

**Medical psychology : comprising a brief exposition of the leading phenomena of the mental states, and of the nervous apparatus through which they are manifested with a view to the better understanding and elucidation of the mental phenomena or symptoms of disease / by Robert Dunn.**

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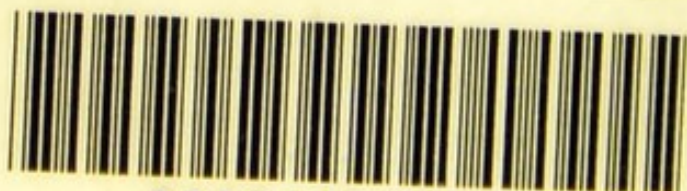


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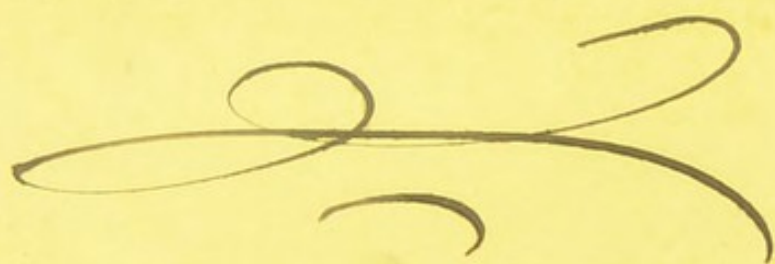


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# MEDICAL PSYCHOLOGY;

COMPRISING A

BRIEF EXPOSITION OF THE LEADING PHENOMENA OF THE  
MENTAL STATES, AND OF THE NERVOUS APPARATUS  
THROUGH WHICH THEY ARE MANIFESTED,  
WITH A VIEW TO THE BETTER UNDER-  
STANDING AND ELUCIDATION OF  
THE MENTAL PHENOMENA OR  
SYMPTOMS OF DISEASE.

BY

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ETHNOLOGICAL, AND OF THE OBSTETRICAL  
SOCIETIES; ETC.

Author of an Essay on

PHYSIOLOGICAL PSYCHOLOGY, &c.

LONDON :

JOHN CHURCHILL, NEW BURLINGTON STREET.

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## DEDICATORY NOTICE.

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IT was my intention, and as expressive of my admiration of the truly philosophical spirit which pervades the whole of their writings, to have dedicated the following pages jointly to

SIR B. C. BRODIE, BART., F.R.S., D.C.L., &c.,

AND TO

SIR HENRY HOLLAND, BART., M.D., F.R.S., D.C.L., &c.,

who, as the respective authors of *Psychological Inquiries*, and of *Chapters on Mental Physiology*, have given an impetus to the study of physiological psychology; and who, for a long series of years, have been alike eminent and distinguished in the highest walks of professional life. But, alas! before the last sheets had passed through the press, Sir B. C. Brodie was removed from among us, "full of years and honours", to the deep and sincere regret of the whole profession, and of the entire community; for myself, I shall ever cherish a grateful recollection of the many acts of personal kindness for which I have been indebted to him. And "although dead, he still speaketh"; for the last contribution from his pen was, I believe, to psychological science. In



him, the unity of the science of medicine and of surgery was strikingly exemplified; and as physiologist, physician, and surgeon, his name and his works will be held in enduring remembrance.

To Sir Henry Holland my best thanks are due; and I am glad of the opportunity thus afforded me of acknowledging the obligations I am under to him; and of giving utterance to the hope, that he may long be spared to us, and that he may again favour us with more of his matured thoughts—some additional “chapters on mental physiology”.

ROBERT DUNN.

31, Norfolk Street, January 1st, 1863.

## MEDICAL PSYCHOLOGY.

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It cannot be disputed that the influence of the bodily states upon the mental manifestations presents a subject for investigation as interesting and important to the medical practitioner, as it is to the psychological inquirer or mental philosopher. Nevertheless, it has long been the abiding conviction of my own mind, that in the general practice of medicine, the psychological phenomena, or symptoms of disease, have been too much unheeded by us. Under the influence of this conviction, and with a view to the better understanding and appreciation of their value and importance in the practice of medicine, it has appeared to me that a summary survey of the correlation of psychology and physiology—a brief exposition of the leading phenomena of the mental states, and an inquiry into the nervous apparatus, through which they are manifested in this life—would form a useful contribution, as introductory to the systematic study of medical psychology. It could scarcely fail of being interesting and instructive to the young psychological inquirer; and it might prove suggestive, and even of some value and importance to the thoughtful and experienced medical practitioner.

