

years ago had suffered from epileptic fits, and that for some months about that period he had been an inmate of the Prestwich Lunatic Asylum, suffering from suicidal mania. The doctor of the gaol was called, and stated that since the prisoner had been in gaol he had understood all that was said to him, and appeared quite sane. He was severely cross-examined as to epilepsy being a symptom of insanity. Mr. Blair, on behalf of the prisoner, called medical evidence to show that he had long suffered from epilepsy, and at times had been very violent. The jury returned a verdict of *Guilty*, and the Judge passed sentence of death. A petition, however, was got up in his favour, and he was reprieved.

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## PART II.—REVIEWS.

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*The Brain and its Functions.* By J. LUYS. Kegan Paul, Trench and Co. London, 1882. (Vol. xxxvii. International Scientific Series).

As this is an original work, it will be well in the first instance to explain the object of the author in writing it, and his method of doing it. This is an easy task, for he has himself, in the preface, referred to both. He says that it is an abstract of his personal experience, and of most of the ideas he has for many years been endeavouring to popularize in his lectures at the Salpêtrière.

He divides his subject into two parts. The first, anatomical, is the foundation of the second, which is purely physiological. In the first he explains the technical processes employed by him. His method consists in making regularly stratified sections of the cerebral tissue, in the faithful reproduction of them by means of photography, and in the employment of successively graduated powers for the representation of certain details. He claims that by these new processes, he has been able to penetrate further into the unexplored regions of the nervous centres, and to bring back correct views and faithful representations of certain territories of which our predecessors caught scarcely a glimpse. He has been able to throw fresh light upon the intimate structure of the nerve cell, on the organization of its protoplasm, and to study it *in situ*, in its connections with the nerve fibres and the neuroglia.

He sketches synthetically the general economy of the

structure of the brain, pointing out the intimate relations which exist between the cerebral cortex, the true sphere of psycho-intellectual activity, and the central organs (those of the optic thalami and corpora striata), which are in a manner the intermediate regions interposed between this and the excitations which proceed from the external world. He specially insists on the fact, which ten years ago he was the first in France to bring to light, that the optic thalamus, with the isolated grey ganglions of which it is composed, represents a place of passage and reinforcement for excitations radiated from the sensorial periphery, while the corpus striatum, with its different compartments, and arches one within another, is on the contrary directly related to the passage of voluntary motor excitations.

Having observed in the cerebral cortex special zones of small cells subjacent to the pia mater, and quite different in configuration from the zones of large cells occupying the deeper regions, he was led to see in this anatomical arrangement a clear relationship to a similar disposition existing in the constitution of the grey axis of the spinal cord. As a consequence, he was led to think that if, as is experimentally demonstrated, the small elements in the spinal cord be affected by the phenomena of sensibility, it was natural to admit *physiological* analogies where *morphological* analogies exist, and consequently to consider the sub-meningeal regions of the cerebral cortex as being the histological territory specially reserved for the dissemination of sensible impressions; while the deeper zones of large cells (analogous to the anterior motor horns of the cord) might be considered as the regions of emission (psycho-motor centres) for exciting voluntary motion. He thus arrived at the demonstration that, in the very structure of the cerebral cortex, among the thousands of elements of which it is composed, there is an entire series of special nerve cells, intimately connected one with another, constituting perfectly defined zones, anatomically appreciable, and serving as a common reservoir for all the diffuse sensibilities of the organism, which, as they are successively absorbed in these tissues, produce in this region of the *sensorium commune* that series of impressions which brings with it movement and life.

In the second part of the work, which comprises an explanation of the uses of the different cerebral apparatuses of which the anatomical details had already been analysed, he gives first of all a physiological explanation of the different

properties of the nervous elements, considered as living histological units. In this manner he tries to show that these properties, which are the ultimate generating elements of all the forms of activity of cerebral life, may be finally reduced to three principal forms:—sensibility, by virtue of which the cerebral cell enters into relation with the surrounding medium; organic phosphorescence, which confers upon it the property of storing up in itself and retaining the sensorial vibrations which have previously excited it (as we see in the inorganic world phosphorescent bodies preserve for a longer or shorter period traces of the luminous vibrations which have impinged upon them), and automatism, which is merely the aptitude which the nerve-cell possesses for reacting in presence of the surrounding medium when once it has been impressed by this.

