

circulation of the blood are closely correlated in their causes. Now since certain conditions are requisite for the formation of the normal or perfect sound, I shall henceforth use the term "degeneration" to express any imperfection that depends upon the absence of one or more of these conditions.

I must here call attention to a very inaccurate expression commonly used by medical authors. Speaking of murmurs in the heart, they say "there was a *bruit de soufflet* with the first sound," or "*with* the second sound," as the case may be. Obviously this arises out of the false conclusion that the normal sounds have their origin in something different from that which produces murmurs. But, if that be the case, a sound emanating from anything but the blood itself, be it muscle or valve, would invariably be heard coincidentally with a murmur, which is an admitted blood-sound, except when the murmur is loud enough to drown the normal sound—a rare occurrence. When the subject is thus approached, an incongruity is perceived, and, to elude this, a phrase, not based on the candour which science demands, is employed; for the normal sounds are not generally accompanied by, but substituted by, murmurs.

From the rarity of disease at the right side of the heart, practically, the pathology of its left side alone concerns us. But if, while we listen to an uncomplicated murmur either at base or apex at this side, the stethoscope be slightly shifted to the right, the faint normal sound of the right heart may be generally heard coincidentally with the murmur from the left. In fairly considering this subject, therefore, the duplicate origin of the sounds must be kept in view; nor, indeed, is the possibility of the formation of an imperfect normal sound synchronously with a murmur, and both at the left side, denied. What is objected to is, the general instead of the exceptional employment of a mode of expression by which erroneous theories are sought to be propped.

But besides degeneration into murmur, the first sound is especially liable to alterations in intensity, duration, and pitch. These changes cannot be so well accounted for by any explanation of its cause as by the present. They are due to variations in the force with which the blood is impelled, or else in its pressure or viscosity, according to which the production of murmur is approached or receded from. By no other means can the complete degeneration of the sound into a murmur of moderate loudness be satisfactorily explained. Nor do the exceptional cases mentioned affect the statement at first made, that it is no less wrongly than constantly said, "there was a murmur *with*," when it ought to be *instead* of, the first sound.

(To be concluded.)

## ON DIAGNOSIS, IN THE FEMALE, BY THE HAND INTRODUCED INTO THE RECTUM.

By C. F. MAUNDER,  
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IN a recent number of THE LANCET I suggested, as a means of determining the precise seat and nature of obstruction high up in the rectum, the introduction of the hand, obstetric fashion, into that viscus; and related a case in which the examination so conducted in a female nearly seventy years of age led to an accurate diagnosis, and was immediately followed by colotomy, performed to relieve complete intestinal obstruction. That patient now, six months from the date of operation, is in fair health.

A few days since my colleague, Dr. Head, requested my opinion in the case of a young woman with atresia vaginæ. With this exception the external signs of her sex were sufficiently developed. We were anxious to determine the presence or absence of a uterus, as well as the possibility of reaching that organ by means of an artificial vagina. The finger in the rectum enabled us to detect the left ovary lying low down in the pelvis, and on a higher level than this the digit just reached a firm body to the right of the mesian line, which might possibly be the cervix uteri. It was determined to cut for this in the natural site of the vagina. Having made an incision in the mesian line between the fourchette and the meatus urinarius (where was a depression), I tunneled my way with my forefingers upwards in the direction of the supposed os uteri. A passage thus made, the length of my finger allowed me to feel something, but still at a distance

from the point of the finger, and not in the mesian line. I was unwilling to cut further. At this stage Dr. Head suggested that I should resort to the mode of examination which he had heard I had adopted, and as is above mentioned. I accordingly (the back of the fingers and hand being well oiled) introduced the hand into the rectum, and was enabled to determine the absence of the uterus, but the presence of the right ovary, and it was this organ which we had suspected might possibly have been the cervix uteri. With the left hand in the rectum, and the right upon the anterior abdominal wall, I was enabled to explore the pelvis with facility.

In cases in which it is of vast importance to determine with accuracy, as it certainly was here (question of marriageability), the state of the pelvic organs, whether in reference to congenital malformation or to morbid growths (tumours &c.), the hand introduced will avail much.

Should the sphincter be ruptured, as it was slightly in the above case, incontinence of fæces for a short time is a matter of little moment when compared with the great importance, in certain instances, of arriving at a positive diagnosis.

Note.—The patient being thoroughly under the influence of chloroform, the hand should be introduced with the backs of the fingers and the knuckles towards the hollow of the sacrum, up which it will glide as soon as the knuckles have passed the sphincter, either by dilating or rupturing it.