As a labour of love, I have thrown into shape my own meditations on the subject; and, in submitting them to the candid consideration and free discussion of others, I am not without the hope that I may be instrumental, among my professional brethren, in rousing into activity



the energy of other minds, of higher intellectual endowments, possessing more leisure, and having better opportunities than I can command, for the prosecution of such an interesting subject of inquiry. Of the practical value and importance of the subject, there can be no dispute. For, as the seat of consciousness, of feeling and emotion, as well as of the higher attributes of reason and reflection, the human mind, alike in its normal and abnormal aspects, ought surely to be studied in the correlations of organisation and of consciousness, and in connexion with the material conditions of the brain; since it is upon the vesicular matter of the encephalic ganglia, as its substratum, that the mind is dependent for the manifestation of all its activities throughout the totality of life in health and in disease. And to search after the phenomena in which the relations of the bodily states and the mental manifestations are revealed, with the unprejudiced eye of experience; to investigate them scientifically in every point that is of importance to the medical practitioner; and to collect them into one whole, has been justly defined as the province of medical psychology; and, "although," as Dr. Reid has well observed, "the labyrinth may be too intricate, and the thread too fine, to be traced through all its windings, still, if we stop where we can trace it no further, and secure the ground we have gained, there is no harm done (but, surely much good effected); and a quicker eye may in time trace it still further."

I. *On the Normal Phenomena of the Mental States.*  
We have first to consider the leading phenomena of the mental states. Now, the more closely we observe and diligently study the composite nature of man, as an animal and social, a moral and religious, as well as an intellectual and thinking being, the more clear and irresistible becomes the conviction that he is born into the world, not "a mere blank recipient of impressions," but endowed with inherent cravings and impulses, animal appetites and instincts; with personal or individual, and



with social propensities and affections; and with emotional, moral, and religious intuitions and feelings, as well as with intellectual faculties—reasoning and reflecting powers. In the primordial cell of a human organism are potentially contained the vital, nervous, and mental forces. Inherent in it are the vital powers of nutrition, development, and growth, under which, *in utero*, duly supplied with the nutrient pabulum, the bodily fabric is evolved and built up, in accordance with all the subsequent wants of the future man; not only the osseous, muscular, and vascular systems, but the nervous system also, upon the encephalic ganglia of which, as its substrata, the mind itself is dependent for the manifestation of all its phenomena in this life.

The germs (so to speak) of all our mental activities, sensational, perceptive, and intellectual, are present from the first. They exist implicitly, *ab initio*, as constituent elements, in every *mens sana*; and they are all, in due order, evolved explicitly, as the successive phases of consciousness become developed. And while, on the one hand, we cannot by teaching or training educe or bring forth a new mental faculty any more than we can make a new law of nature or a new organ of sense, so, on the other hand, before all teaching or culture, the instinctive intuitions of the mind, sensational, perceptive, and intellectual, as original principles, are spontaneously developed in the successive phases of consciousness. And first in the order of time are evolved the sensational intuitions of the mind; for the senses come into play from the moment of birth, and among these, as primordial, are those of feeling and touch—universal, or common to all, and the most essential to human existence. Next follow the perceptive intuitions—ideas—the ideation, or intuitions of the perceptive faculties; and such are our immediate cognitions of external objects, their sensible qualities and physical attributes—our moral intuitions of right and wrong—of the true, the beautiful, and the good; and our religious and emotional intuitions—of awe, wonder, veneration, and reve-



rence, inspired and awakened by objects of sublimity, grandeur, vastness, and mystery.

Lastly, arise the intellectual intuitions—our primitive beliefs and primitive judgments. Such our belief is in our own conscious and abiding existence, in our personal identity, and in the existence of an external world. Among our primitive judgments, instantaneously and intuitively formed, we may instance those in relation to the differences in objects or things when compared together; such as that “the whole is greater than a part”; that for every known effect there must be a cause; that it is impossible for a thing to exist and not to exist at the same time; etc.

After birth—that is, as soon as embryonic life is passed, and an independent individuality is established, with the organic vital powers of nutrition, development, and growth—the animal functions, and their allied appetites and instincts, come into action; and then, too, the nascent consciousness becomes awakened, but which is purely sensational at first, for man is at birth the mere creature of sensation and instinct. And thus his outer life begins with consciousness, and with consciousness it ends; but, as for consciousness itself, that is an ultimate fact, beyond which we cannot penetrate. It is an essential attribute of animal life, and the primary and universal condition of intelligence—in a word, it implies *mental existence*. It is equivalent to the knowledge that we possess of our own personal identity, for it is involved in every sensation which we experience, and every mental act that we perform, in feeling, perceiving, thinking, and willing. Reid and Dugald Stewart were clearly in error in restricting the functions of consciousness to that of a particular faculty co-ordinate with the other intellectual powers, instead of regarding it, as it manifestly ought to be, as the universal condition of intelligence. The great and fundamental mystery of life, indeed, consists in the relations of consciousness, and of that dynamical agency, or intellectual force, which we call volition, or the will, to the functions of the special



senses, and to those of the perceptive and intellectual faculties, which connect man as a sentient, percipient, and thinking being, with his own organisation, and with the world without.