Having surveyed each of these elementary properties of the nervous elements, he shows how their co-operation may be used to explain the principal phenomena of cerebral physiology. He thinks that he has thus demonstrated that by grouping among themselves the foregoing data, we may perceive that all manifestations of cerebral activity—even though we have to deal with the phenomena of psychical life proper, or the operations of intellectual life—like their fellows which have the spinal cord for a theatre (reflex phenomena), are always susceptible of being decomposed into three elementary phases; that they are always originally determined by the arrival of an incident sensorial impression, recent or former (phase of incidence); accelerated by the particular reaction of the interposed medium, reacting by virtue of its specific energy (intermediate phase); and completed by the secondary reaction of the intermediate medium, reacting and carrying outwards the primordial vibration which has been communicated to it (phase of reflexion).

It results then, from this manner of looking at the phenomena of cerebral activity, that it is always a fact of the vital order which is at the origin of every process of evolution. Sensibility is always the primary motor agent; it originates all movement. Propagated through the sensori-motor machinery of the cortex, it becomes insensibly transformed, like a force in evolution, and ends by disengaging itself from the organism in the form of a motor act.

In short, in these researches, in which the author's sole object has been to carry the data of contemporary physiology into the hitherto uninvaded domain of speculative psychology, he has endeavoured to show that the most complex acts of

psycho-intellectual activity are all definitely resolvable, by the analysis of the nervous activity, into regular processes; that they obey regular laws of evolution; that, like all their organic fellows, they are capable of being interrupted or disturbed in their manifestations by dislocations occurring in the essential structure of the organic substratum which supports them; and that, in a word, there is from this time forth a true physiology of the brain, as legitimately constituted as that of the heart, lungs, or muscular system.

Such, in the very words of the author, is the object of his work. We do not think that we wrong him when we declare that he has not completely succeeded, for under the circumstances we believe success impossible. Nevertheless his book is most interesting and profitable reading; for whether we agree with him in his deductions or not, we cannot help thinking as we go along, admiring the ingenuity of the speculations, the general aptness of the illustrations, and the originality of the work as a whole. As to absolute results, we do not know that physiological speculation as to cerebral function is any more productive than metaphysical, especially when, as in the case of the brain, the clearly established facts count as nothing to those about which we know absolutely nothing. With a moderate number of facts the philosophical use of the imagination may be able to show in which direction the truth lies, and thus lead to the highest results; but what can be done when the facts are few and perhaps questionable, where the organ and its manifestations in action present the most bewildering complications, and where the so-called explanations make such sweeping assumptions that the reader instinctively draws back from his guide?

From the nature of the book, to review it thoroughly it would be necessary to write a notice almost as long as itself. This, however, is out of the question, and we must be content to indicate here and there such points as have specially attracted our attention.

Whether the author is right in claiming such advantages for his method of examining the direction of the cerebral fibres we refrain from saying, not having perused his atlas, though we have it from a very competent observer that he has been able to make nothing of the plates. Taking for granted the truth of the author's anatomical observations, are his physiological deductions warranted? It would be absurd to contend that they all command ready assent, but some at least indicate truths of great value.

In spite of all kinds of opposition, the idea has gradually

gained ground that our intellectual operations are nothing but cerebral reflexes. This is well expressed in the following words:—

We generally imagine that we ordain the direction of our ideas into any desired channel, and that we can govern their evocation. We do not usually perceive that, while we imagine we are leading our ideas in one direction, we are unconsciously obeying the second phase of a movement of which the first has already taken place.

I imagine that I think of an object by a spontaneous effort of my mind; it is an illusion—it is because the cell-territory where that object resides has been previously set vibrating in my brain. I obey when I think I am commanding, merely turning in a direction towards which I am unconsciously drawn. A phenomenon quite analogous to the conjuring trick of forcing a card, takes place in this instance, the conjurer forcing us unconsciously to take a card, while letting us imagine we have a liberty of choice.

