

There is still, I think, nothing advanced to show why the sheath should, if normal, be sometimes transparent, sometimes opaque, sometimes closing adherent to the capillary or artery which it surrounds, and sometimes even inclose a small knot of varicose vessels.

I think it highly probable that the nerve tissue of the cerebral centres, especially in old cases, undergoes some change in its structure. I think the altered specific gravity of the brain indicates as much, but at present the microscope has not, I think, made the change palpable to our vision.

Note on the Localisation of Function in the Cerebral Hemispheres. By H. CHARLTON BASTIAN, M.A., M.D. Lond., F.R.S., Professor of Pathological Anatomy in University College, London.

MAN is born with a nervous system of the highest type, and in accordance with what we know concerning the laws of hereditary transmission, with one which—though at the time of birth so far advanced morphologically as clearly to foreshadow its future excellence—we are entitled to believe possesses within itself certain potentialities of organic development, definite enough and powerful enough to ensure its evolution in given directions, so long as its different parts are acted upon by those stimuli to which they have been accustomed in the preceding individuals of the parent race. To a certain extent the infant is even born already possessing capabilities of receiving impressions and of executing movements—corresponding parts of its nervous system being more advanced than others in histological development. And it may be stated generally, that these capabilities and these powers are gradually strengthened and extended in a definite order, as particular parts of the nervous system advance towards a more perfect development of tissue—that is to say, as nerve-cells and communicating nerve-fibres gradually arise out of the less specialised embryonic tissue which formerly occupied their place.

Although there is, therefore, a pre-arranged plan, so to speak, of development, and the several parts of the nerve-centres inherit a natural tendency to develop after a given

method, and in accordance with a pattern which has been gradually modified till it has attained its present comparatively perfect form, still the degree of development which the several parts will ultimately attain, depends in a most marked manner upon the kind and degree of education to which the individual is subjected. Experience acting upon the race has had its influence in gradually building up a complete nervous system such as the infant inherits from its parent; this carries with it certain powers, answering to what may be called the Instincts, and certain potentialities, on which the presence of so-called Innate Ideas depends. And now the experience of the individual, acting upon his particular organism, with its potentialities, will gradually build up his own particular knowledge and strengthen the reasoning faculties.*

The cerebral hemispheres are at the present time generally admitted to be the great Perceptive centres, which, in man, are chiefly concerned with the phenomena of Intellect, Emotion and Volition. These parts are double, and our sense organs have a bilateral symmetry, similar to that which exists for all the other organs of relation, although our Consciousness together with our sense of personal identity is single. Seeing that the education of the individual is carried on by means of the impressions derived through his more special senses of sight, hearing, smell, taste, and touch; from the action and consequent sensations derived through his muscular system; and from the less special, though still important and more general impressions of an organic nature flowing into the higher nerve centres from the various viscera; and seeing that these various avenues of knowledge are bilaterally symmetrical, it seems only fair to infer that the cerebral hemispheres on each side of the body, which are the ultimate recipients of these various impressions, should be endowed with like functions, since they too may be said to have a bilateral symmetry.† I am therefore strongly inclined still to believe in the similarity of function, and practical equality of education of the two cerebral hemispheres, notwithstanding all that has been said of late in opposition to this doctrine.

With regard to the question as to the existence of distinct faculties of the human mind, such as were formerly sup-

* See Herbert Spencer's "Principles of Psychology" for a full exposition of this doctrine.

† In minor details I am fully aware this is believed not to be the case in the opinion of the best judges—and if there is one thing more striking than another distinguishing the brain of man from that of the higher apes, it is the fact that in the former there has risen a very slight though still perceptible want of symmetry between the convolutions of the two hemispheres.

posed to exist by the phrenologists, and such as M. Broca and other pathologists have lately been speaking of under the name of the 'Faculty of Articulate Language,' I am thoroughly of opinion that any such division of the human mind into distinct faculties is impossible. In his profound work, the *Principles of Psychology*, Herbert Spencer says that, "fundamentally considered, intelligence has neither distinct grades nor is constituted of faculties that are truly independent; but that its highest phenomena are the effects of a complication that has arisen by insensible steps out of the simplest elements. Every form of intelligence being in essence an adjustment of inner to outer relations, it results that, as in the advance of this adjustment, the outer relations increase in number, in complexity, in heterogeneity by degrees that cannot be marked, there can be no valid demarcations between the successive phases of intelligence" (p. 486). If, then, such a division is a false one psychologically, we must all the more strongly disbelieve in the possibility of success attending the attempts which have been made to give such supposed faculties a definite seat in the cerebral hemispheres.