Now, we can best conceive of consciousness in relation to time, not merely as an incalculably rapid succession of acts or states, but as passing through a series of successive developments. *Still one it is, and indivisible*; for the unity of consciousness is the deepest and most indisputable fact in the nature of man; and psychology has accordingly been briefly but aptly defined, "*developed consciousness.*"

There are three phases of consciousness successively developed: the sensational, the perceptive, and the intellectual, marking three distinct stages in our mental progress, however difficult, if not impossible, it may be to determine precisely in time the genesis either of the perceptive or of the intellectual consciousness—at what moment, for instance, the infant eye, ceasing to convey a mere nervous impulse, awakens in the mind its first perceptive glimpses of the sublime and beautiful, or when the ratiocinative and reflecting faculties come first into play. But true it is, that we feel before we can perceive; we perceive and form ideas before we can think; and, long ere we can either reason or reflect, we manifest the animal instincts, and the social propensities, affections, and feelings. Equally true it is, and indisputable, that feeling, perceiving, willing, and thinking—in other words, sensation, perception, and intellection—are different and distinct states or phases of consciousness successively developed, and not to be confounded with each other. Hereafter, as we shall find, they each severally have and require a distinct nervous organic instrumentality of corresponding elaboration and complexity, for the manifestation of their respective phenomena in this life. Nevertheless, self-consciousness, world-consciousness, and intellectual consciousness, are indissolubly connected. They cannot exist without, but only by and through each other; and under these three



phases of mental activity or consciousness, the sensational, the perceptive, and the intellectual, all our psychological phenomena of whatever kind are comprised, and may be grouped.

Self-consciousness, as the earliest, is necessarily the lowest phase of mental development; for in it, the mind, at first, exists in a state of bare receptivity. The senses, indeed, come into play from the moment of birth, but the intelligence is purely sensational; the feelings are simply those of pleasure and pain, and the impulses to action are innate and instinctive. The instincts, as the untaught activities of our animal nature, are innate; as subjective feelings, they arise in obedience to certain laws of our nature, or are brought into action in direct response to stimuli acting upon the sensational consciousness from without. All our actions are automatic, reflex, consensual, and instinctive, at birth; the infant mind responding solely, at first, to impressions from without, or to instinctive feelings from within.

The sudden light, indeed, may dazzle, and a loud noise may startle; but, until the perceptive consciousness has been awakened, the mind is in a state of isolation; it takes no cognisance of an outward world. And thus we see that the essential phenomena of the sensational consciousness, besides the intuitions of the special senses, are sensori-motor consensual and instinctive feelings and actions. Among the phenomena of the sensational consciousness, common sensibility or feeling, and the capability of receiving pleasure and pain from mere tactile impressions, are primordial—the most universal in Nature and the most essential to human existence. But still strictly consensual are the intuitions of all the special senses, and confined to the sensible phenomena of matter. For we see light, we hear sound, we smell odour, we taste sapor, and we feel pain, heat, and cold; so that it has been truly observed, we have no knowledge of body by any of the senses. What we are conscious of by sense is the sensible phenomenon itself, and not the bodily substance, with which it is con-



nected, either as the proximate cause of the sensation, or as the organ by and through which it is felt; so that the exercise of the senses displays to us five elementary modes of being, logically unconnected with the bodily substance.

But besides the intuitions of the special senses, and the simple elementary feelings of pleasure and pain associated with their functional activity and exercise, we have various subjective sensations, appertaining to the bodily states, both in health and disease. Such are the sensations of the appetites, as in hunger and thirst; and of abnormal conditions of the muscular system, as in cramps, spasms, shudderings, etc. We have painful as well as pleasurable sensations; but pleasure is the natural associate of all the normal actions of life—pain, the exception, acting as a monitor, and revealing to the consciousness the existence of morbid actions and abnormal conditions.

In fine, sensation is the link in the chain of being between the vital and mental forces, connecting together the conscious and the unconscious processes. As a complex act, it lies partly within and partly without the consciousness; but, as soon as embryonic life is passed, it traverses the line which separates the physical and vital from the nervous and mental processes, enters the light of consciousness, and thus becomes a fact, psychological as well as physiological.

*Phenomena of the Perceptive Consciousness.* We have seen that in sensation the conscious mind is solely absorbed in its own subjective conditions or feelings, as induced by the bodily states; but in perception its attention is transferred from these to their interpretation, as expressive of outwardly existing facts, so that perception implies a consciousness of the object which induced the sensation or impression—a recognition of its cause, as something external to the mind itself—an outward reality; and, thus, while on the one hand, sensation is wholly subjective in relation to knowledge, perception is, on the other, objective. The one is self, and the other is



world, consciousness; but they are indissolubly connected, and no sooner has the perceptive consciousness begun to dawn, than greater mental activity is manifested, increasing in intensity and energy as the sphere of its action is widened; arising, not only from the direct conflict of the perceptive faculties with the external world, but also from the development of the will or intellectual force, and from the evolution and play of the individual or personal and social propensities and affections, and of the emotional, moral, and religious intuitions and feelings. For, in the second stage of our mental progress, *ideas* are formed and retained in the mind; for *memory* exists, *volitional power* is developed and exercised, and *emotional sensibility* is awakened and manifested.

