

The Perceptive Centres and their Localisation. By the Rev. W. G. DAVIES, B.D., Chaplain to the Joint Counties' Asylum, Abergavenny.

THE cerebral anatomist, if destitute of any leading idea as to what he should be searching for, must be labouring under considerable disadvantage when he examines the intimate structure of the brain; and since the study of his choice must, from its peculiar intricacy, demand his best attention, he cannot be expected to be as profound in his psychology as he is in his anatomy. "It is interesting to remark," says Wagner, "that wherever an insight into the nature of the functions performed by an organ has been wanting, there has the structure also remained more or less obscure; we feel the want of everything like a guiding principle in the anatomical inquiry; of this truth we have satisfactory assurance in the cases of the thyroid, thymus, and supra-renal bodies and spleen."* Then, as regards the psychologist proper, if he devotes his days and nights to the analysis of the mind's conscious and expressed operations, it is not in human nature that he should be a professed and original anatomist as well. Indeed, division of labour is more necessary, perhaps, in this obscure field of research than in any other. Now, it is as a psychologist who, in the interest of truth, has deemed it his duty to explain mental phenomena in such a way as to be in harmony with the ascertained structure of the brain, that the writer offers the following remarks, hoping that they may not be unserviceable to the cerebral anatomist.

We offer this paper as a sequel to our last,† and the reader's attention is invited, in the first place, to what was therein propounded as to the nature of Perception. This mental operation is considered to be, so to speak, a bi-une process, involving the action of a sense-centre together with that of an intellectual centre or centres. As soon as a sense-centre ceases to act, while the intellectual centre or centres continue to do so, what is experienced is an idea or notion of what had previously been presented in sensation, which is considered to be simply presentative consciousness or concrete intuition, in

* Elements of Physiology, Willis's Translation, Part III., p. 606.

† Journal of Mental Science, October, 1868.

other words, the object of the many. A tree, for instance, as seen by us, is sense-consciousness alone; and if we can say that the tree does not know, that is, perceive, conceive, and remember, so also are we justified in saying that sense-consciousness does not exhibit these purely intellectual powers. The sense-centres, then, simply present an object; the intellectual centres analyze that object in the manner to be explained below.

Seeing that sensation is a kind of consciousness, and yet does not amount to knowing, it is desirable to mention that the term consciousness, though used by many metaphysicians as synonymous with intelligence, may, with greater accuracy be confined to a lower signification. Consciousness appears to be the most appropriate word in our language to express all that the mind reveals or manifests. Thus, sensation and emotion are kinds of consciousness; they present, but inasmuch as they cannot be said to be knowing operations, since they do not discriminate in time, they cannot be called intellectual actions of the mind. Consciousness, therefore, would be appropriately regarded as more generic than knowing or intellection. It should be correct to say that all intelligence is consciousness, but not the converse.

We now propose giving a condensed account of some of the laws of thought, primitive and derivative, and pointing out, as we proceed, which of these involve separate seats in the cerebral hemispheres, and which do not.

In the first place it is known that the organ of smell is connected, by means of nerve-fibres, with the olfactory ganglion, which is concluded to be the olfactory sense-centre; that the organ of hearing is similarly connected with what is inferred to be the auditory sense-centre;* and the organ of sight, with the corpora quadrigemina, which are concluded to be the visual sense-centre. Although the remaining organs of sensation have not yet, so far as we know, been discovered to be in connexion with any special ganglion, it is, nevertheless, fully believed that such is the case, and that eventually the anatomist will be able to establish this as a fact. † One advance made in this direction is that by Dr. Brown Sequard, who states his view of a certain point as

* *Researches on the Intimate Structure of the Brain.* By J. Lockhart Clarke. Second Series—Of The Auditory Nuclei and Nerves.

† *The Physiology and Pathology of the Mind.* By Dr. Maudsley. Chapter IV. Sensory Ganglia.

follows :—“ We think, and for many years already have tried to prove, that the nerve-fibres employed in the transmission of each of the following sensitive impressions are as distinct one from the other as they all are from the nerve-fibres employed in the transmission of the orders of the will to the muscles. Of the three hypotheses that may be made to explain a loss of one or of a few only of the following sensations, there is but one which agrees with the facts at present known ; and we repeat that this one is, that the conductors of the various sensitive impressions are distinct one from another. The kinds of sensitive impressions which have different conductors are those giving the sensations of *touch, tickling, pain, heat, and cold*, and the peculiar sensation which accompanies muscular contraction.”* Now, if this be a true statement of the facts, it is evident that distinct centres have to be sought for these impressions ; and two of these centres, that for touch and that for the peculiar sensation which accompanies muscular contraction, are of very high importance in the intellectual economy, since it is to them we owe our knowledge of the extended and the solid. Now, since nerve-fibres are known to proceed towards the cerebral hemispheres, from such sense-centres as have been discovered, and from the other bodies at the base of the brain, it is highly probable—and the laws of thought seem to demand as much—that each sense-centre is in immediate connexion, by means of the nerve-fibres passing from it, with a certain portion of the cortical surface above, such portion forming its intellectual centre. According to this hypothesis, there are first a *sensitive* and then an *intellectual* centre attached to each of the organs of sense ; and the latter, except when occasion arises for clearly distinguishing it from its related sense-centre, may be appropriately entitled a Perceptive centre.