Even Perception, Intellect, Emotion, and Volition are all so intimately associated with one another in our ordinary mental processes, that as it seems to me, if we were ever to attempt anything like a definite mapping out of the territories of these—allotting a separate province for each of these great divisions of mind in the cerebral hemispheres—we should fall into a grievous error. Just in those parts of the cerebral hemispheres that are most concerned when we look upon a fine painting or a fine piece of statuary, may we imagine the emotions of admiration kindled to which the sight of these objects of art has given rise; * and just as the sight of ripe fruit upon a tree may incite a desire to possess, followed by a volitional stimulus for the purpose of obtaining the desired object; so in this case the parts concerned in the manifestation of the desire, and those in which the volitional stimulus originates, are probably situated within some portions of that same area of convolutional grey matter which was concerned in the perceptive act itself. In short, if anything like localisation of function is possible in the cerebral hemispheres, then I believe it would occur, and could be

* Dr. Maudsley seems to hint at some such relation as this, though he does not specify that the perceptive act and the emotional resultant pertaining to it have their origin in the same areas of grey matter, when he says, "Emotion is strictly perhaps the sensibility of the supreme centres to ideas." (*The Physiology and Pathology of Mind*, p. 47.)

accounted for, rather in this way:—that inasmuch as we have certain distinct avenues of knowledge (through the Sense Organs and their proximate nerve ganglia), and that the cerebral hemispheres are the parts concerned in the elaboration of impressions so derived,* we can well understand that the impressions entering through one gate or sense-avenue, may pass through the substance and towards the periphery of these Cerebral hemispheres in certain definite directions, and according to accustomed routes. Then, the impressions entering through another gate of knowledge, or avenue of sense, may, and probably do, pursue a different direction through its substance, so that at the periphery the fibres and cells concerned in the conduction and elaboration of these impressions may exist in maximum quantity in different portions of the surface of the hemispheres—though in part they may occupy jointly the same area, and be intertwined with the fibres and cells concerned in the elaboration of the previously mentioned set of impressions. And so on with the various sense organs and their ultimate expansions in the form of what I would call ‘Perceptive centres’ in the cerebral hemispheres. Thus, though there may be much and compound overlapping of areas, and though the area pertaining to the impressions of any particular sense in the cerebral hemispheres may be a very extended one (not to speak of the still further complication brought about by the communication established between the nerve cells of one sense area with those of others in the same hemisphere, and of the probable union by means of commissural fibres between analogous parts of the two hemispheres), still it may well be that certain portions of the surface of the cerebral hemispheres might correspond more especially to the maximum amount of nerve cells and fibres pertaining to some one or other of the various senses. I should expect, therefore, that the parts concerned in the production of the emotional feelings related to any particular sense or senses, as well as in the production of the volitional stimuli to which these might give rise, would be those parts of the Convolutional grey matter that represented, as it were, the Perceptive Centres of the senses in question.†

* Converting them in fact into what I call Perceptions—using this term in its ordinary psychological acceptation.

† For some of the applications of this doctrine the reader may consult a paper “On the Physiology of Thinking,” and also one “On the various forms of Loss of Speech in Cerebral Disease,” in the current Nos. of the *Fortnightly Review*, and of the *British and For. Med. Chirurg. Review*.

If we are to believe in the existence of anything like order or uniformity in the operations of the higher nervous centres, it seems to me that we are bound to come to some doctrine of localisation; and I am as fully disposed to believe that the path through the cerebral hemispheres traversed by an auditory impression in its passage upwards from the medulla to the cortical substance of the hemispheres is a definite one, as I am to believe when I touch the table at which I am now writing, with one of my fingers, that the impression so occasioned travels along a perfectly definite route from my finger to my spinal cord, and moreover that a similar impression would always follow the same course so long as the conducting parts remained uninjured. Unless we believe that some such order and regularity are observed in the passage of impressions through the higher centres, then it would be impossible to conceive how the perfection of result actually witnessed could be obtained. Where there is now order and constancy nothing but confusion and irregularity would seem possible, if nerve currents, instead of following definite routes, went wherever chance directed them.* Such a condition of things would, in fact, be a matter of the utmost improbability, seeing how much it would contradict the order observed in all the phenomena of the organic world, where functions are found to be always performed in a definite and regular manner.

