

WILDER. (ALEX.)

The ganglionic nervous
system.



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The Ganglionic Nervous System.

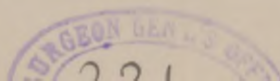
By ALEXANDER WILDER. ✓

“It must be now obvious,” remarks Dr. John O'Reilly, “that a thorough and comprehensive knowledge of the laws and connections which govern and regulate the animal and organic nervous system is indispensably required by every medical practitioner—such, in reality being the Alpha and Omega of medical and surgical science. It is the foundation on which a permanent superstructure, capable of containing a universal knowledge of the nature of diseases, as well as a true explanation of the *modus operandi* of therapeutic agents, can be created.”

John W. Draper goes further and asserts that the advancement of metaphysical science is through the study of Physiology. “In his communications throughout the universe with us, God ever materialises,” this accomplished author declares. “I am persuaded,” he adds, “that the only possible route to truth in medical philosophy is through a study of the nervous mechanism.”

We may not accept this conclusion unqualifiedly; but we can by no means dispute the importance of that knowledge to an intelligent understanding of the various problems with which we deal. It is essential to judicial as well as speculative investigation, and it will ultimately distinguish the scientific from the superficial physician.

Whether we propose the study of the corporeal structure as philosophers, or simply as physiologists, the proper understanding of the nervous organism, its functions and relations, is essential. We cannot afford to rest content with an imperfect or superficial apprehension, but must push our research to the very core of the matter. It is incumbent upon us to learn all that is already known, and to endeavor to find out whatever else we may be able. The significance of this knowledge consists in the intermediate relation which this



organism sustains between the psychic nature and the bodily frame-work. The union which exists through this medium constitutes the physical life. The moral and mental qualities are thereby brought out and carried into outward manifestation and activity. Man is thus the synthesis of the creation, including in himself the subjective principles of the universe together with the objective factor which they permeate.

It is a common practice of teachers and writers accordingly to treat of him as twofold, a body and a soul. Knowledge is, therefore, usually classified as physical or scientific, and metaphysical, or beyond the province of phenomenal observation. All philosophy, moral and mental science, and whatever relates to causes and principles, are relegated to the department of metaphysics as being beyond the limits of sensuous knowing. They are the higher and more important as pertaining to that which is actually real, and as therefore furnishing the groundwork for the right understanding of things. The sentiment of Optimism, that all the creation and events partake of good and are from it, is from the metaphysical source, evolved from the interior depths of the mind. On the other hand, the views of life and action which many love to honor as practical have their ulterior origin in selfishness and a gloomy notion that all things are virtually controlled from the worst.

The psychic nature is correspondent to the corporeal, and constitutes the essential selfhood and individuality. It is, however, twofold; one quality is intellectual and perceives, the other is moral and feels. The latter pertains to the physical and emotional life, the former to the spiritual. The two are constantly in operation close together, so to speak; at times, however, they are not in harmony with each other. We feel and desire in one direction, when sometimes we are convinced the other way. Pleasure and pain belong to the emotional nature, happiness and unhappiness to the other.

This twofold aspect is in perfect analogy to the physical structure. Platô, following Pythagoras, sets forth in the *Timaios* with great appositeness, that the immortal principle of the soul was originally with the Deity, and that the body was made for its vehicle; and likewise that there was a mortal

soul placed in the body, having the qualities of voluptuousness, fear of pain, temerity and apprehension, anger hard to be appeased, and hope. These two psychic essences were assigned to different regions; the rational soul to the head and the sensuous to the body. There are accordingly two nervous structures, corresponding with the twofold quality. Modern writers are approximating this same mode of classification. There is the cerebro-spinal axis, consisting of the brain, the commissures and other fibres, the sensorium, spinal cord and nerves; and the sympathetic or ganglionic system, consisting of the various ganglia of the viscera and spinal region, with the prolongations, bands and fibres which unite them to each other and to other parts and organs. The origin of the sympathetic system, as fœtal dissections abundantly prove, is the great solar or semilunar ganglion in the epigastric region. It is the part first found in the embryonic period, and from it as a common centre the rest of the organism proceeds, differentiating afterward into the various tissues and structures. It is the very place at which, according to the great philosopher, the impulsive or passionate nature comes in contact with the sensuous or appetitive; and that it is the central point of the emotional nature is apparent to every body's consciousness. The instinct of the child and the observation of the intelligent adult abundantly confirm this. The ramifications of these two nervous systems, however, are more or less interblended; and this enables both to accomplish their distinctive functions in concert, each as auxiliary to the other.