Dr. Charlton Bastian has independently arrived at views very similar to these, and we sincerely hope that his superior opportunities, and intimate study of anatomy, will enable him to throw considerable light on this important question.†

For the better understanding of this examination, we would draw attention to the fact that thought moves in two categories. :—

* Physiology of the Nervous System. Lecture VIII.

† Dr. Bastian has, of his own accord, explained that the views advanced by him in the January number of this Journal were in print before he had any knowledge of our article in the previous number.

The Category of Difference.

Differentiation
 or
 Discrimination.
 Definition.
 Division (logical).
 Law of Contiguity.
 Connotation.
 Whole of Comprehension.
 Analysis (of a Whole of Comprehension into its parts or qualities by predication).

The Category of Resemblance.

Identification
 or
 Assimilation.
 Generalization.
 Classification.
 Law of Similarity.
 Denotation.
 Whole of Extension.
 Synthesis (of individuals into a Whole of Extension, by noting their likeness, and bringing them under one name.)

We have selected the above terms without attempting strict accuracy as to their opposition and order, simply to mark out the leading features of each of the categories; and it must not be supposed that there is a decided separation in thought between the one class and the other. Did space allow, it could be shown how closely interwoven these contrasted operations are; and, as it is, we shall have to show that, independently of each other, the two categories, in so far, at least, as they include the elementary laws of thought, cannot exist.

Accepting the physiological theory that all thought is preceded by cell-action in the ideational centres, we go on to show what the fundamental laws of thinking are, and wherein they involve a separate seat in the brain, and wherein they do not.

Two indispensable elements of all thought are *discrimination* and *identification*. An object, as presented in a sense-centre, is cognized by the related intellectual centre as a whole. This whole is discriminated, 1st externally, from other wholes presented by the same sense-centre; 2ndly internally, from the qualities which compose it; 3rdly, these qualities are distinguished from each other. There are various links between a whole and the qualities which can be predicated of it; but the fundamental and invariable link is contiguity in time. Objects perceived together or in immediate succession are apt to cluster together in the same order in memory, and form wholes of thought. Thinking mainly consists in analyzing these wholes, and is expressed in language by the proposition or asserting sentence. The subject of the proposition invariably represents the whole about which we are thinking; the predicates which may be asserted of the subject, the positive or negative qualities and relations of

such a whole. When a proposition simply unfolds the contents of the subject, it is called analytical; when it adds to these, synthetical. Now, it appears to us that when a proposition is analytical, there is no cerebral action involved in the predicate-notion other than that which is involved in the subject-notion. In the synthetical proposition, however, it appears that there must be cell-action in addition to that implicated in the subject-notion. In the former case, given the subject-notion, the predicate-notions are already given in it; but in the latter case, the subject-notion summons up the predicate-notion in some other seat of the brain. The laws of mental succession as relating to different thoughts following one another in chronological order, come under this head alone. "Thoughts," says Hamilton, "are dependent on each other, only as they stand together as relative parts of the same common whole. This may be called the Law of Relativity or Integration."

"But this whole is of *two* kinds. It is either an *objective* (necessary and essential) unity, constituted by and intrinsic to the thoughts themselves; or it is a *subjective* (contingent and accidental) unity extrinsic to themselves and imposed on them by the mind—the mind in general. In the former case, a certain thought being given, it *necesssarily, of, and along with, itself evolves a certain one exclusive other*; in the latter, a certain thought being given, it only moves the mind, according to definite subjective laws, to pass on to this or that of a certain plurality of others. In the one instance, there is a determination to an individual consequent; in the other, only a determination to a class of consequents, the preference of this or that class, or of this or that individual under it, being regulated by circumstances, external to the nature of the antecedent thought itself. The former constitutes what may be called the *logical* or *objective*; the latter, what may be called the *psychological* or *subjective* train of thought."* The logical train involves no other cerebral action in the conclusion than that already involved in the premisses; in the psychological train the consequent involves action in some other seat than that concerned with the determining or antecedent thought.

In order, however, that a whole may be cognized by the discrimination of its parts, there must be continuity of this cognition in time, or the cognition of the present moment must be identified in thought with that of the latest, later, late past, &c. Let the beginning of a flow or succession of

* Hamilton's Reid, p. 911.

thought be A (for all thought is a flow, "and every consequent modification in the mental train is the effect of that immediately antecedent"),* then as the same thought continues, we have A + A' + A" + A''', &c. Each thought leaves its traces or residua behind it, and the stronger these are, and the more they are accumulated, the firmer is the thought retained, and the greater is the force and aptitude stored up in the cellular neurine concerned. Now, as to localization, this identifying of a present thought with its past involves precisely the same seat as the thought in its discriminating aspect does. While, then, distinct Perceptions involve separate seats, the continuity of a Perception in time does not, for it merely implies continuance of action in one and the same Perceptive centre.

