14. The diminution of the fits and all the other good effects of the medicine reached their maximum in adults at thirty grain doses three times a day, while ill effects were manifested when thirty-five grain doses three times a day were reached.

15. There seemed to be no seriously ill effects produced in twenty of the cases by fifty grain doses of the medicine thrice a day, continued for ten weeks.

16. When the medicine was entirely discontinued in all the cases the average number of fits increased in 5 of the cases benefited, to or beyond their original number in four weeks; in 13 cases they remained considerably less. The total average during that time was a little more than one half the number of fits taken before the medicine was given, and the greatest number of fits occurred in the second week after the medicine was discontinued.

The Distinction, physiologically and psychologically considered, between Perception, Memory; Sensation, and Intellect: By The Rev. W. G. Davies, B.D., Chaplain, Joint Counties' Asylum, Abergavenny.

Perception we define to be the intellectual and presentative consciousness of objects of any kind, internal or external, and the primary gateway of knowledge. In every perception the object is a most prominent feature. It is in the invariable presence of the object in perception, and its absence from memory and imagination, that we behold the striking difference which there is between it and the latter; and it is on this distinction the universal assurance is grounded that what we perceive is different from what we remember or imagine. In every perception there is an intellectual and a sensational element, and memory proper is the persistence of the intellectual element after the sensational element has disappeared from consciousness, or after the peripheral nerves have ceased to excite the sense-centre. In no instance have we been able, by any amount of effort, to make an act of memory or imagination seem a perception; yet Hume divided perceptions into two classes, as distinguished by their different degrees of force and vivacity. The less lively he named thoughts and ideas; the more lively, impressions. Professor Bain seems to take the same view of the question. In refer-

ence to the recalling of past feelings, he says :—"The renewed feeling occupies the very same parts, and in the same manner, as the original feeling, and no other parts, nor in any other manner that can be assigned."* It is the opinion of some, then, that memory and imagination only differ from perception in being less lively. The latter is a vivid picture, the former are faint reproductions of it. We fail to see that this is precisely the case. In every perception there is an object present, and cognized as distinct from the consciousness of it—in special instances, as even distinct from the perceiver altogether. When we gaze at a picture, the picture is regarded as one thing, the knowing of it as another; whereas when we only think of the picture, we do not recognize any object as really distinct from thought itself. An imagined external object is still detected to be a mental object. "A representation considered as an object is logically, not really, different from a representation considered as an act. Here object and act are merely the same indivisible mode of mind viewed in two different relations. . . The same may be said of image and imagination."† "Imagination, regarded as a product, may be defined, the consciousness of an image in the mind resembling and representing an object of intuition."‡ Though we do not exactly hold with these opinions, we quote them in order to show what view is taken by some psychologists in reference to the distinction between presentative and representative consciousness, or between knowing a thing immediately in perception, and knowing it mediately through an image of the mind's collecting. How is it possible, when contemplating a mountain which one is on the point of ascending—albeit the mountain is to us, as immediately known, in a sense-centre—to regard it as identical, except in vivacity, with the recollection which we afterwards have of it? Perception is, so to speak, a bi-une fact, a synthesis of cognition and object, whereas memory and imagination are not bi-une, for the object is not present in them, in the same manner, at least, as it is in perception. But let us now proceed to adduce facts and deductions confirmatory of this view of the question.

At the present time, it is commonly admitted that there are in the brain sensory ganglia or sense-centres. "Any one of the senses may be destroyed by injury to its sensory

* "The Senses and the Intellect," p. 333, § 10.
† "Hamilton's Reid," p. 809, § 10.
‡ "Prolegomena Logica," Prof. Mansel, 2nd edit., p. 13.

ganglion, as surely as by actual destruction of its organ; blindness is produced by injury to the corpora quadrigemina, smell is abolished by the destruction of the olfactory bulbs. These ganglionic centres are thus intermediate between the higher hemispherical ganglia above and the spinal centres below them; to those they are subordinate, to these they are superordinate."* We cannot, then, with the light which physiology now sheds on mental science, hold the ultra-common sense doctrine that the mind is somehow conscious, face to face, of a real external object, for it is looked upon as an established fact that we have no presentative consciousness of the external objects of the many, except in the sense-centres. Even Sir W. Hamilton, after once holding that we are cognisant of an external object at the peripheral extremity of the nerves of sense, found the evidence in favour of the other position too strong, and admitted that, from many pathological phenomena, the former alternative might appear the more probable, namely, "that the mind is proximately conscious of the reciprocal outness of sensations at the central extremity of the nerves in an extended *sensorium commune*".†

