in some cases, the milk of the mother changed to far in its Character.
Character from a fit of anger, that it proved a fatal poison to the Child. The nervous influence, which modifies and controls the processes of organic life, is exerted principally through the Sympathetic system, and those of nutrition and secretion appear to have the closest dependence upon it; but whether the nervous power is generated in the ganglia of this system, or merely modifying and directing the passage of the power from the spinal nervous centers, has not yet been fully deter:

The connection of the Sympathetic nerves with the vascular system although very obscure in the present state of our knowledge is a point of much interest to physiology, nor is it of less interest to know their agency in the effects of mental emotion upon the vital organs, seeing that the alimentary canal from the stomach downward, with the gland adnexa opening into it, the urinary and generative organs and the diameter of all the blood vessels, receive no other supply and consequently whatever influence these parts may receive from mental state or from irritation is applied to themselves the system of nerves.
Nerves must be the only channel and the
same is true of a great number of the
glandular apparatus and chiefly their
bloodvessels, any alteration in their function
as in the case of the secretion of milk
already mentioned, depending upon Con-
dition of mind, cannot be brought about
through any other channel; but we find
also that some organs whose activity of
function are most obviously influenced by
state of the mind are also supplied through
the Cerebro-Spinal system. Therefore it is
highly probable that the influence of
the mental state upon the functions
of these organs may be exerted both
through the Cerebro-Spinal and Sympathetic
System. This in virtue of the Connection
of the Sympathetic and Cerebro-Spinal
System that those parts which are solely
supplied by the former are capable of
transmitting sensory impressions to the
Sensory and Vice Versa. These are
various organs, although not affected by
any effort of the loile, but are influenced
by certain states of the mind, as motions
and
and attention, we find the heart sympa-
the orsy to much with the emotions that
it is referred to as the seat of the
feelings, also certain states of the mind
produce alteration in the character of
the blood vessels to as to give rise to the
blush of modesty or shame and the palor
of fear. The influence of the state of
expectant attention upon the heart, its
action as Dr. Holland has remarked is
quickened or otherwise disturbed by the
mere Centrung of the Consciousness upon
it without emotion or anxiety and
the same may be said of the acts of
respiration. The alimentary Canal
is affected in a similar manner as is
manifested by a case of a patient under
Dr. Carpenter's care. The patient was
seated before him, with the abdomen
uncovered, and was made to fix his
attention intently upon his abdominal
sensations, assumed that in a short time
he would begin to feel a movement in
his bowels. In a short time the expecta-
tory movements were felt and a copious
Evacuation.
Evacuation followed.

It is now satisfactorily proved that the pneumogastric nerves exert a regulative control over the secretion of the gastric juice, and the same applies to the other secretions.

The influence of certain states of the mind in modifying the various secretions, for example had been the salivary secretion increased under the moderate excitement of the emotions, and checked by violent ones, as in intense grief the tears do not flow. The flow of saliva is increased by the taste or thought of food and suspended by violent emotion as shown by the test resorted to by the Indians for detecting a thief. There is every reason to believe that the gastric juice is affected in the same manner as that of the saliva, hence the favorable effect of cheerfulness on the performance of the digestive function and of the opposite state of feeling in suspending it. No secretion is strongly marked by the influence of the nervous system, especially
especially the emotional states as that of the mammary glands, the secretion is augmented by the sight or thought of the infant, especially when associated with the idea of suckling, this gives rise to a rush of blood to the mammary arteries of the gland analogous to that which takes place in the act of blushing, these dilatations taking place through the instrumentalities of the sympathetic nerves. The change which the emotional states bring about in the mammary secretion is not peculiar to it alone, although we are not able to detect their effect upon other secretions, as we have in the system of the child affording proof by disorder of its functions, of Changes in the character of the secretion. Which no other examination could detect. These changes are brought about by fear, grief, abruptness of mind, and anger. The influence of the state of the mind upon the function of nutrition is far less evident than upon the secretory process. But we see the result in the altered nutrition of these parts exposed to.
to external impressions. The withdrawal of certain influences from a part renders it less able to withstand the destructive influence of physical agencies. We have the influence of depressing function upon the function of nutrition often manifested by the change produced in some part of the body, as in the instance or record of the hair of robust healthy persons being changed gray in the course of one night. We have sufficient inferred that severe violent excitement of some depressing function as terror may produce a fatal crisis of the organic functions and the symptoms resemble those of sedative poisoning strongly indicates that there is some change produced in the blood which may be the cause of this disturbance of the animal functions. But there can be no doubt that the habitual state of the emotional sensibility has an important influence upon the general activity and perfection of the nutritive process as is shown by the well-nourished appearance
usually exhibited by those who are free from mental anxiety as well as from bodily ailment. Contracted with the lean and angry look of those who are a prey to controversial discontentment. This disorder of nutrition by mental motion is confirmatory by many facts on record of which this is a remarkable instance. A lady who was watching her little child at play, saw a heavy window-sash fall upon its hands cutting off three fingers, and she was so much overcome by fright and distress as to be unable to render it any assistance. A surgeon was speedily obtained who hurriedly dressed the wound, turned to the mother, whom he found seated howling and complaining of pain in the hand. On examination, the fingers corresponding to those of the child were discovered to be swollen although they had ailed nothing prior to the accident. In four and twenty hours, incisions were made into them and pus evacuated; sloughs were afterwards discharged and the wounds ultimately healed. The influence of attention on the process of nutrition and secretion.
Secrecy often very manifest. The simple direction of the Consciousness to a part independently of rational excitement but with the expectation that some change will take place in its organic activity is often sufficient to induce such an alteration, and would probably always do so, if the concentration of the Consciousness were sufficient, as is well exemplified by the experiment of Mr. Baird upon individuals in the "hypnotic state" and when it has been thus proved that the voluntary direction of the attention to a part produces salutary results, the involuntary fixation of the attention upon what is to be the result must produce the same effect and from the expectation of benefit from some Curative Method in which full Confidence has been placed that we attribute those Cases which have been produced through the imagination. And this fact enables us to understand and account for the Amendment which has been produced in many insalubrious practices which could have no other effect than
than to direct the attention of the sufferer and keep him in confident expectation of the Cure. The Charming Away of disease by Spells and Royal Hands must all be ascribed to this Cause not omitting the Globulistics Administration of Infinitesimal Doctors and the Manipulation of Mesmerists of our own day, all which from sometime very Successful in the manner just described; and often the same fact affects the opinions of our most trustworthy medical observers as to the efficacy of some Drug which has been successful in his hands, but the efficacy lying not in the Drug but in drawing the Attention of the patient to the fact and Confident that the Drug would produce a cure of the Malady. This Confident expectation often operates for evil as well as good, a belief that a Disease had pierced the Frame which would prove Mortal despite any treatment, the sufferer losing all hope and Confirmed, has been in numerous instances the Cause of a fatal result. Hence the Hypochondriac
by directing his attention to his own fancied ailments and morbid feelings tend to induce real disorder in the action of the organs which are supposed to be affected.