An easy method of elucidating how far perceptions suppose distinct seats in the brain, and the reverse, is to select a sensation—sound, for instance—and submit it to examination.

Sound is a quality *sui generis*, and is also distinguished from the tangible, the visible, &c., in so far as it has a special organ allotted to it. This organ is known to be attached to a sense-centre; and there are strong reasons for concluding that this centre is moreover attached to a certain portion of the vesicular neurine of the hemispheres, the latter forming the intellectual centre of the sense of hearing. For, in consciousness, sound, though not possessed of that eminently separating attribute, extension, is, nevertheless, strongly discriminated from the objects of the other senses; and since it can be perceived contiguously in time with colours, odours, tastes, &c., this seems to us probative evidence that it has a separate intellectual centre pertaining to it, for how otherwise could it be simultaneously distinguished from other sensations? How could the whole of the intellectual region of the brain be engaged at one and the same time with the sensation of sound, and yet distinguish this from other sensations which are being synchronously experienced? We do not see how it can be true to state, *assomodo*, that two thoughts cannot be before the mind at one time. We admit that two thoughts cannot be in one and the same seat at once; but it does not follow from this that two centres cannot be simultaneously engaged, each with its own thought, when a comparison is made, or but one act of attention demanded. A relative implies a correlative, a logical

* It does not follow from this that action does not persist in the same seat for a long time together, giving rise to identical thoughts, as illustrated in the text.

whole is that the parts of which cannot be absent, and although in these instances there cannot be two thoughts in one seat, or the same cluster of cells, yet it is absolutely necessary that they should be simultaneously present each in different seats.

The quality (emotional) of single sounds, as agreeable or disagreeable, and of sounds heard together (who will undertake to deny this?) as harmonious or discordant.—This quality being only a mode in which the auditory centres, sensitive and intellectual, are affected clearly does not seem to us to involve any separate seat in the brain.

The quality (intellectual) of sound, as the ring of metals, and the articulations of speech.—This also does not appear to demand a separate seat, being simply a variation in the sensation of sound.

The intensity or loudness of sound.—As this only implies the degree of force with which the centres are acted upon, no one will think that it demands distinct localisation.

Pitch or tune.—Now, although this mark of distinction between sounds does not involve any other cells than the auditory, yet it does seem to us to involve difference of locality among these. Take the common chord in music, say C E G C in the natural key. When these sounds are struck together they can be clearly distinguished from each other. This being the case, we fail to see how the whole auditory apparatus, physical, nervous, sensitive, and intellectual, can be occupied at the same moment with each of them. The distinguishing of objects from each other is made possible, we should say, in the first place, because the objects are different, and produce different impressions; but if the whole auditory apparatus is affected by every sound, it must be homogeneously excited throughout, and in that case, how could there be any discerning of sounds of different pitch, struck at the same moment? It may, then, it is presumed, be laid down as a law, that if certain objects are synchronously discriminated, there cannot be homogeneous action in the whole brain. We beg to submit then:—

1.—That when sensations are of different species, they exclude each other to such a degree as to demand separate centres, not only of sensation, but also of intellection; and the anatomical evidence of this is well-nigh conclusive throughout.

2.—That certain sensations *simultaneously* cognised, and being of the same species, when they differ so much as to be

numerically distinguishable from each other, also exclude one another so far as to involve a distinct seat in their special centre; thus, one colour excludes another in extension, and one sound another in pitch, whenever both of either are perceived at the same moment.

3.—But that certain qualities which an individual sensation, a colour or a sound, may possess, although distinguishable from each other when simultaneously cognised, do *not* involve a separate seat, for let a colour be perceived, it may be well or badly lit, bright or dead, pleasing or otherwise, all at the same time; and all these qualities can be accounted for by supposing that the seat occupied in perceiving the individual colour is capable of experiencing, at the same moment, affections of various kinds. One source of variety in this respect is the degree of intensity in a sensation; another is the emotional effect which frequently attends one. Sounds, for instance, are emotionally felt as harmonious or discordant, colours as beautiful or ugly, tastes as delicious or disgusting.

So far we have examined perceptive consciousness, and have come to the conclusion that, as each of its divisions involves a distinct organ of sensation, and a distinct sense-centre, so it does also a distinct intellectual centre. We next proceed to examine conceptive thought, and promise a very different result.

Conception presupposes perception, for it requires two or more similar percepts to form a concept.* Thus A' A'' A''' are, to perception only, three different objects; but because they resemble each other, they become united in thought as one whole, a quantitative one; and this further mental pro-

* “Notions formed from several objects are called conceptions, as being produced by the power which the mind possesses of taking several things together (*concipere, i. e., capere hoc cum illo*).” Outline of the Laws of Thought, by the Archbishop of York, § 48.

By conception is meant the act of conceiving; by concept that which is conceived. This latter term is now commonly adopted in this sense. There is a similar distinction between the act of perceiving and the object perceived, and it would be well to use the word percept to signify the latter.