## ON THE FUNCTION OF THE GANGLIONIC SYSTEM IN RELATION TO THE OPERA- TIONS OF MIND.

By METCALFE JOHNSON, Esq., M.R.C.S.E.

OBSERVATION of the effects of organs, such as the liver, uterus, &c. (under the influence of the ganglionic nerves), in conditions of disease, upon the mental operations, shows us that mind is not solely the result of the cerebro-spinal system in the performance of its duties, but the consequence of the combined efforts of both systems.

The frequent insanity of persons of depraved habits of the sexual organs, the depressed spirits or hypochondriasis of hepatic disorders, the vomiting of cerebral disease, the diuresis of mental excitement, the diaphoresis of fear, as well as the lachrymosis of grief, point to the conclusion that the ganglionic and cerebro-spinal functions are so inseparably connected that we may safely infer that mental operations result from the combined efforts of the whole nervous system, ganglionic as well as cerebral—in fact, that *corpus sanum* is the *propter hoc* of *mens sana*.

The enantia (εναντιον) of mind are instinct and experience, or sense, just as ozone and antiozone are the enantia composing oxygen. It may be said that instinct is common to the whole animal kingdom, while sense is proper to the vertebrata. True, attempts have been made to show a cerebrum in some of the invertebrate animals; but if we allow the performances of the insect world to result from experience, we shall conclude, after the experiments of Maraldi and Koenig, that the bee is possessed of the highest mental organism of all created nature; for where is there in the most civilised states one which evinces such perfection of social, sanatory, and constructive laws?

The instincts proper to the whole animal kingdom are two, gastric and genital; the former to serve for the maintenance of the animal; the latter for its perpetuation. The senses, commonly called five, are in reality but modifications of the one function of sensation. That the instincts are the *propter hoc* of ganglionic, and sense of cerebro-spinal systems will be seen in the sequel. The coincidence of instinct and sense, invertebrate and vertebrate, is, at least, remarkable.

From the tree to man we find a gradual transition of nervous function, only remarking the hiatus between Mollusca and Pisces, which has as yet never been spanned. The tree is insensible to external touch. The sensitive plant (first homologue of sensation) presents a remarkable peculiarity. Chara, Diatoms, Paramæcium, Volvox, and Vorticella (first homologue of reflex motion) show progressive stages of the function. Beroë pileus (first distinct ganglia) and the diploneurose system in

Articulata are steps in advance. But in *Ascaris* we observe the first evidence of the binary form of instinct anatomically developed in the two ganglionic rings around the mouth and female vulva—an evidence of the gastric and genital instincts. The nervous ring around the œsophagus in Rotifera (first supra-œsophageal ganglion) and prolongation to a cord (first homologue of spinal column) in *Hydatina*. Chains of symmetrical ganglia, with enlarged supra- and sub-œsophageal ganglia, in *Papilio brassicæ* and the concentrated ganglia of the imago of *Melolontha vulgaris*. These evince successive developments of ganglia till we arrive at the higher forms of Mollusca, and thus at an end of the invertebrate system. In this class of creatures we observe the reign of ganglia, and evidence only of instinct.

Passing now to fishes, we find a new neural element, Prosencephalon of Owen, who says:—"The anatomical condition of the prosencephalon (of fishes), and its homology with the hemispheres of the bird's brain experimented on by Flourens, would lead to the belief that it was in this division of the fish's brain that impressions became sensations, and that here was the seat of tenable ideas." From the smooth brain of fish to the convoluted brain of man is but one gradual progression of successive forms of perfection. And with this increase of convolution is evidence of increased perception, of sense, and of reasoning power.

Taking man, then, as the subject of our investigation, we will inquire, What are the functions performed by the various component parts which go to make up the one whole Mind? And these parts are, (1) the cerebro-spinal nerves, terminating in corpus striatum and thalamus opticus; (2) cortical structure, or grey matter, of cerebrum; and (3) the ganglionic system of nerves.

First of Nerves. Kirkes (in his Handbook of Physiology) says: "Nerve-fibres appear to possess no power of generating force in themselves" (p. 390). "All nerve-fibres are mere conductors of impressions" (p. 392). "No nerve-fibre can convey more than one kind of impression" (p. 394). They consist of two sets of fibres, afferent and efferent.