Perception, through the inlets of the senses, speaks to us from *without*; and ideation, or the formation of ideas, is effected in response to impressions from without, by virtue of the primeval harmony which subsists between the perceptive faculties of the mind and the external world or Nature. For, in perception, as the correlative of sensation, and indicative of its intellectual phase, sensory impressions are *idealised*—that is, translated or converted into intellectual phenomena, and become the pabulum of thought; and thus we see that, in the progress of mental development, to the sensational the perceptive phenomena are superadded; these are *ideation* and *volition*, with their associates *memory* and *emotional sensibility*. The genesis of the *will* and of the *memory* is in the perceptive consciousness; for their manifestation is dependent solely upon the presence of ideas in the mind. There can, indeed, be no *volitional* or *determinate action*, any more than there can be any exhibition of the power or faculty of *memory*, without the existence and retention of ideas in the mind; and hence ideation, memory, and volition, are interwoven with each other, and are at the root; when, indeed, the perceptive consciousness is in abeyance, they are one and all suspended.



As the inseparable concomitants of memory, in the development of the perceptive consciousness, the phenomena of the associative principle are far too striking and too important to be overlooked. And although the *doctrine of the association of ideas* by the Hartlian school, and especially by the illustrious Priestley, was, to the exclusion of other essential elements of the human mind, carried too far, it nevertheless involves an important principle of great activity and efficiency in our intellectual culture.

The influence of the will on the memory is all important; for, unless the attention of the mind, by an act of the will, be directed and fixed upon an object or event, the *idealised impression* may be so evanescent and transitory that, like the baseless fabric of a dream (in which volition is suspended), it may scarcely leave a trace behind it.

The will, indeed, is a mental element of vast importance; and the power of the mind by the will varying, it is true, in degree in different individuals, and at different times in the same individual, to *determine* and *control* the succession of our mental states, whether of feeling or of thought, is most important, in as much as the intellectual character of every mental process depends upon the manner of succession, and especially on the action of the will in determining the result. It has been well observed, that "the will, or intellectual force, is eminently capable of cultivation by steady intention of mind and habitual exercise; and thus rightly exercised, it becomes one of the highest perfections of our moral and intellectual being. By no quality is one man better distinguished from another *than by the power of his will*; by the mastery acquired over the subject and course of his thoughts; by the power of discerning what is desultory, frivolous, or degrading; and of adhering singly and steadily to those objects which enlarge and invigorate the mind in their pursuit." (Sir H. Holland.)

It is true that the will can *originate* nothing; for it is



limited in its power and in the sphere of its action to the *selection* and *intensification* of what is *already* and *actually* before the consciousness. In its evolution, it proceeds *pari passu* with that of the higher faculties of the mind, until they reach their dominant development in the highest reason and the freest will; and then it is that an act of the will, embodying the whole man emphatically, involves intelligence, emotion, impulse.

The perceptive consciousness is not limited in the sphere of its action to the mere cognition or ideation of external existences, their sensible qualities and physical attributes. It has a far more extended range; for, excepting the sensational intuitions, all our immediate or intuitive knowledge, of whatever kind, has its origin in perceptive experience—in the direct conflict of the perceptive faculties of the mind with the external world or Nature. All our ideational activities, appertaining to man as an individual emotional and social, as well as a moral and religious being, are duly evolved and brought into play in the development of the perceptive consciousness; for, *before all teaching*, he has not only an intuitive æsthetic sense of the true, the beautiful, and the good—of sublimity in Nature and of harmony in sound,—but moral intuitions of right and wrong, and religious and emotional of wonder, awe, veneration, and reverence.

Long before he has attained to the utterance of articulate speech—nay, as soon as the perceptive consciousness has begun to dawn, and the power of recognition to be awakened—the child is able intuitively to interpret the tones, gestures, and expressions of emotion, and becomes sympathetically affected by them. In his mind, an intuitive apprehension of right and wrong is attached to certain actions, and evidently precedes any distinct apprehension of the language by which moral truths are conveyed. The blush upon the cheek, and the early sense of shame, come before there have been any trains of thought as to the consequences of miscon-



duct or of crime. In the expressive language of Lord Bacon, "the light of Nature not only shines upon the human mind through the medium of the rational faculty, but by an internal instinct, according to the law of conscience, which is a sparkle of the purity of man's first estate." Equally and alike intuitive are his religious emotional feelings of awe, wonder, veneration, and reverence, early developed, and awakened by objects of sublimity, grandeur, vastness, and mystery.

Moreover, closely associated in the perceptive consciousness, with the propensities and affections, and with the moral and religious intuitions and feelings, are the emotional states. Like them, these are all of a composite nature, involving in their manifestation perceptive or ideational activities, as well as sensorial feelings. There are, indeed, certain elementary emotional sensibilities, readily roused into activity, through all the organs of sense, and which, in the absence of the ideational element, may be said to bear the same relation to the true emotions which the instincts do to the propensities and sentiments, as, for instance, joy and fear, etc.; for such is laughter, the expression of joyous emotion, when a mere consensuous act, provoked by titillation on the surface of the body; and such, too, are the trembling fear and shuddering dread from the lightning's vivid flash, quickly followed by the crash or peal of the loud thunder. But still ideation is the connecting link inter-mediating between the extremes of mental action, emotion and volition—between our inherent elementary emotional sensibilities and impulses on the one hand, and the operations of thought and volitional power on the other; sometimes, indeed, in subordination to the one, and sometimes the other. For Laughter, holding both her sides, when an emotional act, is excited by ludicrous ideas in the mind.