We cannot discover any cognitive act so simple as that answering to a term. Perception, the most elementary act of thought, is a judgment, and has no other explicit form of expression, as a whole, than the proposition. As a term, therefore, is only part of a proposition, so it only represents a portion of an act of thought. We gather from this that common terms are properly called concepts because they imply a conceptive judgment. In like manner the word percept must imply a perceptive judgment, which is presupposed by every judgment of the former character.

cess is called conception, to which we owe all common terms and general propositions. The latter are, in fact, but so many singular propositions expressed, because of their precise similarity, in one proposition. Thus, when we say that all men are fallible, we state, in a condensed form, that John, James, Thomas, and the rest of the individuals who comprise the human race, are fallible. Now, the inference to be drawn from this is, that we require no other seats for concepts than those required for percepts. When the various perceptive seats, whether in one centre or in more, are put into similar action they unite as one, and give origin to conceptive thought or to a numerical whole, the units of which only differ in number from each other, not in quality. Each unit is a qualitative, the sum of such units a quantitative whole. When we perceive a flock of sheep, we observe that the individuals composing it bear a strong resemblance to each other, they are, therefore, regarded as a concept. Now, suppose the sheep to be metamorphosed into objects very dissimilar to each other, they would then be no more regarded as a concept of the same quantity as previously, but they would still continue to be viewed as so many percepts. Now, it is the same perceptive centres precisely which would be engaged in both these instances, but in the former, because the sheep are recognized to be so like, they are considered as a concept; in the latter, because they have become so unlike, the concept disappears, but yet the same number of percepts remain as before. It is only reasonable to suppose that when like impressions are made on the organs of sense, like messages are sent on by these to the sense-centres, and also by the latter to the supreme centres; and that, therefore, conceptive thought is fully to be accounted for by a special mode of action in the various seats of Perception. Having thus disposed of Conception, we have next to turn our attention to Reasoning.

For greater lucidity of exposition, we shall examine Reasoning, in the first place, as it exists in the Category of Difference. Reasoning involves two propositions called premisses, and these must be of such a nature as to contain between them a third proposition, called the conclusion. Thus, if A, as a qualitative whole, contains B, and B contains C, then A contains C. Observe here, that we have two percepts, namely, A contains B, and B contains C. But these percepts, by implication, contain a third percept, a mediate one, namely, A

contains C. Now the recognition of this implied percept is reasoning, which is, in fact, no more than mediate cognition. As to the question of localization of function, what is the inference to be drawn from what has now been stated? That reasoning involves no other seats whatever than those involved in the percepts, which form its premisses. What renders the conclusion of an inference strictly valid or undeniable is the fact that if the premisses have been thought, the conclusion has *already* been thought in them; and from this we conclude that when the cerebral action necessitated by the data has taken place, that necessitated by the conclusion has already taken place in the former. It is only the special act of attention given to the implied proposition, and its expression in words, that can be said to follow. Of course, memory being necessary to all thought, when we express the conclusion of an inference, the thought, which is a threefold relation, continues present to the mind, for it is characteristic of a relative that it cannot be entertained without the idea of its correlative being present at the same time. If the conclusion of an inference involved some other cerebral activity than that which is presupposed by the premisses, we should require some such organ as the Causality of the phrenologists; but seeing it does not, we are bound to remain content with Perceptive centres alone, *entia non sunt multiplicanda præter necessitatem*.

As, in the one Category, reasoning depends on the principle of differentiation in a unity of time, which leads to the formation of a whole of Comprehension, so, in the other Category, it depends on the law of similarity, which leads to the formation of a Whole of Extension. An instance of reasoning, however, in this Category is not in the Whole of Extension, if the premisses are supposed to be singular, for, in order to constitute such a Whole, there must be two similars, at least, denoted by the terms of a proposition. A proposition which declares that this A is like that B, is not in the Whole of Extension, but it expresses that kind of judgment by which such a Whole is generated, for if we judge that A is like B, then A and B form a concept, and can be given the single name, A.

As far as we have gone, it has been clearly seen that the order of knowledge is from the simple to the complex, the individual to the general, the concrete to the abstract, and not the reverse. Knowledge is built up, like everything else in nature, by gradual development out of simpler into more special combinations. Reasoning, for instance, is primarily in

the Whole of Comprehension, that is, to be quite explicit, must be in this Whole as the condition of its being in the counter Whole. In logical order, the Whole of Comprehension is presupposed by the Whole of Extension, but not the converse; nevertheless, chronologically, the two wholes perhaps are never uncombined. Reasoning, then, if regarded as exclusively in the Whole of Comprehension, is quite independent of common terms or general propositions. It is the function of conceptive thought to make general propositions out of a multiplicity of singular ones, and thus to give us arguments having general premisses. All reasoning, therefore, apart from Conception, must have singular premisses and a singular conclusion. What do we gather from this? That the famous *dictum de omni et nullo* is not the foundation of all argument. Since ratiocination is a descent from generals to particulars, it cannot be the first and only step in reasoning, as the Aristotelian school maintains. We have at root of all inference nothing but isolated singulars, standing like so many piers of a bridge aloof from each other, and waiting for the superstructure which is to unite them.