Sensation, then, has its seat in the secondary nervous centres, and our extended sensations are projected in consciousness from these to the peripheral extremity of the nerves, owing to the fact, as has been shown elsewhere,‡ that the nerve-filaments, extending from the extremities to the brain, are in consciousness nil;§ and that the centres with which they are connected form an extended sensorium, while the centres themselves, having no tactual sensibility, are not, in consciousness, located in the brain; consequently, they seem to have their affections present in the localities to which they are by all men assigned.

The distinction for which we are contending is very perceptible in the use of speech. There is evidently a marked difference between language in audible communications, and in silent reading. When a book is read so that the voice be heard, there is actual movement in the articulating organs, but when it is silently read, there is no such movement. The difference in these instances seems to be that, in the one, the

* "The Physiology and Pathology of the Mind," Dr. Maudsley, p. 87, et seq. "Lewes's Biographical History of Philosophy," Cabains, Condillac, and Darwin.
† "Hamilton's Reid," p. 861, *note*.
‡ "Journal of Mental Science," Oct., 1867.
§ "Muller's Physiology," pp. 692-696, English translation.

mind, while operating, causes the articulating organs to act, but in the other, arrests their action. The tendency, at first, is for the organs of speech to perform their function when a book is perused, as we perceive in the case of the novice, who reads in a whisper, when attempting to read silently, because he is not yet able to sever the actions of the mind from the associate actions of the motory centres concerned in audible reading. The physiological explanation of this distinction is, we presume, the following:—In audible reading the working of the cerebral organs calls into full activity the appropriate motory centres, while in silent reading, the action of the former does not call the latter into full activity, yet seems to excite them into subdued operation, accompanied by arrest of a portion of their function.*

In the preceding paragraph we have examined the operation of centres which are under the control of the will. In contrast to these, we shall next examine a centre which is not under the direct control of the will—namely, that of sight. We cannot understand how a rose as seen and the idea of a rose involve one and the same operation of the mind. The visible rose exists as a sensation in the sense-centre, and furthermore makes operative the related cells in the cortical region of the brain; the sensation and the notional manifestations thus forming together the bi-une fact called perception. Now, what we desire to point out is, that the nervous current proceeds from the peripheral surface to the sense-centre, and thence to the ideal centres; and that along this route its course, like that of a tideless river, seems never to be reversed. Reflex action does not take place along the route of the sensitive nerves in the reverse order, but along the motory nerves. The notion of a visual object appears, then, to excite into action, not the visual centre, but the motory centres concerned in seeing. The elevation, depression, and lateral movement of the eye-ball, the adjustment of the lens, the converging or diverging of the axes, some or other of these movements seem to be indispensable for forming a vivid image of an absent object; and these result from the operation of the motory centres. The conclusion, then, to which we are led is this:—In memory the sense-centres are not acted upon

* The writer of this has frequently succeeded, even while eating, in singing some air with which he was familiar The motory ganglia most largely concerned in this experiment seem to be those pertaining to the respiratory organs. This subdued operation of the motory centres appears to be indispensable to an act of thinking.

by the cerebral convolutions, except by means of the motory ganglia, which are directly under the control of the latter. The feeble hallucinations* which are experienced in vivid recollection or imagination are produced, not directly, as in perception, but indirectly, from the habit which the sense-centres have acquired of operating in conjunction with the motory ganglia concerned in perceiving. Were it in the power of the ideational nervous centres to re-act immediately upon the sensory ganglia, any one could experience hallucinations at pleasure, differing in nothing from perception but in the fact that the latter were involuntary, while the hallucinations were voluntary; one could enjoy a banquet when he chose, entranced by the glories of the visible creation, the murmurs of falling waters, the singing of birds, and the music of celestial choirs. Who would be a beggar, when he could thus dream at will, and be a king? Who would concern himself much with the real world, when he could thus, in his sense-centres, summon into existence the paradise most congenial to his taste?