Now, as sensation is the link in the chain of being between the conscious and unconscious processes, the vital and the mental forces, so is perception intermediate between sensation and intellection—the lowest and the



highest phases of consciousness or mental development. The intuitions of the perceptive faculties, being often closely interwoven with feeling, and sometimes, especially in regard to our social and moral relations intensely felt, while on the other hand, they furnish the pabulum of thought. And though feeling has no place in the constitution of abstract ideas, or on the processes of logical reasoning, still we have both pleasurable and painful trains of thought and reflection.

*Phenomena of the Intellectual Consciousness.* *To perceive* and *to think* are distinct mental acts; for perception, as we have seen, speaks to us from *without*, but intellection from *within*, so that the mental processes are here reversed. And while, on the one hand, all our immediate or intuitive knowledge has its origin in perceptive experience; so, on the other hand, all our representative knowledge is the creation or product of the mind's own intellection and introspection, of imitation, imagination, ratiocination, and reflection: for these, with memory and volition, are the distinguishing phenomena of the intellectual consciousness. It is through them that man is raised so immeasurably high in the scale of being above the brute creation, and that the human mind attains to its culminating phase of development in the highest reason, and the freest will. Rising above sensation, and above perception, man soars to the region of representative knowledge, grasping through his intellectual faculties and reflecting powers abstract ideas, and necessary and universal truths, and finding articulate utterance and expression for them through the noble faculty of speech, in language.

There are, as we have seen, instinctive intellectual intuitions, primitive beliefs, and primitive judgments; but, in the development of the intellectual consciousness, the imitative and imaginative faculties are the first to come into play, and to begin the work of abstraction. Man is from his cradle an imitative animal; and in the infancy of the race, in remote antiquity, he first sought to embody, through the imaginative faculty, his percep-



tive intuitions, his inward or mental images, and representative ideas, in the outward realities of nature, as their signs or symbols, and afterwards set himself to work, by means of his hands and with the chisel and the pencil, to mould, form and fashion images of those objects of nature, in which he had embodied his mental images and generalised ideas, and also to make pictorial representations of them. Such of old, were the winged bulls of the Assyrians, and such the hieroglyphics of the Egyptians; and thus, through the imaginative and imitative faculties, were sculpture and painting, however rude in their beginnings, his first step in the process of abstraction. For, until signs are employed, our mental images are not held clearly apart; they merge like dissolving views into one another. Our life in fact, without them, would be more like a dream than a waking reality, portions of a thousand different ideas perpetually combining with and melting into one another. But, when once symbolised or embodied in signs, our generalised ideas are no longer, but cease to be, mere subjective representations; for, being thrown into fixed and significant types, which perform, though imperfectly, the office of abstract ideas, they exist in the mind altogether apart from the region of immediate or inward experience, as independent intellectual realities; and, as such, become distinct and intelligible objects of contemplation and thought, which can be placed at pleasure either within or without the consciousness of the moment. But still man could not be said to have achieved his first step in the freedom of human thought, until, instead of objectifying his inward images in existing outward realities, he had, by his creative mental energy, produced, invented, and constructed his own sign, phonetic or visible, for the embodiment of the intellectual idea, "the sign for the thing signified." And this he has done in language, creating a new external world, and transferring into it the phenomena of his inner life. For "in language the sign, whether spoken or written, is objective. It appeals to the senses; it comes to us from the



outward world, and is constructed from the elements of nature around us. At the same time it has no natural meaning, and contains no thoughts, apart from the mind which created or uses it. Its whole force consists in its being the embodiment of an idea; in brief, it is idea objectified." (Morell's *Psychology*.)

Now, constituted as man is, and endowed with the faculty of speech, his exclusive prerogative, it is as natural, when vividly affected, that he should give expression and find utterance, in articulate sounds, for his feelings, emotions, ideas, and thoughts, as that he should voluntarily use his locomotive powers in progression. It is true, that the scream of alarm, the shriek of horror, and the laugh of surprise, like the scowl of hatred, are natural signs, and not conventional ones, like articulate words. But having an instinctive apprehension of the gestures, cries, and other signs of natural language, he gradually ascended from these to the acquisition of articulate speech, by giving, step after step, conventional names to objects and actions, emotions and passions, generalisations and abstractions. Among all the races of man, the instinctive impulse is irresistible to give utterance in articulate sounds to the feelings, emotions, and thoughts; and not only to fix upon articulate sounds, or names, as representatives of his intuitive cognitions or conceptions of things, but also to find expressions for the different qualities and states of things. And thus to the natural language of inarticulate sounds, gestures, and actions, he first added the conventional language of signs, and afterwards, in the fulness of time, alphabetical writing and the invention of printing consummated the intellectual benefits derived from the noble prerogative of speech.