Let the following be reckoned as two singular arguments, the first in the Category of Difference, the second, in the Category of Resemblance:—A is linked by contiguity to B, B to C, therefore A to C; and A is linked by likeness to B, B to C, therefore A to C. Now, all that is requisite to bring these arguments into the Whole of Extension is to make the singular premisses general ones; by so doing, we unite under one concept so many similar percepts, a process which involves no separate seat in the brain.

There are, then, in the Whole of Extension, two kinds of inference, of which the above are examples, the one based on the principle of difference; the other on that of similarity. We have, in resemblance, a means of assimilating objects to each other, and forming a numerical whole; and the rules of deductive reasoning are designed chiefly to ensure that the quantity of the terms compared be equal, or that the quantity of the first term contain that of the second, and that the quantity of the second term contain that of the third. Thus, if the amount of resemblance expressed by the term man be covered by that expressed by the term animal, and the amount of resemblance expressed by the term animal be covered by that expressed by the term organic, then the quantity of the term man is covered by that of the term organic.

Now, the result of this analysis, as it appears to us, is, that nothing takes place in the most complex kind of reasoning which is not fully to be accounted for by the action of the Perceptive centres only. If the singular syllogism is clearly seen to be a case of mediate perception, all we have to do, in order to comprehend a general syllogism, is to consider it as so many similar mediate percepts stated in one formula.

Sir W. Hamilton has done much to dispel that blind submission to authority, by means of which deductive logic, more especially, was kept a closed subject, and he has introduced a postulate, compliance with which is the very foundation of logical science. This postulate is: "That we be allowed to state in language what is contained in thought." It seems to us, however, that much as Hamilton has done to apply this postulate, he has not succeeded in doing so to the full extent. For instance, the conclusion of a syllogism, such as:—

Whatever Being is sensori-motor is excito-motor,

Whatever Being is ideo-motor is sensori-motor, therefore

Whatever Being is ideo-motor is excito-motor—

is elliptical. The unabridged statement of the conclusion is the following: Therefore, whatever Being is ideo-motor is (through the medium of being sensori-motor) excito-motor. All reasoning, as we have before declared, is mediate cognition; and the conclusion of an inference, if *fully* expressed, should clearly convey this idea. We invite special attention to this fact, because it serves to elucidate what we have to propound below.

We have long come to the conclusion that the most important kind of inference conducted (we shall now make bold to say) by the Perceptive centres, is not the syllogism, but that which we have described elsewhere, and expressed in the following formula:—If it is perceived that *this*, when connected with *that*, exists; and if it is further perceived that *this*, when *not* connected with *that*, does not exist, then it is inferred (*i. e.*, mediately perceived) that *this* is necessarily dependent on *that* for existence; in unelliptical phraseology, that this is so connected with that as not to be able to exist apart from it. In the premisses of this inference we have two percepts, the one positive, the other negative. As to the first of these, any number of them would not yield the conclusion, for they would only amount to the *inductio per enumerationem simplicem* so much condemned by Bacon or the *post hoc propter hoc* of the illogical. In order, therefore, to render the positive

premiss of Induction of any avail, it must be complemented by the negative premiss, and to ensure this, the following Rule must be observed: *The medium through which the positive and the negative premiss of an inductive argument are compared must be strictly one or equivalent to it.* This Rule would have effectually deterred Macaulay's facetious judge from making a show of proving, according to Bacon's Rules, that the cause of the prevalence of Jacobinism was the practice of bearing three names. An inductive inference in order to stand the test of valid inference as already laid down must comply with this Rule. For to state, with truth, that this is dependent for existence on that, we must be able to state the data in which this proposition is implicitly contained, namely, those which enable us to declare that this is in suchwise connected with that, as not to be capable of existing without it. It is impossible, by one line of observation, that answering to the positive premiss of inductive reasoning, to be cognizant of what is commonly called necessary connexion. What Hume has written on this subject clearly establishes, so far as immediate perception is concerned, that "in all single instances of the operation of bodies or minds, there is nothing that produces any impression, nor consequently can suggest any idea of power or necessary connexion."* To know, for example, that a statue depends for the position which it maintains on the pedestal beneath, it is not sufficient to observe that the statue is above the pedestal, and in contact with it. For supposing that we had not, by prior inductive experience, ascertained that the statue necessarily rested on the pedestal, this line of observation would never teach us that it did. But let the pedestal be removed, and lo! the statue falls. We have now in our minds the mediate perception—the origin, as it seems to us, of the idea of necessary connexion—that the statue rests in suchwise on the pedestal, as to be incapable, without it, of maintaining its position.

It is by inductive reasoning that the Perceptive centres infer causation, and necessary co-existence. To omit mentioning this would give the transcendentalists room to say that these leading ideas were not mediate perceptions, but rational intuitions. Of the truth of this theory, however, we can discover no evidence whatever. It seems very clear to our minds, that causation or necessary antecedence and consequence are known by inductive reasoning, thus:—A follows

* Essays—Of the Idea of Necessary Connexion.