Now of Thalamus and Corpus Striatum—homologues of supra- and sub-œsophageal ganglia, "most assuredly to be regarded as ganglionic centres" (Carpenter, p. 677). They are not the ultimate links in the chain in the manifestation of psychological phenomena; as they may be injured, and yet mind remain. (See Wilks, Guy's Hosp. Rep. 1866.) They seem capable of receiving stimuli from afferent and conveying them to efferent nerves. (See Carpenter's Comp. Physiol.: on the automatic motions of pigeons after removal of cerebrum in slices.)

Now, as regards Grey Matter of Convolutions, Sir C. Bell says: "I have never seen disease general on the surface of the hemispheres without derangement of the mind."

In general paralysis, whose earliest symptom is some eccentricity or other mental aberration, Wilks recognises "chronic change in the brain, especially the grey substance. .... The wasted brain (convolutions) in delirium tremens denotes a failure of mental power. .... There can be no doubt that this portion of the brain (cineritious substance) is intimately connected with the intellectual operations."—(Wilks, Guy's Hospital Reports, 1866.)

"There seems a strong probability that there is not a direct continuity between any of the nerve-fibres distributed to the body and the medullary substance of the cerebrum. Although it was long held as a physiological truth that the principal part of the sensory fibres passes up to the grey matter which forms the surface of the cerebral hemispheres, and that the fibres which are subservient to voluntary motion originate in the same situation, and pass downwards through the spinal cord and nerve-trunks to the muscles; yet anatomical inquiry fails to sanction such a doctrine, and tends, concurrently with the results of physiological investigation, to the conclusion that no sensory fibres pass upwards beyond the chain of sensory ganglia (including the thalami optici), and that no motor fibres really originate from any higher point than the corpora striata."—(Carpenter, Compar. Physiol.)

Dr. Wilks mentions a preparation in Guy's Museum (1564<sup>75</sup>) of a slice of brain, showing the separation of the external layer of the cineritious substance.

"The observations of Prof. Wäagner, who enjoyed several opportunities of examining the brains of men endowed with great power of intellect, seem to point to the conclusion that the more richly convoluted brains coexist with great intelligence."—(See Turner on Convolutions of Cerebrum.)

"Now if it be true that the superficial grey matter is intimately connected with mental activity, then it follows that

the multiplicity of the convolutions is connected with the development and increase of intellectual capacity, the substratum of which is the increased quantity of grey matter."—(See Carl Vogt, Lectures on Man.)

Finally, with respect to the Sympathetic system: "The sympathetic nerve when excited produces contraction in the arteries. If you divide on one side the branches which supply the globe of the eye, you will very soon remark a notable hyperæsthesia of the conjunctiva follow on the operation. If we divide the sympathetic nerve, the vessels are then dilated, and the blood passes from the arteries into the veins without undergoing any material change; and when drawn from the jugular it is almost as ruddy as that which escapes from a wound inflicted on the carotid. It was formerly believed that the oxygen introduced into the lungs was then and there combined with the elements of the blood. We are now aware that the combination of oxygen with the cast-off materials of the economy takes place, not within the lungs, but in the very depths of the tissues themselves. If it is intended to propel the blood from the arterial into the venous system without altering its properties, to accelerate its passage is the safest method of obtaining this result. If, on the contrary, it is desired to create in this respect as wide a difference as possible, these opposite effects are produced by galvanising or dividing the sympathetic nerve. The numerous vessels which ramify in the brain and spinal cord being placed under the control of the ganglionic system, the influence of the sympathetic nerves extends to the very centre of the nervous system. In the experiments of Donders (the introduction of a thermometer into the skull after the division of all the branches of the upper cervical ganglion) the cerebral substance itself participates in the effects of this operation, its temperature rises, its vascularity increases. When the ramifications of the system (sympathetic), which spread to the outer ear in rabbits, are separated from the centre of nervous action, the vessels are dilated, the blood flows in an arterial state to the veins, and the ultimate result is an augmentation of temperature in the affected region."—(Claude Bernard on the Spinal Cord.)