Sensorial excitations, once they are disseminated in the plexuses of the cortical substance, continue, as we have already several times said, the movement commenced by their contact with the external world. The process in evolution pursues its course, and thus they are distributed—some to the sphere of psychic activity, others to that of intellectual activity proper (p. 254).

As bearing on the same subject, and as tending to make the author's meaning more distinct, we reproduce the following paragraphs. They also afford an excellent example of his method: how he lays hold of anatomical facts, and uses them to support his theory of cerebral action.

Now, as experience proves that the nervous currents pass across the spinal cord from the smaller to the larger cells, and that these latter never enter into activity spontaneously, but merely in consequence of an incidental excito-motor excitation, which they simply reflect, we cannot help admitting, from the most legitimate analogy, that the nervous actions must be evolved in a similar manner throughout the stratified elements of the zones of the cerebral cortex. We may, therefore, conclude that the regions of small cells in the cortex represent in the brain the posterior grey regions of the spinal cord, and that, like them, they are the territory of dissemination of sensitive impressions, designed to retain them, store them up, and afterwards propagate them to the subjacent zones. From the clear analogies which exist between these two spheres of nervous activity, the spinal cord and the brain, we are therefore led to the conclusion that the different zones of the cortical substance, taken as a whole, represent, as it were, a series of sensori-motor organs conceived on the same plan as that of the similar organs of the spinal axis; that the nervous activities are developed throughout its tissue as throughout

that of the spinal grey matter; and that in both instances the processes which take place are always—except for differences of medium, the different qualities of the elements called into play, the amplitude and complexity of the different phases of which they are composed—similar processes, reducible to the same primordial phenomena. It is always a phenomenon of sensibility that produces the movement, and excites the activity of the motor cell; and the motor act itself, whether we have to do with the spinal cord or the brain, is always, as regards its dynamic signification, merely a secondary and subordinate phenomenon, the return effect of a sensitive impression transformed.

This being the case, the phenomena of cerebral activity, as regards their successive development, may be briefly reduced to a series of processes, of regularly linked physiological operations, all derived from one another, becoming complicated in their diverse phases, but always having a common basis of elementary operations.

It is always a phenomenon of sensibility, an anterior sensorial impression, present or past, that marks the point of departure, and becomes, in a more or less sensible form, the primary stimulation that induces the movement. In a word, it is always an agitation of the sensorium, an emotion of the personality, that expresses, through the infinite series of cerebral operations, the condition of erethism which it has experienced.

Hence there are three natural phases under which we shall successively consider the mode of evolution of the different processes of cerebral activity:—

1. A phase of incidence, which corresponds to the moment when the external impressions arrive in the plexuses of the *sensorium* and are perceived there (phenomenon of attention—genesis of the notion of personality—conscious perception).

2. An intermediate phase, during which the affected elements of the cortical substance enter into active participation with the external impression, transformed into a psycho-intellectual excitation (dissemination of sensorial impressions in the psycho-intellectual sphere—evolution and transformation of these impressions—operations of the judgment, &c.).

3. A phase of reflexion which corresponds to the moment in which the primordial excitation, being propagated through the plexuses of the cortex, passes outwards, and expresses, by voluntary motor reactions, the different states of the previously impressed *sensorium*, (genesis and evolution of the phenomena of voluntary motion) (pp. 212-14).

Such speculations may not command universal assent; indeed, they are sure of vigorous opposition from some schools of metaphysicians; still they are legitimate, and compel attention. They are genuine examples of the philosophical use of the imagination. The same can scarcely be said of

the following ideas regarding tactile sensibility. Here we seem to have speculation run mad, and the whole reminds us of the late Professor Laycock, who was so apt to run riot when he got hold of a favourite speculative hobby. Who cannot recollect with amusement and admiration the sweeping conclusions he sometimes arrived at from a not by any means established and apparently insignificant fact?