B, but when there is no B, no A follows; A, therefore, so follows B as not to be able to do so without the antecedence of B, in one word, A is caused by B. B may stand for any set of circumstances which are followed by an effect, for instance, the mixture of an alkali and acid in water. Necessary co-existence is also known by inductive reasoning, for example:—This circle has a centre, eliminate the centre, and the circle ceases to exist; therefore, the co-existence between this circle and its centre is of such a character as not to admit of the elimination of the centre; in short, the co-existence is a necessary, not a contingent one. Even contingent conjunction is not directly but indirectly perceived, for it can be known exclusively by the failure to establish necessary conjunction. Thus, day precedes night, but eliminate the antecedence of day, and night still exists; therefore, it becomes mediately known that the antecedence of day is only contingently connected with the sequence of night.

A full and varied exposition of inductive inference, in accordance with the theory here propounded, which differs in several points of moment from that upheld by Mr. J. S. Mill, would occupy many pages; and as we have already afforded this elsewhere,* we must now content ourselves with merely replying to the question: how it is that necessary conjunction is regarded as equivalent to universal conjunction, for to conclude without solving this difficulty would still leave the transcendentalists in possession of a portion of their defences. “Necessity and universality,” says Hamilton, “may be regarded as co-incident. For when a belief is necessary, it is *eo ipso* universal; and that a belief is universal is a certain index that it must be necessary (See Leibnitz *Nouveaux Essais*).” † In order to answer the question put above, let us examine the proposition:—This circle (as mediately perceived) must have a circumference. “This circle,” you exclaim; “but how about all circles? You cannot, from this single instance, conclude that all circles must have a circumference, at all events, not by postulating Perceptive centres as all that is needful to thought.” Well, let us see. I endeavour to suppose that a circle may have no circumference, but I fail to do so. Why do I fail? Because, psychologically

* The Alphabet of Thought, &c, 1861. The Law of Certainty. Medical Critic and Psychological Journal, 1863. Mr. J. S. Mill and the Inductive Origin of First Principles. Journal of Sacred Literature, 1866.

† Hamilton's Reid, p. 754.

speaking, I have in my mind the mediate perception, that a circle *must* have a circumference; and this completely excludes the supposition I attempt to make; physiologically speaking, because, when I think of a circle, certain kinds of cerebral action are involved, and if I try to suppose, while thinking of a circle, that a circumference is not necessary to its existence, I am endeavouring to disunite actions, which, on trial, always prove to be inseparable. For if we cannot by any possible means think of a geometrical figure which does not enclose a space, of two straight lines that do, or of an island which is not surrounded by water, it must be because the cerebral actions necessary for this are not possible; and, indeed, when the matter is clearly stated, we cannot fail to see why this should be the case. We cannot have certain brain-cells universally, and yet not universally, in operation at one and the same moment; nevertheless, this is the absurdity involved in attempting to suppose that a figure may not enclose a space. For in order to think of a figure, certain brain-cells must be universally engaged, but if we try to suppose that a figure does not enclose a space, we can only succeed on condition that some of these cells cease to act; should they do this, however, the notion of a figure must completely vanish. By endeavouring, then, to attach such a predicate as "does not enclose a space" to the subject "figure," we posit in the subject what we attempt to annihilate in the predicate; the two, therefore, cannot possibly co-exist. We cannot have our cake and eat it. It is no wonder, then, that we never can succeed in supposing the contradictory of necessary truths or conjunctions. Now the universal is an emphatic expression of the fact, that thus it is, and we cannot reverse it, yea, cannot even suppose, much less conceive, the reversal.

We have seen, then, that a necessary conjunction is mediately, that is, inductively known.

In order to be known, a necessary conjunction involves certain cerebral actions.

Nothing short of these actions will enable a necessary conjunction to be realised.

Therefore, to think anything concerning the idea of necessary conjunction which, either directly or by implication, necessitates anything short of these actions, is wholly incompatible with the continuance of the idea in the mind.

Wherefore it is inferred that it never can be possible to retain the idea of necessary conjunction, and, at the same

time realise a thought which involves the withdrawal from it of any of its distinguishing features.

Furthermore, when it is possible to retain the idea of a conjunction, notwithstanding the withdrawal from it of any quality not a distinguishing one, the conjunction is a contingent one.

Consequently the conclusion is, that in order to preserve the features which distinguish them from each other, a necessary conjunction must always be necessary, and a contingent conjunction always contingent.*

There is, however, no necessity in the *existence* of a case of necessary conjunction. Thus, an island may not exist, but if it does it must be surrounded by water, in order to continue distinguishable from other things.

Now, seeing that universal truths are arrived at in this negative fashion, we fully believe—and that without in the least discounting their claims to take higher rank than contingent conjunctions, as the manner of some is—that the Perceptive centres are completely adequate to their production.