The name *ganglionic* is applied to this system because it consists distinctly of ganglia and nerve-structures connecting them. Solly has proposed the longer but more expressive designation of *cyclo-ganglionic* system, as corresponding in its mere anatomical arrangement with the nervous system of the cyclo-gangliated or molluscous division of the animal kingdom. It is also very frequently called the *great sympathetic*, from having been supposed to have the function of equalising the nervous energy, the temperature and other conditions of the body. It has also been denominated the *vegetative system*, as controlling the processes of nutrition and growth; the

visceral, intercostal and *triplanchnic*, from its presence chiefly in the interior part of the body; the *organic* as supplying the force which sustains the organism in vigor; and the *vaso-motor* as maintaining the life of the blood-vessels, enabling them to contract and pulsate, to send forward the blood, and so keep the body in wholesome condition. Draper considers that the name "sympathetic," which is most common in the text-books, has been a source of injury to the science of Physiology, and that it would be well even now to replace it by such a term as *vincular*, or *moniliform*, or some title of equivalent import. This would indicate the fact that the ganglia of this system are connected like a necklace or chain of beads. Nevertheless, as the designation of "ganglionic" approximates that meaning as well as indicates the peculiar constitution of this nervous system, it is preferable.

The function of the ganglial nerve-cells and molecules consists in the elaborating, retaining and supplying of "nervous force." The chief ganglion is denominated from its peculiar form the *semilunar*; and the group which surrounds it is known as the *solar plexus*, from the fact that this region of the body was anciently regarded as being under the special guardianship of the solar divinity. It has been designated "the Sun of the abdominal sympathetic system," and Solly describes it as a gangliform circle enveloping the *cœliac axis*. From this circle branches pass off in all directions, like rays from a centre, and it appears to be the vital centre of the entire body. Injuries at every extremity report here, and every emotion and passion has its influence for ill or good directly at this spot.

It is not necessary here to give more than a cursory sketch and outline of the history of the cerebro-spinal axis. If we consider it according to its process of evolution, we must begin at the medulla as the first rudimentary structure. In point of time the ganglionic system is developed first, being in full operation in the unborn child, while the other can hardly be said to begin a function till after birth. The rudiments of the spinal cord are found to exist, nevertheless, at a very early period in foetal existence. The close relation of

the medulla oblongata to the sympathetic system is shown by the evidences of inter-communication, and more particularly from the fact that it is the seat of power for the entire body. It seems to be the germ from which the entire cerebro-spinal system is developed, and is, in fact, the equator of the cerebro-spinal axis. At the superior extremity, two fibrous branches extending toward the rear of the head form two of the lobes of the cerebellum at their extremity. A second pair of fibres develop into the optic ganglia, whence in their turn proceed two nervous filaments with the rudimentary eyes at their extremities. The auditory and olfactory nerves issue from the ganglia at the medulla, each with the rudimentary structure of the future organ attached to it. Another and later formation is the frontal lobe of the brain. In due time, but not till some time after birth, the whole encephalon—brain, commissures, sensory ganglia, cerebellum—becomes complete.

The spinal cord below and the nerves are also formed about simultaneously with the other parts of the structure.

It may not be amiss to suggest that the primordial cell or ovule is itself a nervous mass, and that the spermatic fluid appears to unite with, if not to consist entirely of, material elementarily similar with that composing the nerve-substance. This would seem to indicate that the germ of the body is nerve-matter, and that all the other parts, tissues, membranes, and histological structure generally were outgrowths or evolutions from the nervous system, if not that system extended further. There is nothing known in physiology that conflicts radically with this hypothesis. If it is actually the case, the understanding of the nervous system and its functions can be greatly facilitated.