In deciding this question, stress, moreover, should be laid upon the fact that certain objects in sensation are not only felt as non-mental, but as also non-egoistical. Some of our sensations, the tactual, the visual, and the auditory, are without passion, mental or corporeal. Although originated in self, they have no element of self in them, and are consequently cognised as not-self. This does not amount to saying that they are unattended by organic feelings, but that they are distinguished from the latter by the absence of any subjective characteristic. The extended sensations, for instance, embrace those which pertain to the organism as an animate *ego*, and in correlation with, and as distinguished from these, those which are felt to be no portion of the *ego*. Now since, in perception, many sensations are known as non-egoistical, while objects are always known as a mode of mind in memory and imagination, we cannot fail to see that there is a marked distinction between these two orders of knowing. The position then seems to be made good that, in an act of perceiving, the sense-centre and cerebral centres have a combined action, while in memory and imagination they have, at least, not this kind of combined action.

Having shown that perception is a synthesis of sensation and

* Griesinger on "Mental Diseases," English translation by Drs. Robertson and Rutherford, p. 29, § 2. "The Physiology and Pathology of the Mind," p. 113 (b).

intellect, it behoves us now to inquire into the nature of these, its constituent parts.—It has long been held by psychologists that a sensation cannot exist *per se.* Sir W. Hamilton gives an account of those who held this doctrine, which may be expressed in the words of Aristotle—"To divorce sensation from understanding is to reduce sensation to an insensible process; wherefore it has been said, intellect sees and intellect hears."* This, however, is only true in one sense. It is now well known that the cerebral centres depend for development upon a stimulus coming from the sense-centres below; that these may and do exist without the former, while the former cannot exist without these; that the sensory ganglia, acting independently of the primary nervous centres, produce sensori-motor effects, and even that they operate when the organs of intelligence are eliminated. "When the cerebral hemispheres are experimentally removed in animals, as was done by Flourens and Schiff, the sensori-motor acts abide; the animal appears as if in a sleep, or in a dream, and takes no notice; yet if a pigeon so treated be thrown into the air, it flies; if laid on its back, it gets up; the pupil contracts to light, and in a very bright light the eyes are shut; it will dress its feathers if they are ruffled, and will sometimes follow, by a movement of the head, the movement of a candle hither and thither. Certain impressions are plainly received, but they are not further fashioned into ideas, because the nervous centres of ideas are removed; and, as has been aptly observed, the animal would die of hunger before a plateful of food, although it would swallow the food if put into its mouth."† We fully acquiesce in these views as to the independent existence of sensation, for we cannot see that it is simply an excito-motor force when existing *per se;* still we cannot admit that a sensation can be known—can in any sense be a gateway of knowledge—in the absence of that agency of mind without which nothing is known to man—that is, nothing is discriminated, remembered, and classed. Although, then, it is found that a sense-centre can be active to some extent, even in the higher animals, without rousing the hemispherical convolutions into activity, still if it should rouse these, the sensation is then *known*, it forms part of the synthesis sensation *plus* cognition, *i. e.*, perception; and in this condition alone is to us a source of knowledge.

* "Hamilton's Reid," p. 878, *note.* See also Mr. Lockhart Clarke, "Medical Critic and Psychological Journal," Vol. II., p. 575, et seq.

† "The Physiology and Pathology of the Mind," p. 94.

Now, if a sensation in perception be known, we should be able to describe its nature.—Let us select for examination a visible object—say a portrait. Such an object, as presentatively known, is, both according to the psychologist and the physiologist, a sensation, being, according to the latter, generated in the visual centre, and therefore a form of consciousness. It is, however, neither ideal nor emotional consciousness, nor is it consciousness possessed of corporeal passion. It is simply consciousness presentative of an object that has no element of self in it, which, indeed, is realized as a *non-ego* located at some distance from the beholder—and were not the object, be it observed, thus realised as a not-self, it could not, as it is, be projected in appearance to a distance from us. A visual sensation then, although, as known, inseparable from intellect, is quite distinguishable from it—so distinguishable, indeed, that by all men it is practically regarded as pertaining exclusively to the external world. In short, objective sensation is what the many regard as an external object—a ball in the hand; a picture; the roaring of the sea. Now a ball does not discriminate, classify, and draw inferences, yet a ball, as immediately known and apart from what it suggests, is a sensation. A sensation, therefore, is simply a conscious presentation of an object to the intellect. We have next to inquire into the nature of the intellect which is roused by a sensation, which is therefore prior to intellect in the order of existence, but is posterior to it in the order of knowledge, for nothing exists for us but through the medium of knowing; so that we may say creation becomes known to itself by means of its latest, most elaborate, and most complex development, and thus knows itself as the synthesis—being *plus* knowing.