For the proper understanding of the doctrine propounded above, it must be added, that the data of an inductive argument cannot themselves be established by any stronger evidence than immediate perception. We have no stronger evidence that the sun has appeared every day above our firmament for centuries, than the universal experience of man to that effect. For the truth of that which precedes inductive inference, therefore, we have no better authority than the direct perceptions of the human race. Now, as no column can in any part be firmer than its foundation, we cannot, as far as relates to matter-of-fact, regard the conclusion of an inductive inference as surpassing in authority the testimony on which its data rest, for *mediate* perception supposes *immediate*. When it is said, therefore, that, according to inductive perception, water, if it continues to exist, must always be what is signified by the chemical notation H O, it must be tacitly assumed that the chemists are correct as to the immediate percepts which implicitly contain the mediate one. That water will continue to exist, however, we can only believe because of the uniformity of its past existence, and because of its being essential to so

* We do not at all insist upon calling the former of these connexions necessary, but we do strongly upon the necessity of clearly marking the distinction between the two by some definite terminology.

many things. For if we firmly believe that the superstructure will keep in existence, we shall feel more confident still that the base will do so. Recognising such distinctions, logicians make a difference between the truth and the validity of a conclusion, for a conclusion may be valid without being true. In the formula of inductive reasoning given above, we have implied this by stating it hypothetically. If it is perceived that A is connected with B, and without B cannot exist, then it is mediately perceived that A is necessary to B. This conclusion, whether true or not as to fact, for that depends on the truth of the premisses, is, nevertheless, completely valid. It is to be noticed, therefore, that whenever a necessary and universal proposition is established by inductive inference, it is unconditionally true as to the idea entertained of an object, but as to the object itself must always imply the postulate—that the data afforded by immediate perception are fully to be relied on. Then, as to the existence in reality of an object, this is quite another thing than the conditions of its existence. We *believe* that the sun will rise to-morrow, because it always has done so; but we *know* that, if it does, it must be a luminous body, *i.e.*, we positively know this of the sun that exists in our minds, and postulate it to be true of the sun as existing in nature.

Since language has so much to do with thought, this paper would not be complete without some remarks on this head. We are disposed to think that next to the unity of mind known as personal identity, language is the great bond which knits together the various centres of perception. These do not operate independently of each other, for this would be productive of deplorable confusion and incoherence, but each seems to act mainly through the agency of the centre occupied with speech, and this imposes upon the rest the necessity of waiting their turn to be served. A chronological sequence at least among our expressed thoughts is thus secured.

To the logical psychologist, whose province it is to describe with minute accuracy the various operations of thinking as expressed, language occupies a high place indeed. Language bears about the same relation to thinking as agricultural implements do to husbandry, which of themselves do not till the ground, yet are indispensable to tillage. It is, however, in union with conceptive thought that language performs its high office, for it brings under one denomination each of the various stages of resemblance in which objects best admit of

being regarded. Were there no conception, everything would be known as an isolated object or individual, all names would be proper names, all propositions singular ones; and much advance in knowledge, therefore, would be quite impracticable.

It is also by means of such formulæ as the proposition and the argument, care being taken fully to state in words what is contained in thought, that we are enabled to understand, much more clearly than otherwise would be possible, what the intimate nature of thinking is; and without the power of originating these formulæ, it seems to be evident that the human mind would have advanced little, if at all, beyond the more intelligent members of the brute creation.

But what is language apart from that of which it is made the sign? Is there, as the phrenologists hold, any special organ for it? We fail to see that there is. Language consists of signs addressed to the ear, in ordinary discourse; to the eye, in writing and printing; to touch and muscular sensibility, in the case of the blind deaf-mute, supposing, that is, he has sufficient capacity for the acquisition of a language by this instrumentality. Language, then, consists exclusively of signs of some kind or other, with which certain ideas have, by convention, become associated. These signs are commonly articulate sounds, which, furthermore, are represented by marks addressed to the eye; for written words do not seem to be immediate signs of thoughts, but of the articulate sounds which are expressive of them.

Now, it is desirable to notice that although ordinary language is addressed to Hearing and Sight, these, considered simply as receptive centres, do not exercise a productive power in speech, for this, as far as our own consciousness informs us, is a power of a motory character, and this not only in audible, but in silent or mental speaking. So far back as the year 1861, we had remarked on this point, "that it is much easier to call up vivid thoughts of some objects than of others. Visible objects, it has been said" (this was by Mr. Bain in the first edition of 'The Senses and The Intellect') "possess this aptitude in a high degree. But to us, by far the easiest objects to realise in thought are spoken words. Corresponding to the actual utterance of words, there is simply an ideal utterance of them." How is this ideal utterance of them effected? We have lately had the advantage of perusing what Dr. Maudsley has written on this head,* and

* The Lancet, November 28—December 5.