The cerebral and spinal systems of nerves together perform the several functions of feeling, thinking and willing, as these are commonly understood. These are the actions of the *central ganglion* or "registering arc," which receives impressions of the brain which perceives them, reflects upon them and wills; and of the *corpora striata* and motor nerves, which

are the agents to transmit the purposes of the will to the voluntary muscles to be carried into effect.. The brain is their influential organ.

Offshoots from the ganglionic system pass upward and join the cerebro-spinal at every important point. Closer examination shows that they go in company with the blood-vessels which supply the various structures of the brain, indicating that the brain exists and is energised from the ganglial system. Each of the cerebral ganglia is arranged on an artery and arteriole like grapes on a stem. In an analogous manner there is a double chain of these sympathetic ganglia, over fifty in number, extending from the head along the sides of the spinal column to the coccyx, which give off fibres to the various spinal nerves which proceed from the vertebral cavity to the various parts of the body. They are named from their several localities, the cervical, dorsal and lumbar ganglia.

In like manner, there proceed from the central region, distinct filaments, which under the name of *plexuses* accompany all the branches given off by the abdominal artery. So we have the carotid, the superficial and deep cardiac plexuses, the phrenic, gastric, hepatic, splenic, supra-renal, renal, pudic, superior and inferior mesenteric, and others. These plexuses are made up of nerve-cords from different sympathetic ganglia, and filaments from certain of the spinal nerves. The nerve-cords proceed from these plexuses to their ultimate distribution; showing that the plexuses serve to combine the various elements in order to form an extremely complex nerve. As regards the ultimate distribution of the Great Sympathetic, it sends its branches to all the spinal and cranial nerves, and they undoubtedly communicate the vital stimulus to these nerves and accompany them to their extremities. The coats of all the arteries are supplied in like manner, and also all the innumerable glandular structures. The viscera, thoracic, abdominal and pelvic, all more or less abound with sympathetic nerves.

One ingenious writer computes that the heart stands at the head of the list; as it receives six cardiac nerves from the upper, middle and inferior cervical ganglia, and has four

plexuses, two cardiac and two coronary, devoted to its supply; also numerous ganglia, embedded in its substance, over and above. These are centres of nervous force for its own use.

The supra-renal capsules come next, and after that the sexual system. Internal organs are more copiously supplied than external ones; hence the female body has a much larger proportion than that of the male. In consideration of this richer endowment, women, and indeed the females of all races and species, have a superior vitality and even greater longevity. The organs of special sense, the eye, internal ear, nasal membranes and the palate seem to come next. After these are the stomach, the intestinal tract and the liver; and last of all, the lungs.

The minute ramifications of the ganglionic nervous system constitute its chief bulk. The tissue is found with every gland and blood-vessel, and indeed is distributed so generally and abundantly as to extend to every part of the organism. It would be impossible to insert a pin's point without wounding or destroying many of the little fibres. The ganglia themselves are almost as widely distributed as the nerve-cords; so that the assertion of Dr. J. C. Davey is amply warranted, that the nervous tissue of the ganglionic system constitutes a great part of the volume and weight of the whole body.

The entire structure of the sympathetic system differs essentially from that of the cerebro-spinal, indicating that there is a corresponding difference in function. The arrangement, the great number and extraordinary diffusion of its ganglia, the immense number and great complexity of its plexuses, are so many additional proofs, if these are needed.

The ganglionic system of nerves, with the solar or semi-lunar ganglion for its central organ, performs the vital or organic functions. Secretion, nutrition, respiration, absorption and calorification, being under its immediate influence and control throughout the whole body, it must animate the brain as well as the stomach, the spinal cord as well as the liver or womb. In point of fact, if either of these organs or viscera was removed from the influence of the gan-

glionic nerves entering so largely into its very composition, its specific vitality would cease ; its contribution to the sum total of life would be withheld.