Intellect in perception, its first form of manifestation, is a differentiating or analyzing process.—It apprehends an object as a whole distinguished from other wholes; and as possessed of parts distinguished from each other, and from the whole which they constitute. What proves this view to be correct is the form of speech in which perception is expressed, namely, the proposition or asserting sentence. In the proposition, the subject must invariably be the name of a whole, while the predicate can be the name of a part of that whole; and as many predicates can be affirmed of one and the same subject as there are qualities pertaining to the whole which the subject designates. But perception, besides being a differentiating process, must also be an identifying one, for there could be no

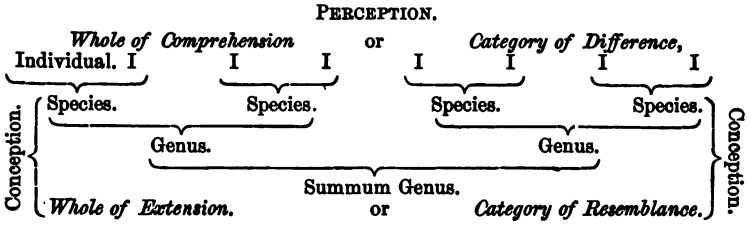
perceiving if the same object were not kept present to the mind for a certain length of time. This is effected by the identification of the present sensation with the representation of the latest, later, and late past, which procedure is the basis of memory. One of the conditions of all intellectual consciousness is "time, which supposes memory, or to speak more correctly, a certain conscious representation of the late and latest past known with and in contrast to our apprehension of the passing present."*

A subsequent mental operation, supposing perception in logical order, though not perceptibly separable from it in time, is conception, which takes note of the resemblance existing among two or more wholes as cognized by perception. It is this mental operation which enables us to classify individual objects, to bring them from confusing multiplicity into unity and order, and to invent common instead of individual terms or proper names, to the use of which, with perception alone, supposing intelligence could thus exist, we should necessarily be limited.

Usually, in describing the function of intellect, perception, as an analysis of sensations in time, is not brought into sufficient prominence, and is confusedly regarded as now a a function of the sensorium, now of the intellect. Lines of investigation, however, starting from various localities on the border of the realm of mind, converge towards a point which necessitates a different conclusion. Those who have investigated the laws of mental association, divide them into the law of contiguity or redintegration, by which *different* mental modes, and the law of similars, by which *like* mental modes, are associated together. It is common to divide the primary mental operations into perception, as that which, though ambigously stated, discriminates or differentiates, and conception (*con-capere*), that which regards in one view this, that, and the other, because they are similar, and collects them into a class. Logic informs us of division, which is effected by attending to differences; of classification, which is effected by attending to resemblances; and also of connotation, or the whole of comprehension, which is the category of difference, and has its pole in the individual and proper name; and of denotation, or the whole of extension, which is the category of resemblance, and has its pole in the *summum genus*.

* "Hamilton's Reid," p. 878, § 6.

The following table will, we presume, render quite explicit the view herein adopted:—



In this table, only three steps are described, but these serve to illustrate all that takes place in the longest series of generalizations from individuals to the *summum genus*.