also Dr. Bastian's criticism on the same.* With the aid of these contributions, together with what we had previously thought on the subject, we have arrived at the following conclusion. It will be conceded that each intellectual centre has afferent nerves proceeding to it from its sense-centre, and efferent nerves proceeding from it to its appropriate cells in the motory nuclei. This being the case, there must be a capacity for two kinds of agency in each of the supreme centres,—the one receptive, the other regulative and actuative, the latter supposing the former, but not the converse. Thus, if I listen to some one talking, the auditory seat is clearly detected to be in the receptive state simply. If, however, I endeavour mentally or silently to reproduce the words I have heard, some motory function or other is clearly being exercised, but whether in any of the motory ganglia situated at the base of the brain, is not at all evident. For, since these are not voluntary and intellectual centres, how can they be possessed of initiative and regulative powers proportioning the force to be expended to some premeditated end? We rather incline to the opinion that, with the exception of their sensori-motor action, they only operate as they are bid by the supreme centres, but that, after some practice, they can, having received the command from above, operate automatically. We incline still more strongly to the opinion that they are quite as incapable of acting without the concomitance of muscular contraction as the piston of a steam engine is of moving without causing the fly-wheel to rotate. They seem to us to form part of the machinery of realised movement only.

Should this view be correct, we are reduced to the necessity of seeking the cause of silent speech in the actuating agency exclusively of one of the intellectual centres, this centre, since it is a voluntary one, having the power to perform such a function without summoning into activity the motory cells needed for actual movement. This opinion has the full sanction of our own consciousness, for to us, silent speech has always appeared to be exclusively confined to the intellectual region.

With Dr. Maudsley, then, we believe that the efferent system is indispensable to mental articulation; that is, however, as it seems to us, the efferent function of a supreme centre only; but, with Dr. Bastian, we think that the auditory centre is the one ordinarily engaged in performing this

* *The British and Foreign Medico-Chirurgical Review*, April 1869. p. 474.

office. It is however, the centre so occupied, because it is the best adapted for the purpose, and has, in consequence, become the practised servant of the thinking mind. Language, however, is not confined to the auditory seat, for in the case of congenital deafness we must, in conformity with the laws of physiology, conclude that this centre is in an undeveloped and inert condition, yet deaf-mutes are not debarred the use of language. With them, we imagine, the visual centre directly performs both the receptive and the actuating functions corresponding to those commonly performed by the auditory centre; while with us who enjoy the use of the latter, the former, as respects language, seems to act only in conjunction with the auditory centre. When *we* read or write, the actuating function of the higher acoustic seat appears to be actively engaged, for if we attempt either of these performances without mentally pronouncing the words, we come to a dead stand, and cannot go on at all until we resume the ordinary method of proceeding.

The theory propounded in this paper suggests many problems, and among these, the following:—Do the emotions involve any other centres than the Perceptive? This is a difficult question to decide, and cannot be disposed of in a paragraph, even if the true reply were known. Judging from what is ascertained as to the sense-centres, we may opine that it will be possible to discover that the Perceptive centres are also capable of being emotionally excited. Sweet sounds, luscious tastes, beautiful colours, exquisite odours, and their opposites, all indicate the emotional susceptibility of the sense-ganglia. Why may it not be the same with the intellectual centres? It is not unlikely that certain ideas are calculated to rouse pleasant or painful emotions in their own seats, just as the sensation of harmony rouses a pleasing feeling in the auditory sense-centre; while other ideas, namely, those pertaining to abstract science, leave these seats in a state of emotional indifference.

Does this theory afford an explanation of the diversity of talents and dispositions observed among men? Since there are several sense-ganglia and intellectual centres attached to them, it is evident that both kinds may vary in relative size and quality, and thus, in conjunction with great diversity in external circumstance, give rise to much variety of talent and character. Besides, when we consider that the higher intellectual operations are involutions embracing the simpler (the

same law ought to hold good in respect to the higher emotions),* there is much room for diversity in the degree in which the higher energies are displayed by different people. It seems to us that when the superior energies of thought and emotion abound, it betokens, seeing these are built upon the lower ones, that the mind-force must be more powerful than in cases where these energies are not strongly exhibited. For the mind-force must naturally be expended, in the first place, in the fundamental operations. The higher ones cannot be displayed with power therefore, unless there is a superabundance of this force. Moreover, according to the law of mental involution, we should conclude that deterioration of mind ought to manifest itself in the loftier earlier than in the lower attributes, because if there is a diminution of mind-force, it must be felt sooner in its remoter, than in its nearer fields of display. A skilled pathologist testifies to the *à posteriori* verification of this deduction. "The most delicately organised residua, representing the highest efforts of organic assimilation, are the first to attest by their sufferings any interference with the integrity of nervous element. Long before there is any palpable loss of memory in insanity, even before an individual is recognized to be becoming insane, there is a derangement of his highest reasoning, and of his moral qualities; his character is more or less altered, and, as it is said, "he is not himself."†

* Among the sense-centres the same law is clearly observable in so far as Sight Hearing, Taste, and Smell presuppose Touch and Actuation, which are the origin *quoad nos* of the extended and solid, that to which we impute colour, sound, savour, odour, &c.

† Physiology and Pathology of the Mind. By Dr. Maudsley, p. 191.