The creative force is directed, as we see, toward the development of the central organ or organs predestined to give life and form to all others ; which it creates, assigning their peculiar force and direction, thus determining the essential parts of the future animal and its rank and position in the infinite being. Lawrence expresses the matter in these terms : " The first effort of the vital properties whatever they may be, are directed toward the development of a central organ, the solar ganglion, predestined to hold a precisely similar relation to the dull and unmoving organism, as the vital fire to the animated statue of Prometheus." Ackermann prosecuted the enquiry further, and insisted that the ganglionic nervous system is the first formed before birth, and is therefore to be considered as the germ of everything that is to be afterward developed. Blumenbach adds his testimony : " The nervous system of the chest and abdomen are fully formed while the brain appears still a pulpy mass." It is the foundation laid before the superstructure is built.

Mr. Quain sets for the priority of the ganglionic to cerebrospinal nervous system in regard to evolution. " As to the sympathetic nerve," says he, " so far from being derived in any way from the brain or spinal cord, it is produced independently of either, and *exists*, notwithstanding the absence of both. It is found in acephalous infants, and therefore does not rise mediately or immediately from the brain ; neither can it be said to receive roots from the spinal cord, for it is known to exist as early in the fœtal state as the cord itself, and to be fully developed, even though the latter is altogether wanting."

PSYCHIC FUNCTIONS OF THE GANGLIONIC SYSTEM.

It is an hypothesis generally accepted, that the brain is essentially the organ of the mind. Thought and cerebration are regarded accordingly as associated processes. The Moral Nature, however, as distinguished from the understanding,

operates in connection with the ganglionic structures. The common sense of mankind refers passion and emotion of every character to the epigastrium, the seat of the semilunar ganglion. This, in fact, rather than the muscular structure so designated, is the *heart*, or seat of the affections, sensibilities and moral qualities in general. The passions, love, hate, joy, grief, faith, courage, fear, etc., have there their corporeal seat.

While the brain and spinal cord constitute the organism by which man sustains relations toward the external world, the ganglionic system is the organ of subjectivity. He feels with it, and from this instinctive feeling coordinating with the reflective faculties, he forms his purposes. "We will find," Dr. Kerner truly remarks, "that this external life is the dominion of the brain—the intellect which belongs to the world; while the inner life dwells in the region of the heart, within the sphere of sensitive life, in the sympathetic and ganglionic system. You will further feel that by virtue of this inner life, mankind is bound up in an internal connection with nature." Dr. Richardson is equally positive: "The organic nervous centres are the centres also of those mental acts which are not conditional, but are instinctive, impulsive, or, as they are most commonly called, emotional."

It must follow, then, that all emotions will make themselves manifest through this part of the physical structure. We observe this at every hand. Every new phase of life, every occurrence or experience that we encounter, immediately indicates its effects upon the central organs of the body and the glandular structures. Every function is influenced by emotional disturbance. We lose our appetite for food, we are depressed and languid, or cheerful and buoyant, at the gratification or disappointment of our hopes, or at some affectional excitement. A careful consideration of the several forms of disease will disclose an analogy, and often a close relation between each malady and some type of mental disorder. The passions, fear, grief, anger, and even sudden joy, will involve the vital centres, paralyse the ganglionic nerves, disturb and even interrupt the normal action of the glandular system, modify the various functions of life or even suspend them.

These influences prolonged would bring about permanent disease, and indeed when sufficiently intense, will even result in death; and hence that maxim of Pythagoras cannot be too carefully heeded: "Let there be nothing in excess."

The converse of this, at least after a certain manner, is also true. Emotional manifestations result from peculiar conditions of the ganglial nervous system. At those periods of life, when the nutritive functions are exceptionally active, such moral faculties as love and faith also exhibit a predominating influence. We observe this in the young, and likewise in individuals recovering from wasting disease. But during the process of wasting, and when digestion is imperfect, the mental condition is morbid, and the sufferer is liable to be gloomy, morose and pessimistic.