It seems to us to be an error, then, to describe thought as being primarily concerned with forming concepts—general notions—for it is impossible to form these but on the basis of individual notions, which, as has already been pointed out, are not given in sensation pure, but are derived from an analysis of sensation by the intellect. We cannot, therefore, agree with those who declare that the intellect's primary function is to fashion impressions or "sensory perceptions" into ideas or conceptions by the abstraction of the similar from the diverse.* From a review of the facts of the case, it appears that the mind originally discloses itself only in so far as it is excited into activity by an external force; that the force exercised by the afferent nerves causes the sense-centres to develope; that the force exercised by these causes the sensori-motor and the primary centres to develope; and that the differentiating or individualizing agency of these forms the basis of their classifying or conceptive agency; for instance, new sovereigns of the same mintage, must be individualized or apprehended as differing from each other in space, and consequently in number, in order to be cognized as so precisely similar to each other. It appears, therefore, that the primary act of thought is a differentiating judgment involving a cognition of time, and that conceptive thought is founded upon this.†

The modus operandi of the brain-force can, it is presumed, never be ascertained by direct evidence; it must be deduced from

* "Prolegomena Logica," chap. I.

† In the "Alphabet of Thought" (Williams and Norgate), part II., chap. 1 and 2, this will be found treated more at length, but requiring correction in one or two instances.

the facts disclosed by anatomy and physiology, as compared with those of a strictly inductive psychology. Now, according to the theory that every manifestation of intelligence is dependent upon the agency of the vesicular neurine of the cerebrum, it must, we imagine, be received as an axiom that what is distinguishable in thought involves either (1), the action of a distinct portion of the cerebrum, or (2) a distinct mode of action in any such portion.

1. As to the *first* of these alternatives, it is more than probable that each cell of a sensory ganglion is connected by a nerve-filament with a cell in the primary centre;* and if this be the case, *each sense-centre has its relative aggregate of cells in the primary centre, forming its special organ.* The contrary supposition—namely, that every sense-cell is joined to each one of the cerebral cells—is not at all probable, for it is incompatible with the fact that the minima of extension are simultaneously distinguished from each other by the intellect. Now this could not be the case, if every discriminating cell were synchronously engaged in being cognizant of each minimum of extension; for one at a time only could then be perceived, and consequently there would be no consciousness of the reciprocal outness of the several minima. Seeing, moreover, how minute and countless the nerve-cells are, the interlacing of fibres would, according to this supposition, be well-nigh interminable; and how could nerve-filaments from every cell in the intellectual region be joined to a single cell in the sensorium? Wherefore it seems highly probable that the contrary supposition is the true one. Weber's experiments conclusively show that, in our tactual sensations, the minima of extension are perceived as distinctly external to each other; and Sir W. Hamilton, after his careful consultation of authorities, declares it to be a law that "A nervous point yields a sensation felt as *locally* distinct, in proportion as it is isolated in its action from every other."† It seems to be the fact, then, that discriminating consciousness depends on the perfect isolation of the nerve-fibres, and their attachment at both the sensational and the intellectual extremity to single cells, each of these yielding a report which is entirely unconfused with that of any other.

The individual action of the cells of an organ—that is, their movement severally,—seems to be the antecedent of the differentiating process in knowing.

* Quain's "Anatomy," 7th edit., part III., p. cxlvii. *See* "Hamilton's Reid," p. 872. School of Boerhaave.

† "Hamilton's Reid," p. 862. *Note.*

When, however, the cells of organs are put into operation (no notion being adequately realized by a single organ, but by a certain number of them forming a complex organ), it is mostly by a sensation having a well-defined outline, so as to admit of being attended to as one whole, a crow, a star, or a hill; that is, according to the law of subject and predicate.*

By means of the anastomosing process, a cluster of cells as engaged in simultaneous action would be in the first stage of activity.

By means of the longitudinal commissures, two or more organs as engaged in being simultaneously, or in direct succession, conscious of parts of one whole, would be in the second stage of activity, but the first of actual knowing or discriminating consciousness.

2. Under the *second* head—distinct *mode* of action—it has to be shown that the discriminating process must be accompanied by that which links a present manifestation of consciousness with a past as identical with it in all except time.

Therefore we have, as necessary to all discrimination, what seems to be *similarity of action* from moment to moment in the cells *severally* of the organs engaged in being conscious of a single whole. This would be the first stage of assimilative or conceptive knowing, and the basis of memory.†

In order the better to comprehend the hypothesis here proposed, it is desirable to be acquainted with the following conditions of consciousness:—

* The method of knowing is that of existence, namely, beginning with the simple, and developing out of this superior and more complex results. Thus the first step in knowing seems to be the realization of the *ego* in extension *plus* time by means of the extended sensorium *minus* the tactual centre; then, in correlation with the extended *ego*, the extended *non-ego* by means of the tactual centre and the motory centres; then, on the basis of these, coloured extension by means of the visual centre, and its relative motory centres, &c. By the time, however, that the senses are fully in operation, an object is known by the conjoint agency of them all. A sensation experienced in one of the sense-centres unavoidably suggests all that it presupposes in other centres, and also possibly suggests what is simply contingently related to it.