Language thus implies a train of thinking; it is the circulating medium of our thoughts, the minister of thought and its interpreter. But without ideation, without mental images and representative ideas, there could be no thought, and without thought language would cease. Still thought there may be, indeed thought there



is, in the case of the unfortunate and uninstructed deaf mute, independent of and without language. Nay, without speech, man, by virtue of his perceptive and intellectual faculties, can observe objects, and mentally arrange, associate, and form them into groups. He can judge of their properties and qualities, compare them and even deduce inferences; but how weak and incomplete are these processes of thought when language is wanting! without the agency of words, how limited and contracted would be those of generalisation and abstraction! As an intellectual instrument, language is intermediate between perception and thought. We reproduce in speech the mutual relations of objects, the relations of our thoughts to objects, and the order and relations of our thoughts to themselves. Nevertheless words are purely conventional, they have no natural meaning of their own, and contain no thoughts apart from the mind which created and uses them. Written notional words are the symbols or representatives of objectified ideas, and all notional words belong to the region of representative ideas, after these ideas have attained their most general character; and although words cannot excite the feelings like a gesture, or warm the imagination like a picture, they are the indispensable machinery in the process of generalisation and abstraction. And "in this way it is that they serve to construct the more general outline of knowledge. Hence the wonderful power which words possess on the whole process of thought; hence the capacity they attain, after the teachings of experience have paved the way, for expressing the very essence of the things to which they relate; hence, too, their use in forming a broad platform, on which the results of all the lower processes of mind are plainly recorded, and from which we can commence those higher forms of mental activity, which give to reason its all but infinite range, and all but omnipotent force." (Morell's *Psychology*, p. 184.)

Words are, in fact, the final expression of that mental process, as well as the depository of its final results,



consummated through the instrumentality of the faculty of language, by which knowledge becomes definite, exact, and communicable; and they enable us, through our reasoning and reflecting faculties, not only to judge explicitly, but also to frame a method by which our judgments may be articulately expressed.

For the constructive faculty of language, from its power of combining words together, enables us, as I have said, to express the mutual relations of objects, the relations of our thoughts to objects, and the order and relations of our thoughts to themselves; and thus, on the one hand, continuous speech becomes moulded step by step into a complete organ of thought; and on the other, a sentence or proposition in language becomes equivalent to a complete thought in psychology, meaning of course by this formal thought, in its logical acceptation, that is: "a distinct act of comparison between two terms, in which we apprehend the relationship that exists between them." In the development of the intellectual consciousness, the reasoning and reflecting faculties are the latest to be evolved, and the last to reach their maturity; they are the most distinguishing attributes of humanity, of "the being that looks before and after"; for, while the moral and religious intuitions are the sole prerogatives of man, and constitute an immutable distinction between him and the whole animal creation, it is through his reasoning and reflecting faculties that he sees clearly the bases upon which moral obligation rests, and that religion becomes to him "a reasonable service," and that his is an intelligent, voluntary, and cheerful dependence upon an all-perfect Being, infinite in wisdom, power, and goodness.

When the exalted, pure, and holy moral and religious intuitions and feelings are directed, guided, and strengthened by the dominating influence of the reasoning and reflecting faculties, then it is, that the true greatness of the human character is manifested and felt by others.

From observation and experiment, from the joint operation of the perceptive faculties and the reasoning



and reflecting powers, result the creation of science, and the achievements of science. Mr. Morell has well observed, "The proper function of reason is to create knowledge or science. The understanding alone can never do this; it can analyse, distinguish, form concepts, construct propositions, weave them into arguments, perform, in a word, any formal process within the data furnished to it, but it can never go beyond the barriers of its own definitions. When, however, we grasp a truth by the power of reason, on the other hand, it implies far more than the attainment of a bare definition of it. It implies that we have penetrated to the centre; that we can trace its pedigree in the world both of matter and form; that we can regard it as one link in a connected chain, of which we are able to tell the antecedents, and to foretell the consequents; that we can recognise it, in fine, as a particular manifestation of some great and universal law, the operations of which we have learned to comprehend and apply." (Morell's *Psychology*.)