The functional impairment of these nerves is often produced from mental disturbance. Indeed, there is a continual action and reaction between the mind and this nervous system so that each is the cause of corresponding moods and conditions of the other. The man who is suffering from nervous dyspepsia will experience a sense of great fear and the heart will be greatly disturbed; and again great fear will disturb the heart's action and prevent any proper digestion. For a time the fear resulting from the disorder will be simply terror; but after a while it will fix itself on an object. There will be the religious-minded person's fear of punishment after death, the lawyer's apprehension of making a professional mistake or losing money, the physician's terror of sudden death, poison, or incurable disease. Fatty degeneration of the heart and calcareous degeneration of the arteries are accompanied by great depression of spirits, and even by agonies of anxiety and terror. In a similar way, great fear will sometimes produce the sensation of stabbing at the heart. The rage of anger will also affect the motion of the heart and arteries and change the blood from pure to poisonous. An individual will turn deadly pale, lose more or less the control of his voluntary faculties, and in a very great excitement will fall dead. An angry woman nursing a child will make it deathly sick, and sometimes from the venom of her milk kill it outright.

In the exacerbations of fear, the sweat will transude through the pores, but will be more of the consistency of serum than like the product of the sudorific glands. Envy and jealousy arrest the action of digestion and assimilation, and if long continued will produce leanness. The example of Cassius in the drama of *Julius Cæsar*, is a forcible illustration; his "lean and hungry look" and sleepless nights were justly to be dreaded.

Instinct is plainly a function of the ganglionic nervous system. The infant manifests it in common with the lower animals; and in both alike it is not amenable to the reasoning processes. It is not to be cultivated, but it may be perverted.

DISEASE FROM IMPAIRED GANGLIAL ACTION.

Microscopic observation has not been carried to a degree of perfection warranting us to depend upon it in investigations of morbid conditions of the brain or nervous system. Few of the explorations of brains, whether of sane individuals or insane, are entitled to any implicit confidence. Dr. Copland declares that "changes may take place in the nervous system sufficient to cause the most acute disease, or even to subvert life, without being so gross as to be demonstrable to the senses." Dr. J. C. Davey also asserts that during his official connection with the Hanwell Asylum in England, eight per cent. of the cases examined *post mortem* exhibited no indication of disease to account for death. A culprit named Blakesly had been executed for murder, and a question was raised in regard to his insanity. It was formally reported to the public through the daily press that this idea was untenable, as his brain had been examined with great care, and no sign or appearance of altered structure or disease had been discovered. The inconclusiveness of such a position, Dr. Davey declares, is certain.

It is faulty pathology to define insanity as primarily and essentially a disease of the brain. It would be more proper to consider it as functional. The blood and nervous substance, Dr. Kreysig truly declares, are the primitive and essential instruments of all the organic functions; and hence "the elements of general and internal disease, or the morbid

predispositions which form the most important objects of treatment, may all be reduced to vitiated states of the blood and of the lymph; or to derangement of the nervous system." It is safe to supplement this quotation by the remark, that neither the blood nor the lymph would be likely to become vitiated except the organic nervous system had been primarily affected.

In fevers we find impairment of all the vital functions; the stomach refusing food or rejecting it, the liver failing to secrete healthy bile, the excretions no longer indicative of health. The heart's action is oppressed, as is also the respiration; and the skin betrays disturbance. The various symptoms are like those attending a blow on the pit of the stomach. Cholera, in so many respects differing from fever, exhibits a similar evidence of impairment. The patients, when the shock is great, fall dead as though struck by lightning, or by a blow at the epigastric region.

Disease of the heart is now set forth as a very frequent cause of sudden death. It would be more rational in many cases to impute it to fatigue and exhaustion. Animals hotly pursued and taxed beyond their power of endurance will drop and die; and birds, in their flight over the ocean, often fall dead from a similar cause. Individuals running till they are out of breath, or fatiguing themselves inordinately incur like peril. The late Vice-President Colfax, on a cold morning in January, 1885, hurried across the town of Mankato, in Minnesota, a distance of three-quarters of a mile, in order to be in time for a railway-train. On arriving at the station he sat down upon a bench and breathed his last. Mayor Havemeyer, of New York, died suddenly in 1874 under similar circumstances. General McClellan hastening to secure his passage on a North-River ferry-boat, contracted the fatal disorder of which he died. In these cases the exhaustion left no sufficient force or stimulus at the epigastric region to propel the blood or inhale the breath. The deprivation of oxygen could be accompanied by only one result. Surgical operations are fatal from the shock on this part of the system. Women in childbed, otherwise doing well, will collapse and die. Sun-

strokes are mortal from the same cause. The poisons, fear, grief, anger, even sudden joy, will attack the citadel of life, paralyse the sympathetic system, suspend the various functions or modify them, and even produce death when sufficiently intense. We may go through the whole range of causes of disease and find the same solution.