† We only remember that which has already existed in consciousness, which involves that the present consciousness should be precisely similar to the past. Memory, therefore, comes wholly under the law of similarity; like recalls like, but unlike has no power of recalling unlike. Cell-action which is different to any previous action, must be original, and therefore excludes the past, whereas memory implies present consciousness known together with the re-presentation of a past similar to it. When we think of Charles the First, and then of Cromwell, it may appear that unlike has called up unlike, but this is not the case, for it is part of a previous state of consciousness that has recalled the whole of the previous state, which it could only do in so far as the states reproduced are similar to the past states. Indeed, the very terms which we are forced to use—"re-calling," "re-producing," "re-collecting," "re-membering"—point to the fact of a repetition of a former state of consciousness; therefore, in memory like recalls like, but unlike has no recalling power.

As to its antecedents—Physiology teaches that there is no consciousness without the prior activity of the brain-cells.

As to succession—Consciousness is a succession, a flow, of manifestations consequent on the continuous working of the brain-cells, either of the same or of successive cells.

As to contrast—Consciousness is a succession of mental manifestations, each distinguishable from the rest, commonly in many qualities, but necessarily in time as past and present; the past being a present representation identified with, yet also *discriminated* from, a present presentation of an object, for identity involves non-identity of time.

As to continuity in time—Consciousness cannot be realised except in so far as the present suggests the past, as already stated, in a thread of identity.

As to what reproduces—The brain cells, by their movements, and in proportion to the judicious repetition of these movements, acquire, through the constructive agency of the nutritive process, the capacity for reproducing the same with increasing facility and certainty.

We shall in the next place exhibit the result of this inquiry in the following tabulated form:—

Knowing.

I. Category of Difference:—
- Discrimination;
- Discriminates objects, *i. e.*, objects in the sense-centre;
- Discriminates objects as wholes and their parts according to the law of integration, or of Subject and Predicate.

II. Category of resemblance:—
- Knowing cannot be a discriminating, without also being an identifying operation, for we only realise knowledge in so far as the present is known as identical with a present representation of the past. (Law of "Repetition," Identification, or Assimilation.)
- The same operation which assimilates present cognitions with present representations of past, also takes note that certain individual objects, such as sheep, resemble each other, or possess certain qualities in common. (Law of Similarity, a mode of the Law of Assimilation.)

The phrenologists believe that there is an organ for number, but manifestly there can be no single organ for this, because the discrimination of objects, as differing from each other in number at least, is the very basis of knowing, whether, for instance, it be of the tangible, the visible, or the audible. They also claim to have discovered an organ which takes account of resemblance and analogy; but every perceptive organ must take cognisance of the identity of an object with itself from time to time, and since being conscious of resemblance among individual objects is only a more complex mode of the same operation, what need is there to postulate for it a separate organ? It seems to us, then, that there is a cerebral organ attached to each sense-centre, forming, together with the latter, a complex organ of perception; but that all other kinds of thought are to be accounted for by a certain *mode* of operation in these perceptive organs. The anatomical evidence in favour of this hypothesis is, at all events, stronger than that which can be urged in confirmation of the phrenological doctrine, one strong objection to which has always been that, in many instances, it ignored anatomical facts; moreover the psychology which it has embodied into its system is of the crudest character.

We have no doubt that in each hemisphere of the brain there are corresponding organs, just as we have two eyes, two ears, and as there are in the two retinæ what are called identical points. In this paper, however, we have, for the sake of brevity, tacitly assumed that such is the case. The explanation of the fact that, with two hemispheres in the brain, we experience but a single flow of thoughts, must evidently be sought for in the assimilating agency of the intellect, coupled with the fact that there is nothing whereby the report of one hemisphere can be distinguished from that of the other.

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