But, in the progress of science, we must not overlook the importance of the imaginative or inventive faculty; and I shall close this imperfect and brief survey of the leading phenomena of the mental states, by reiterating what I have elsewhere said on the relations of the imaginative and reasoning powers. "Out of the fanciful combinations and groupings of external nature, new conceptions are formed; and by the imaginative faculty, we are placed in scenes, circumstances, and relations, in which our actual experience has never placed us, and from which, in consequence, as new sources of thought, new conceptions arise. But, while these new creations may bear strongly the impress of the æsthetic and emotional character and tendencies of our minds, the highest efforts of the creative faculty involve equally the agency of the intellectual powers, of collocation, analysis, and comparison, to achieve their loftiest triumphs. And thus, while, on the one hand, ideality is dependent upon the intellectual powers for the development of its highest and sublimest flights; so, on the other, is the under-



standing indebted to the imaginative faculty for those ideal combinations and conceptions, which, independently of their artistic value and importance, are seen to be so operative in the common affairs of human life, suggesting those pictures of the future which are ever before our eyes, and are our animating springs of action, with those visions of enjoyment, never perhaps to be realised, and their prospects of anticipated evil, that often prove to be an exaggeration of the reality, prompting the investigations of science, that are gradually unfolding the sublime plan on which the universe is governed, and leading to a continual aspiration after those higher forms of moral and intellectual beauty, which are inseparably connected with purity and love."

"Every system of philosophy," to conclude in the words of Morell, "rests in God, as its highest idea and its final aim. To see the Divinity as the beginning, the middle, and the end of all things, is the culminating point of all human thought. Thus it is the goal, not only of providence, not only of redemption, but also of the no less divine laws of reason itself, that God should be all in all."

II. *On the Nervous Instrumentality or Apparatus  
through which the Phenomena of the Mental  
States are manifested.*

WE have next to inquire into the nervous apparatus of the sensational, perceptive, and intellectual phases of consciousness.

Now it is universally conceded that the brain or encephalon, in its totality, is the material organ of the mind, where the ultimate molecular changes precede mental states, and where the mandates of the will originate the changes which lead to and terminate in acts of volition. But, as I have elsewhere observed, "be it remembered, in affirming that sensation, perception, emotion, thought, and volition are functions of the nervous system, it is only maintained that the vesicular matter of the encephalic ganglia furnishes the material conditions—the substratum through which these mental phenomena are manifested in this life; and, at the same time, it is fully admitted that *the essential phenomena of matter and of mind* are so completely antagonistic, it is in vain that we attempt to establish any relationship of analogy or identity between them." (*Vide Essay on Physiological Psychology*, p. 7. Churchill: 1858.) In truth, to us, the abstract nature both of matter and of mind is alike inscrutable. We can no more comprehend the essence of the one than we can that of the other; for the *forces of external nature* which underlie all vital phenomena, and the changing states of consciousness, which constitute our mental life, are as inscrutable to us as is that *internal something* of which consciousness itself is the exponent. But, whatever may be our belief as to the abstract nature or essence of mind, this at least is indisputable, that *sensibility* and *motility* are its primordial points of contact with the external world or nature; and it is clearly demonstrable that these essential attributes have their seat in the sensory and motor ganglia



of the nervous system. In the life of relation, indeed, and throughout the whole animal kingdom, the nervous system is the medium of communication with the external world. This system, in its simplest but essential type, consists of *nervous centres or ganglia, commissures, and nerves*. The vesicular matter of the nervous centres or ganglia is the source of the nervous force, where impressions are received and impulses are generated; between these centres, the commissures are the media of communication; and to and from them, the nerves are internuncial conductors or cords. In the invertebrate sub-kingdom is best seen the simplest form of the nervous system; namely, distinct ganglia, with commissural cords and nerves, administering to the functions of automatic life, and to the operations of instinct. Now nervous actions are of a threefold character—physical, or *excito-motory*; sensory, or *sensori-motor*; and volitional, or *intelligent*. But it is only in the highest class—the vertebrata, and where there exists a cerebro-spinal system—that we recognise the existence and co-ordination of all these different kinds of nervous actions. In the very lowest animal organisms, the physical or excito-motory alone are present. These are essentially automatic, and occur without sensation; to them, in the invertebrate kingdom, and as typical of animal life, the sensory or sensori-motor are superadded; whilst it is solely in the vertebrate series that the intelligent and purely voluntary come into play. Throughout the whole of the vertebrate subkingdom, the type of the nervous system, including man himself, is the same. It admits of a threefold division, in accordance with its functional endowments and co-ordinations—into,

1. The physical or excito-motory and reflex—the true spinal system of the late Dr. Marshall Hall.
2. The nutritive and secretory, or ganglionic system, administering to the functions of animal life.
3. The sentient, percipient, and intellectual, or the cerebro-spinal system.



But it is only with the last of these that we are now more immediately concerned, in relation to the sensational, perceptive, and intellectual phases of consciousness; for, in its totality, it comprises the organic instrumentalities through which the phenomena of sensation, perception, and intellection are manifested in this life. The physical or excito-motory phenomena are, indeed, without the domain and beyond the control of intelligence; and the reciprocal relations between the ganglionic and the cerebro-spinal systems have but an indirect, though a most important bearing on our present inquiry. In the nervous system of the invertebrata, we have the homologues of the nervous apparatus of the sensational consciousness of the vertebrate series, and even of man himself; for the sensory ganglia are the instruments through which the phenomena of the sensational consciousness, of whatever kind, are manifested—not only of sensorial feeling, but of emotional also; and the cranio-spinal axis, with the corpora striata at its summit, is the centre and source of all the movements of the body, reflex, consensual, emotional, and volitional; the two great centres of sensation and motion being co-ordinated and brought into harmonious and associated action through the medium of the cerebro-spinal axis. And thus we see that the nervous instrumentality of the sensational consciousness of man—the sentient and sensori-motor apparatus—the system of automatic life and instinctive action, subservient to sensations, and to those consensual and instinctive actions which are indissolubly linked on with sensations,—consists of the spinal axis and nerves, the medulla oblongata, and the chain of sensory ganglia, including those of the special senses at its summit. For, if we follow up the cranial prolongation of the spinal cord—the medulla oblongata—into the fibrous strands of which we see imbedded the *respiratory*, the *auditory*, and the *gustatory ganglia*, and carefully trace out its ramifying branches, we find it sending off distinct fasciculi of fibres to the ganglionic centres at its summit—to