The whole range of disorders called *nervous* will be found, upon careful estimation, to begin with the disturbance of the ganglionic centres. It is but rarely, says Dr. Davey, who had been for several years in charge of an Insane Asylum, that persons afflicted with diseases do not exhibit signs, more or less evident, of something amiss with the liver or stomach, or parts accessory or subordinate thereto. This is true of epilepsy, hydrophobia, tetanus, delirium tremens, hysteria, chorea, and paralysis in several of its forms. It is customary to refer the external symptoms of these disordered conditions to the cerebro-spinal organism ; but the integrity of that organism depends upon the normal condition of the ganglionic system, and therefore these diseases are to be accounted for accordingly.

Insane patients, and persons suffering from various other nervous disorders, invariably exhibit disturbances in the functions of nutrition, secretion and absorption. Nor can they be relieved or materially benefited till these are corrected. The morbid action began with these functions, and extended afterward to the others. We can have little confidence in the utility of the treatment of patients at insane asylums except it is conducted on this principle. Insanity is a disease of debility.

The considerations appear to establish firmly the conclusion that the ganglial system is concerned more or less directly with every form of functional action, normal and abnormal, in the body. Its innervation enables the performing of the vital and organic functions, circulation, sanguification, calorification, nutrition, sleep, and all others. They are links in a chain. If one is impaired, the others participate in the ill results. They all depend upon the circulation, and fail of healthy performance when it does not take place normally. If

the innervation is weakened, the blood fails to move in the vessels with its proper celerity. Thus there is passive congestion; the blood-making processes are retarded, and then directly come failure of nutrition, lack of animal heat, and likewise disagreeable dreaming, phantasms and sleeplessness.

Dr. E. H. Wood declares it almost susceptible of demonstration that all disturbances of the organic functions are due to this cause, and sets forth the subject in a little monograph with great distinctness. He designates the condition *gangliasthenia*, or loss of ganglionic nerve-power; rejecting the more common term *neurasthenia*, as somewhat misleading and not sufficiently expressive. The ganglionic tract being regarded as entirely distinct in its sphere from the cerebro-spinal division of the nervous system, there should be a terminology in accordance with that fact. He lays down the following as an axiom and principle in medicine: "*Whenever idiopathic passive congestion is present it is due to gangliasthenia, and the intensity of the congestion is the measure of the degree of ganglionic exhaustion.*" The consequent changes in the character of the blood which are liable to result in some form of specific disease, as may be determined by individual peculiarities, epidemic tendencies or other morbid agencies. Disease is said to be Protean in shape, but the signs of impaired nervous energy are unvarying in character, and their meaning is invariably the same.

Common intelligence is sufficient to dissipate the impression that passive congestion is the result of malaria. There is no adequate support to the conjecture of specific poison. It may be considered only as an assumption, the truth of which has never been demonstrated by scientific investigation. The source of trouble comes from within the body itself and not from extraneous agency. The nerve-force from the ganglia, which permeates the blood and vivifies every corpuscle, is cut off or diminished, and as a direct consequence the blood is unable to free itself from the dead and worn-out material which it has accumulated in the course of its circulation. The poison is thus generated and set in operation from

disordered conditions within the corporeal economy. In all forms of passive congestion the blood remains fluid after death ; thus showing that the vital energy had become dormant prior to dissolution.

Sometimes the corpuscles when deprived of their normal supply of nerve-force, will lodge at the points where the vessels intersect. Then becoming swollen by endosmose of serum, they burst and their fragmentary remains are carried again into the circulation. This constitutes what is denominated specific poison. In another form of congestion the corpuscles pass through the walls of the capillaries into the tissues ; but sometimes they are entangled and remain half inside and half outside of the wall of the vessel, and exhibit a curious distortion of shape from their peculiar predicament. This appearance is often attributed to the suppositious agency denominated malaria.