Passing, then, in review the opinions of these various authors, and considering the facts which they bring forward, a theory of mentation may be deduced as follows:—The afferent nerve conveys the impression produced by an external stimulus (say the prick of a pin) to the sentient nerve of the skin; a sound or combination of waves of sounds to the tympanic nerve; a smell, composed of odoriferous particles, to the olfactory; or a taste to the gustatory. This impression passes through the nerve-fibre to the ganglionic centres, corpus striatum, and thalamus opticus. From thence the efferent nerve conveys the impression to the cervical or other ganglia; the ganglion to the carotid ganglion; and this produces its effect upon the internal carotid artery, which, by its capillary ramifications over the grey matter of the convolutions, produces sensation, modified by the nature of the primary stimulus and its conveying medium. The result of this stimulus to the capillaries is the secretion of brain of such a kind as to produce a more or less permanent effect, according to the formation and arrangement of grey substance. In case action is to be the result of sensation, the stimulus may be conveyed from the grey matter of convolutions to the grey matter of spinal cord, which may at once send out its telegraphic message to the muscle by means of the efferent nerve of the anterior root or column.

In further elucidation of this suggestion, let us suppose a stimulus—say the odour of a rose—to be conveyed by the olfactory nerve, through thalamus and corpus to the ganglia. This stimulus causes the distension and contraction of certain capillaries with blood; and the histological change to take place in these capillaries to be called 1, 2, 3, 4. Again, the form and colour of the rose, through the optic nerve, to distend certain other capillaries, to be called 5, 6, 7, 8. Again, the undulations of sound produced by the word "rose" to excite the auditory nerve, so as to promote the distension of capillaries 9, 10, 11, 12; and so on through the senses of feeling and tasting. The resultant of all these vascular distensions will be a more or less perfect image of a rose, which will be more or less perfectly reproduced whenever any one or more of the senses is brought under the impression of the rose. Now, let us imagine the olfactory and optic nerves to be stimulated by a rose at the same time that the senses are being excited by the associations of some other object—say "The Old House at Home,"—we know by experience how often a sense under the stimulus of the one idea will reproduce the other. The combinations of this form of mentation may be varied and modified to an unlimited extent.

In explanation of the particular state of the capillaries under

the stimulus of ganglionic nerves, we find, by the experiments of Claude Bernard, that when the ganglionic stimulus is applied to the vessels the conversion of arterial to venous blood takes place, and that, as a result, cellular changes of formation and decomposition of effete cells ensue; while in the absence of ganglionic influence the blood passes through the capillaries to the veins in the arterial condition. From the experiments of Donders, this would appear to be the case in brain as well as other tissues of the body.

Of the formation of images or ideas called thought, it must be remembered that we cannot think without words, or at any rate without the reproduction in our minds of some assemblage of circumstances which may be called an image. These images must be either simple, as a rose; or collective, as a tribe of men, an army, or a scene in nature. These images do not arise spontaneously in our minds, but require some stimulus to reproduce them. Thus the smell of a rose may reproduce to our minds a whole garden of roses; the sight of a black man may reproduce to us the idea of a nation of savages; a red coat or a sword may remind us of an army; or the chimney of a single house may remind us of a whole village.

In proof of the effect upon the brain being similar in case of thought to that of actual sight, smell, taste, or feeling, witness the man who faints away at the description of a wound, or the sensation of pain some men experience at the idea of a train passing over any part of the body. If only the image is sufficiently distinctly produced, the sensation will be felt. A proof of this is found in the man who died of cholera after being placed in a bed in which he was told a cholera patient had died, though there really was no truth in the statement, no such patient having been in the bed.

By this process of mentation we shall see reason for the mental phases known as an alcoholic, bilious, hysterical, phthisical, gouty, or nicotised opinion. In support of this vascular theory of mentation we may appeal to the slow rate of conveyance of impressions as compared with electrical effects. (See Barnett's paper in the *Intellectual Observer*, June, 1866.)

The pathological interest of these suggestions will be at once manifest when we come to inquire into the relation of grey matter to the mental history of the patient. I have observed a vast difference in the distinctness of cortical structure in different subjects, but my experience does not enable me to lay down any rule. It is obvious that will, mental perception, sensation, and memory are each separate functions of the mind, and may hereafter by tabulated experience be brought to be associated with certain anatomical appearances. The researches of such men as Turner of Edinburgh will tend to elucidate the question. Again, the pathology of insanity would be much assisted by such investigations, and the surprise at so little morbid change of cerebral structure in certain cases of unsound mind would cease if we were more accustomed to look for the exciting cause in ganglionic centres, rather than in brain itself.

By this vascular theory of mentation it will be seen how the greater part of the operations of the nervous centres is of the nature of a reflex act, while only a small sphere is left for the action of the will, which remarkably coincides with the investigations of all psychologists, from St. Paul and Socrates to Buckle, Comte, Stuart Mill, Goldwin Smith, and Ferrier. Moreover, the theory goes to elucidate the secondary automasias of Carpenter, by supposing that capillaries frequently, having received a similar stimulus, are enabled to reproduce, almost without will and on the slightest provocation, a result to which, by their anatomical relation, they would, by a law of frequent use, become fitted to bring about.