Here is what Dr. Luys says about *tactile* impressions:—

It is chiefly tactile impressions that form the special contingent destined to provoke the reactions of the intellectual sphere.

Radiated from the extremities of the peripheral plexuses, gifted with a special organization (sensitive papillæ, tactile corpuscles of Pacini), these impressions furnish the intellect with a number of notions, not very numerous, it is true, but very precise, respecting the different qualities of bodies in contact with them. It is by means of them that we form our judgments respecting the dimensions and surface-condition of external bodies, and respecting their motion, temperature, and degree of dryness or moisture. It is by means of them and their fellows of muscular sensibility that we are informed of the expenditure of nerve power necessary to gauge the weights of heavy bodies, to lift them, and indirectly acquire a precise notion of their volume and solidity.

This special contingent of sensitive elements, by means of which the notion of human personality is developed and maintained, and by means of which also we are constantly in contact with the things of the external world—this contingent, I say, is still destined to vibrate in harmony with all the mental faculties, and to give specific bent to the character of the individual, as well as to the creations of his mind. We may say, then, that a greater or less degree of perfectionment, and a greater or less degree of sensitive power in the sensitive regions, find their counterpart in the central regions, and that the greater the degree of physical, the greater will be the degree of moral sensibility.

We all know how fine, delicate, and sensitive is the skin of women in general, and particularly of those who live in idleness, and do no manual work, how their sensitive nervous plexuses are in a manner exposed naked to exciting agencies of all sorts, and how, from this very fact, this tactile sensibility, incessantly awake, and incessantly in vibration, keeps their mind continually informed of a thousand sensations that escape us men, and of tactile subtleties of which we have no notion. Thus in idle women of society, and men with a fine skin, mental aptitudes are developed and maintained in the direct ratio of the perfectionment and delicacy of sensibility of the skin. The perfection of touch becomes in a manner a second sight, which enables the mind to feel and *see* fine details which escape the generality of men, and constitutes a quality of the first order, *moral tact*, that touch of the soul (*toucher de l'âme*), as it has been called,

which is the characteristic of organizations with a delicate and impressionable skin, whose *sensorium*, like a tense cord, is always ready to vibrate at the contact of the slightest impressions.

Inversely, compare the thick skin of the man of toil, accustomed to handle coarse tools and lift heavy burdens, and in whom the sensitive plexuses are removed from the bodies they touch by a thick layer of epithelial callosities, and see if, after an examination of his intellectual and moral sensibility, you are understood when you try to evoke in him some sparks of those delicacies of sentiment that so clearly characterize the mental condition of individuals with a fine skin. On this point experience has long ago pronounced judgment, and we all know that we must speak to every one in the language he can comprehend, and that to endeavour to awaken in the mind of a man of coarse skin a notion of the delicacies of a refined sentiment is to speak to a deaf man of the deliciousness of harmony, and to a blind man of the beauties of colours (pp. 259-61).

Is not this speculation run wild? Surely the national bard of Scotland, Robert Burns, a hard-working ploughman, understood the voice of nature better than all the idle women and scented dandies who have ever lived, and have been the curse of humanity since the world began. He had a toil-worn hand, yet his cerebral reflexes have seldom been equalled and never excelled. Leaving so-called natural genius out of the question, can we believe that a delicate skin is of more importance to the artist than an eye educated to recognise the infinite effects of light and colour; a brain able to decide how these should be represented on the canvas; and a hand able to carry out the ideas elaborated by much voluntary and involuntary brain action?

The chapter on the functions of the optic thalamus is very interesting and important. The same may be said of the one on the corpus striatum, and from it we extract the following paragraphs. They shortly and clearly express the author's views:—

Thus it follows, from what we have just explained, that the corpus striatum, like the optic thalamus, is a nervous apparatus with multiple activities.

It is a common territory into which the cerebral, cerebellar, and spinal activities come in succession, to be combined, and I might almost say, to anastomose. It thus represents, from a dynamic point of view, a synthesis of multiple elements.