We have already referred to the intimate relation between the nervous and vascular system and we cannot doubt for a moment that some essential object in the animal economy is served by this intimate relation. And that such is the case we have sufficient evidence. We have seen the effect produced upon the functions of nutrition and secretion by mental emotions, this state of mind being the principal channel through which the mind has any influence upon the body, and the emotional states possess this capability from their immediate relation to nerve force, which produces different results according to its quantity. It is a familiar fact to every observer of human nature that violent treatment of the feelings most speedily subsides when these are not unrestrainedly expended themselves
themselves in their expressions. Thus quick-tempered persons, manifesting great irritability on small provocation, soon forget the affront; whilst those who display little anger cherish their feeling of indignation, but will give vent to them when a favourable opportunity happens to arise. Thus may irascible persons give vent to their indignation by a hearty explosion of oaths, the insalubrity of which seems to be a safety valve for the excess of nervous force. Again the distressing emotion are worked off by a fit of crying or sobbing, the nervous force being expended in the production of an increased secretion of tears.

If the excess of nervous force were not exploded in this manner, a worse result would follow either on the part of mind or body. The frequency of Hysteria in women may be fairly attributed to excess of nervous force along with the circumstances, that in all that relates to sexual love, she is restrained by the nature of her situation and sense of Decorum.
Accompanying vain to the feeling, which the patient cherishes and whose injurious influence is exaggerated by the attention she pays to them. Although this disordered state of the nervous system by the motion is essential to hysteria, there are often seen in most cases at play acting as exciting causes. We sometimes find an excess of nervous force producing augmented and perturbed activity of the sensory ganglia causing a predominance of sensory motor over the volitional power, giving rise to the jactating convulsions, interfering with volitional movements, which is known as Chorea; and this as well as the following disorders appear generally traceable to a state of imperfect nutrition depending upon a depraved and poisoned state of the blood, this at least acting as the predisposing cause, while great excitement of mental motion bring on the attack and this excitement of the motion or nervous force has already been found to give rise even to the disorder of the blood which interfered.
interfered with the proper nutrition of the nervous system and producing a disturbed state of all its functions, according to the extent it is affected. Sometimes the Cerebrum only is affected, other times the sensory Ganglia other times these remaining while the disorder is limited to the Spinal Cord. Thus we find that the primary part affected is the Sensory Ganglia; a disordered condition of the blood intermixing with their proper nutrition and preventing their action. When the Spinal Cord is the part affected we find its activity either increased or diminished or completely suspended as in Syncope, Concussion + Tetanus. That all those mentioned may be produced by the influence of nerve force or emotional excitability is sufficiently evident, finding that these exert a direct influence upon the physical powers through the organs of Respiration and Circulation, the heart's impulses being more vigorous and regular and the action of the bowels being more efficiently performed by Cheeful
Cheerful and joyous emotions; whilst an altogether contrary effect is produced by depressing or overexciting ones, or in other words a due and moderate quantity of nervous force produces the favorable results above mentioned, whilst an excess or deficiency quite the opposite.

In conclusion I must again remark that this topic, from its importance to the physician in coming to a direct and true knowledge of the etiology and treatment of disease, and from the interest now taken in the study of it, must undergo great advancement, as has happened to other physical sciences. Those of physiology and psychology being now more attended to conjointly than separately as has hitherto been the case, a circumstance which promises a discovery the importance of which shall be known only to future generations. — Finis.