There is one other pathological point of interest connected with the action of the sympathetic nerve to which attention may be drawn as a suggestion for further inquiry. There are certain sensations, not of pain, but rather of constriction or dragging, which are associated with affections of organs under the influence of the ganglionic nerves, and as we know that the whole chain of ganglia is connected by innumerable ramifications, we may see reason to account for the following sensations as the result of impressions on certain ganglia, the more so that the stimulation of a ganglionic nerve is not directly productive of pain as is the stimulation of a cerebro-spinal nerve.

To begin with globus hystericus. The ganglia supplying the uterus, ovaries, and genitals may communicate, when irritated, a stimulus to the thyroid ganglion. The dragging in the left side associated with leucorrhœa (solar plexus). Distended bowels in hysteria (solar plexus). Oppression of præcordia in

fissured anus and hæmorrhoids (solar plexus). To these may be added the sense of constriction experienced after the subcutaneous injection of morphia, to say nothing of the vomiting of pregnancy and the various sympathetic affections in brain, kidney, liver, and enteric disease.

In conclusion it may be suggested that the ganglionic system in connexion with disease has, perhaps, hitherto hardly received that amount of attention which its important position and magnitude would seem to call for.

Lancaster, Sept. 1868.



## OF THE PRACTICE OF MEDICINE AND SURGERY IN THE HOSPITALS OF LONDON.

Nulla autem est alia pro certo noscendi via, nisi quamplurimas et morborum et dissectionum historias, tum aliorum, tum proprias collectas habere, et inter se comparare.—MORGAGNI *De Sed. et Caus. Morb.*, lib. iv. Proæmium.

### ROYAL FREE HOSPITAL.

#### CASES OF RAILWAY INJURY.

(Under the care of Mr. J. D. HILL.)

WE resume this week the description of several cases of severe injuries amongst railway officials, of which we gave two examples last week. The series illustrates very well the influence of shock from violence when combined with a varying amount of local injury.

**CASE 3.** *Compound fracture of left leg; amputation below the knee; recovery.*—John G—, aged thirty-one, a railway porter of good constitution, was admitted into the hospital on Oct. 15th, 1867, having been knocked down and run over by a train in rapid motion. When admitted, he was much collapsed, the pulse and breathing being hardly perceptible, the countenance pale, and the surface of the body covered with cold sweat.

*Examination of the limb.*—The integument over both malleoli, and extending towards the knee, was lacerated, and blood effused between this structure and the muscles halfway up the leg. The deep fascia was laid open, extensor tendons torn from their muscular attachment, and anterior tibial vessels and nerve ruptured in the middle third of the leg. The tip of the internal malleolus was broken off, and two inches above the external malleolus the fibula was cracked across. The ankle-joint was laid open, and the astragalus split vertically.

*Treatment and progress.*—Stimulants were given freely, and in the course of an hour, by which time he had rallied, Mr. Hill performed amputation below the knee by the circular method. At the anterior and external part of the circle the integument was found bruised, and slightly detached from the deep fascia by clotted blood; the precaution was, however, taken to secure plenty of covering. Pretty sharp reaction set in during the three following days, and by the fifth day the respiratory and circulating systems had regained their equilibrium. The last ligature separated on the fifteenth day, and the stump healed partly by adhesion and partly by granulation. He progressed without a bad symptom (except that a small portion of the bruised integument lost its vitality and was cast off), and was discharged in good health on Nov. 30th, 1867. The stump at that time was quite sound; there had been no retraction, and the cicatrix was three inches in length.

*Remarks.*—Here again the train was travelling at a rapid speed; hence the coexistence of severe shock with local injury. With respect to the injuries, it may be observed that the anterior tibial vessels and nerve were ruptured in the middle third of the leg, and that the extensor tendons were torn from their muscular attachments. The yielding integument was detached from the deep fascia, even as high as the line of amputation. These circumstances will be explained by the shape of the wheel, and the comparative elasticity of the several structures.

The next case illustrates severe shock and general concussion, with extensive capillary rupture and local injury.

**CASE 4.** *Compound fracture of tibia and fibula; amputation of thigh; death; autopsy.*—James F—, aged thirty-eight, a