It is in the midst of its tissues that the influence of volition is first received at the moment when it emerges from the depths of the psycho-motor centres of the cerebral cortex. There it makes its first



halt in its descending evolution, and enters into a more intimate relation with the organic substratum destined to produce its external manifestations—in one word, *materializes* itself.

From this moment it comes into intimate contact with the innervation radiating from the cerebellum, and it is now no longer itself, no longer the simple, purely psycho-motor stimulus it was at its origin. It is associated with this new influence, which gives it somatic force and continuity of action. It then passes out of the brain by means of the peduncular fibres, combined with a new element, and pursuing its centrifugal course, it is finally extinguished here and there by setting in motion the different groups of cells of the spinal axis, whose dynamic properties it thus evokes.

Thus also, proceeding like an electric current into the different departments it animates, it now tends to produce phono-motor movements designed to express outwardly the emotions of our sentient personality, and now to determine in the different muscular groups, general or partial movements of flexion, extension, or progression, according as it is distributed to such or such groups of satellite cells, the habitual servants of its excito-motor demand.

We see then, to sum up, by means of this simple physiological sketch, what an all-important part these two central ganglions play in the phenomena of cerebral activity, and how completely different is the mode of action of each.

The elements of the optic thalami purify and transform by their peculiar metabolic actions impressions radiating from without, which they launch in an intellectualized form towards the different regions of the cortical substance. The elements of the corpus striatum, on the contrary, have an inverse influence upon the stimuli starting from these same regions of the cortical substance. They absorb, condense, *materialize* them by their intervention; and having amplified and incorporated them more and more with the organism, they project them in a new form in the direction of the different motor ganglions of the spinal axis, where they thus become one of multiple stimulations destined to bring the muscular fibre into play (pp. 57, 8).

There are various matters touched on in this volume which we would willingly notice if space permitted. We are, however, compelled to recommend our readers to study them for themselves. A single reading will not suffice for most men, and repeated perusal will show more and more the ability of the author and the ingenuity of his speculations. "The controversies of philosophers and metaphysicians, which have been taking place from time immemorial, have succeeded in arriving at but one thing—the expression in sonorous language of their ignorance, more or less complete, of the fundamental characters of psychical life." It is to be feared that the old metaphysicians are not alone guilty

in cloaking ignorance in a cloud of sounding words. From some of the sentences of our ingenious author it is sometimes exceedingly difficult to extract a meaning; and it occasionally happens that when the meaning has been got at, the mind feels that it has not got any further into the secrets of cerebral action. This may be partly due to the subject, which is a decidedly difficult one; or perhaps to the style, which is involved. We take it for granted that this book is a translation, and this may account for some of the sentences being long and difficult of comprehension. Mistakes are few, but they do occur. Thus at page 69 we have "accidents" for symptoms; at page 95 "coming to bring;" "function" is occasionally used as a verb; and we are not quite sure that "perfectionment" is as yet an English word.

It will be seen that our notice is largely composed of extracts from the book itself. This has been done for a definite object—to excite to the perusal of the whole work. Physicians engaged in asylum practice, and interested in something beyond administrative details, will find much to interest them and much food for reflection. The whole of Book II. must be specially attractive to them, and they will also study carefully the chapters which treat of the genesis of pathological states; the genesis of the notion of personality; the explanation of somnambulism; and the perturbations of automatic activity in insanity.

T. W. McD.

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*Evolution, Expression, and Sensation, Cell Life and Pathology.* By JOHN CLELAND, M.D., F.R.S.

The merit of this little book by the Professor of Anatomy in the University of Glasgow may be said to be in inverse ratio to its size. Dr. Cleland holds that the evolutions of organization are definite in their character, and that the highest evolution of animal life completes itself in our race. Development marches forward to a completed whole. Professor Cleland does not, however, scruple to recognise design in development. Thus he writes: "There is morphological design, and when in any line of development the design is completed, the evolution ceases, although by the operation of environment or external circumstances variations may continue to occur, and degenerations of diverse kinds may take place."