Thus, localisation in this sense seems to be a simple *à priori* necessity; but how far there is distinct and separate localisation is a very different question. I, for my part, entirely disbelieve in the possibility of distinct and separate localisation, though at the same time I do believe that certain portions of the cerebral hemispheres—the anterior lobes for instance—are always concerned in the carrying on of intellectual and volitional operations of much the same nature, though of different

* Whilst believing, therefore, in a doctrine of uniformity, as regards the transmission, &c., of nerve stimuli, it would seem that though this is the general rule, still where injuries or lacerations of substance have taken place that a stimulus is capable of making its way along unaccustomed routes, so long as anastomoses exist, by which it may pass continuously from nerve-cell to nerve-fibre. This is found to be the case in the transmission of sensory stimuli upwards through the spinal cord—the transit is effected so long as the continuity of the grey matter is not entirely severed in any one region. It seems to be that the passage of an impression through nerve tissue from periphery to centre, or from centre to centre, accommodates itself to altered conditions in the same way that a stream of water would, if, flowing down a moderately steep incline, it came to a place where its main bed was dammed up, whilst collateral channels were present by which it might pursue its onward course.

degrees of complexity in different individuals ; and yet it can scarcely be said of carrying on, but rather of assisting and aiding to carry on, certain intellectual and volitional operations ; for, as previously hinted, it seems improbable that even such a large division of a cerebral hemisphere as the anterior lobe has a distinct set of functions peculiar to itself. The division into anterior, middle, and posterior lobes is an entirely artificial one, and the grey matter of the anterior region is, in all probability, intimately related, both structurally and functionally, to the grey matter of the middle and posterior parts of the hemispheres ; so that just as our psychical nature consists of one great complicated but unbroken network in which are bound together sensations, perceptions, judgments, emotions, and volitions, so is the physical organ corresponding to these also represented by the most complicated and intricate network of nerve-cells and nerve-fibres, mutually bound together and brought into correlation. In saying, therefore, that the anterior lobes are always concerned in the carrying on of intellectual and volitional operations of the same nature, I mean that they are mainly instrumental in such functions, not ignoring the great probability that they are assisted in these operations by the more posterior parts of the hemisphere, or the equally great probability that they take part to a minor degree in the execution of certain other operations which depend more especially for their execution upon the functional activity of the middle and posterior lobes. Just as certain of the senses contribute in a preponderating degree towards the building up of our mental impressions and their corresponding volitional results (e.g., those of sight, hearing, and touch), so we may imagine that these sense organs would be connected internally with a comparatively wide area of cortical substance in each hemisphere. It would be fair to infer as a probability, therefore, that the perceptive centres for visual impressions, and also those for acoustic impressions, would have a widespread seat in the cerebral hemispheres, whilst those pertaining to the gustatory and olfactory senses would have a more limited distribution.

Concerning the actual areas of distribution of the several perceptive centres, we can say little in the present state of our knowledge. Do they extend to any notable extent into the posterior lobes, or are these concerned more especially with the higher manifestations of intellect ? The latter is the supposition which, I think, much of the best evidence in

our possession rather tends to support.* Then, again, what share does the cerebellum take as a perceptive centre for impressions of any kind, or are its functions of an entirely different nature? These are questions concerning which we are not, at present, in possession of sufficient data to enable us to decide.

On the Antiquity of General Paralysis. By T. CLAYE SHAW, M.D., Lond., Assistant Medical Officer, Middlesex Lunatic Asylum, Colney Hatch.

SHAKESPEARE has used the character of "Achilles" to portray in vivid language his own conception of a malady of the mind which modern pathologists choosing to consider

A new disease, unknown to men,

have made familiar to us under the term of "General Paralysis." Doubtless, the recognition of this as a distinct phase of insanity necessitating confinement in an asylum dates from comparatively recent times, but Shakespeare not only remarked and described the chief symptoms, but also noted them as constituting a disease of the mind, though probably he would not have classed those so afflicted with the rest of "Bedlam Beggars."

In the "Manual of Psychological Medicine," p. 17, is a passage from Trelut said to be quoted from Hippocrates, in which Dr. Hack Tuke hints "we might recognise the symptoms of incipient general paralysis," but the quotation referred to from Hippocrates is doubtful.

The passage now to be commented upon is found in "Troilus and Cressida," Act II. Sc. III., and it is Ulysses who speaks:—

" Things small as nothing, for requests' sake only,
He makes important: possess'd he is with greatness;
And speaks not to himself, but with a pride
That quarrels at self-breath: imagin'd worth
Holds in his blood such swoln and hot discourse,
That, twixt his mental and his active parts,
Kingdom'd Achilles in commotion rages,
And batters down himself: what should I say?
He is so plaguy proud, that the death-tokens of it
Cry—' No recovery.' "

* Macmillan's Magaz., Nov. 1864, "On the Human Brain."