The kinds of passive congestion correspond with the manner in which the ganglia, or any portion of them, are affected by depression. Every ganglion is regarded as constituting a focus of nervous energy, and capable, accordingly, in its own peculiar sphere, of receiving, transmitting and reflecting impressions on which the healthy performance of function depends. The ganglial system being the corporeal seat of the emotions, it is immediately affected by every cause that excites them. The blush of shame is produced from a temporary depression of the vaso-motor nerves of the arteries, which causes a transient congestion of the arterioles ; while the pallor of guilt or fear proceeds from a corresponding depression of the nerves of the veins which influence the venules. Apathy, the absence of all emotion, is a prominent feature in all acute congestive diseases, and denotes the profound depression under which the ganglial structures are laboring.

GANGLIONIC SYSTEM.

So in one form of passive congestion the face is suffused and of a dusky red. It has the appearance of a permanent blush, and is the result of congestion of the arterial blood-vessels.

In the other forms, the countenance exhibits a permanent paleness, often mistakably termed anæmia, which is due to the congestion of the veins and venous capillaries, from depression of the veno-motor nerves.

This distinction marks the division of congestive diseases into two types: one characterised by deficient animal warmth, and the other by excess of heat—*hypothermy* and *hyperthermy*. In the former type the congestion is in the venous, and in the other in the blood-vessels. The abnormal temperature affords a means of estimating its intensity. The hypothermic type, which is due to congestion resulting from nervous depression of the venous system, exhibits in its greatest intensity a fall of eight degrees (F.) below the normal standard. The hyperthermic, which originates from the congestion produced by arterial depression, will, in its severest form, exhibit an increase of temperature to ten degrees above the standard of health.

In the veno-motor form the nervous apparatus of the veins is paralysed, and the blood is impelled by the nervous force till it emerges from the capillaries, when it is cut off from that influence, and the veins accordingly engorged. In the other form, the vaso-motor nerves of the arterial system are enfeebled, and the impulse of the heart is, or seems to be, the principal if not the sole force to propel the blood through the arteries. The result is, that these vessels retain an undue proportion of the blood, while the venous system is correspondingly deprived of its normal supply.

Disorders from perverted functional activity are most likely to appear when there has been some severe strain upon the nervous system. It may be from overwork, insufficient sleep, or mental shock; or from an enfeebled nervous condition with no assignable cause. Chorea, epilepsy, and the various forms of insanity, are from debility, and therefore to be traced to the same source. Heredity comes in with its contributions. The weaknesses of parents, whether moral or physical, are apt to manifest themselves anew in the children. As social demoralisation invariably and inevitably characterises the

generation being next after a war, so mental and nervous in firmity appear after an epidemic visitation or other calamity. Alcoholism entails neurosis of the ganglial system. Indeed vice and immorality in every form are detrimental to the body, and certain in some manner to impair its integrity. "Whenever the equilibrium of our mental nature is long or very seriously disturbed," says M. Reveille-Parise, "we may rest assured that our animal functions will suffer. Many a disease is the rebound, so to speak, of a strong moral emotion; the mischief may not be apparent at the time, but its germ will be nevertheless inevitably laid."

In diseases of organs not liberally supplied with ganglial nerves there is less evidence comparatively of physical suffering or mental disturbance. Persons injured in the lungs make little complaint and appear to suffer less than those hurt in the abdomen. But when the stomach, heart, liver, or other of the glands or internal structures that have a copious supply of organic nerves are disordered there is always emotional disturbance. Cancer of the stomach, ulceration and inflammation are emphatically characterised in this way. Every physician has witnessed the emotional horrors that often attend dyspepsia. Insane persons are always more or less enervated and usually have intestinal disease, often with no apparent cerebral lesions. They become moody and low-spirited; indeed, everything with them seems to be out of plumb. In fact, functional derangement and mental disturbance accompany each other with more or less uncertainty as to which was first and which the resultant.

In this way doubtless, the whole department of pathologic science can be adequately set forth. Every agency that tends to lower the spirits and moral power of the individual is certain to impair his vital energy. We may enumerate these causes according to our habits of accounting for things; as, for example, the varying conditions of the atmosphere, social inharmonies, the circumstances of life as regarding food, clothing, labor and sleeping arrangements; in short, everything that affects the corporeal existence from within or without.

The particular type which the disease assumes is determined by the peculiar temperament and surrounding conditions of the individual.

The following comparison of the functions of the two great departments of our nervous organism is suggested by Dr. R. M. Bucke, and is entitled to favorable consideration. The cerebro-spinal system is an enormous and complex sensory-motor apparatus, with an immense ganglion—the cerebrum—whose function is *ideation*, superimposed upon its sensory tract; and another, the cerebellum, whose function is the *co-ordination of motion*, superimposed upon its motor tract. The Great Sympathetic is also a sensory-motor system without any superimposed ganglia, and its sensory and motor functions do not differ from the corresponding functions of the cerebro-spinal system more than its cells and fibres differ from those of this latter system; its efferent or motor function being expended upon unstriped muscle, and its afferent or sensory function being that peculiar kind of sensation which we call *emotion*. As there is no such thing as coördination of emotion, as there is coördination of motion and sensation, so in the realm of the moral nature there is no such thing as learning, though there is development.

It is out of undue deference to psychological tradition, Dr. Lindorme justly declares, that the brain is exclusively dwelt upon as the organ of the mind. There is an abuse of this term in its restriction to the sense of intellect, or more strictly, in reference to that of our understanding and reasoning faculties—a restriction which is in obvious contradiction to the plainest facts of every-day observation. It is literally true and logically incontrovertible that there is not one organ in the body that is not an organ of the mind.

It follows as a corollary that genius, longevity and every form of earthly excellence are very closely allied to the functional integrity of the ganglionic system. Religion is always an exercise of the affections, and as a general rule the superior genius is also of a high religious character. Taking the phrenological method of estimating, however full the develop-

ment of brow and middle regions of the head, the three-storied brain carries off the palm. Intellect is more than reasoning faculty or understanding; it is the power to look beyond. The highest moral nature is nearest in accord with the truth of things. All our great artists are largely endowed in this respect. We conceive of selfish men as narrow-minded, and of generous and liberal souls as broad and full-developed. Savages are proverbially deficient in noble quality; they are heartless and untrustworthy in social, family and other relations which involve fidelity and unselfish affection. They are also short-lived in comparison with other races. Men, however, who are distinguished for superior moral qualities excel others in the average length of life. The Semitic races are more tenacious of their religious customs, and more generally educated than the Aryans, and they are certainly longer-lived. In physical development, while they are fully equal in brain-power, they are superior in bodily physique. Women, too, have a richer endowment of organic nerves, and also of the moral qualities which are allied to these; and they both excel the other sex in their longevity and power of endurance, but exercise an influence correspondingly greater on manners and social culture.

The married live longer than the unmarried; not alone because the conjugal relationship is more in accordance with nature and preventive of disorder, but because they who contract it are individuals more perfectly endowed with moral sentiment and the corresponding nervous organism, and accordingly have that instinct of long life and permanent domestic relations which makes marriage desirable. These facts are borne out by statistics, and are abundantly verified by observation.

This knowledge of the interior life-ministering nervous structure may not be prudently neglected. It is essential in regard to the Higher Remedial Art. Medical learning, in order to be really scientific, must recognise as a fundamental truth, the influence of mental and moral states over the physical functions. The missing link which is to be discovered as well as

recognised, is not only the skill to restore a mind diseased and "rase out the written troubles of the brain," but to recruit as well as to sustain the vital forces.

The study and exploration of the grand system of ganglionic nerves, will enable us to understand, as we may not otherwise, the connection of every organ to all the others and their relation to the mind itself. To that system pertains the *vis medicatrix naturæ*, the force which is Nature's physician. It holds the middle place in our being between the within and the without, standing at the last verge of mortal existence. It is the first thing created in our bodies, the last which is palsied by death. It contains the form, or organising principle, which abides permanently and controls the shaping of every part of the corporeal organism, and at the same time it mirrors the whole universe.