the cerebellum, the corpora quadrigemina, the thalami optici, the corpora striata, and to the peduncles of the olfactory ganglia. Moreover, a continuous nervous thread ramifies throughout the entire centre of special sensation; the thalami optici, as the great centres of sensorial feeling, being the common foci or points of union for all the nerves of special sense. The whole series, indeed, of the sensory ganglia of the cerebro-spinal system, including those of the special senses, are in direct fibrous connexion with the cranio-spinal axis, forming with it, as an aggregate or whole, the *sensorium commune*, or great circle of sensational consciousness, of consensual and instinctive action.

It is further demonstrable that the spinal cord, with its cranial prolongation, is a *distinct and independent centre of action*, consisting of a series of segmental ganglia and nerves, structurally homologous, and functionally analogous to the jointed ganglionic cord of the articulata. The excito-motory and reflex actions of which it is the seat are evidently subservient to the conservation of the organism, by the excitation of the respiratory movements, by the governance of the various orifices of ingress and egress, and by the maintenance of the integrity of other vital processes in which the reflex movements are concerned. Of the medulla oblongata—the *nodus vitæ* of Flourens—Schroeder Van der Kolk truly remarks that, “of all the parts of the human body, there is not one which is of such great moment to existence and to the continuance of life, and to the maintenance of the most different and important functions of the system; uniting in a small space, and directing, as from a central point, so much that is various in aspect, and really diverse.”

It is a centre of *sensation* and of *co-ordination*, of automatic respiratory movements, and of deglutition—a middle point, in which are imbedded the roots both of sensory and motor nerves; not only the seat of the ganglia of the nerves of *hearing, taste, and feeling*, but also of the vagus, hypoglossus, and glosso-pharyngeus,



etc., where many different bundles of fibres end, and from whence others, originating in various ganglionic groups, radiate and transmit their influence to other centres and organs of the body. Some fibres, ascending, as Foville has shown, to the "*espace quadrilatère perforé*", and from thence passing out through the antero-posterior arch of fibres, under the internal convolutions, radiate into the grey matter of the hemispheres. It is emphatically "the knot of life"; for, "in a limited portion of the organ, a simple puncture or injury suffices immediately and irrevocably to extinguish life, and, as with a stroke, to annihilate its principal phenomena, as respiration, voluntary motion—nay, all that constitutes existence."\* It has been experimentally proved that, if the brain be cut off above the medulla, respiration still continues.

Now it is practically of great importance to bear in mind that we have in the nervous apparatus of the sensational consciousness *a distinct centre of action*, independent of, and not to be confounded with, that of the perceptive or intellectual consciousness; for it may be intact when these are in abeyance, benumbed, or paralysed; no longer capable of receiving impressions, and of responding to or acting upon them; and we may be called upon to witness the sad and melancholy spectacle of a man in prime of life reduced to his primitive condition of a mere sensational and instinctive being. An interesting and instructive illustrative instance of this kind came under my notice some years ago, in the case of a young woman whose intellectual faculties were quite suspended, and whose only open avenues to the sensational consciousness were those of sight and touch; for she could neither hear nor speak, taste nor smell. The

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\* *Vide* Sch. Van der Kolk, "On the Minute Structure and Functions of the Medulla Oblongata." Published by the New Sydenham Society, 1859. This able work, and the experiments and the equally valuable researches of Dr. Brown-Séquard, into the relative function of the several columns of the spinal cord, are alike interesting and important, from their practical bearing, to every pathologist and medical practitioner.



narrative of the case, and a commentary on the more important of its psychological bearings, will be found in the ASSOCIATION MEDICAL JOURNAL for 1855. It has been characterised by Dr. Carpenter as the most remarkable case upon record in illustration of the nature of a purely *sensorial* and *instinctive*, as distinguished from an *intel-  
ligent existence*, and the gradual nature of the transition from the one to the other. (Vide Dr. Carpenter's *Human Physiology*, 5th edition, p. 667.)

*Nervous Apparatus of the Perceptive Consciousness.*  
 "If", says Mr. Solly in his valuable work,\* "there is one point in the physiology of the brain more unequivocally demonstrated than another, it is, that the great hemispherical ganglia are the instruments of the mind—the portion of the brain in which sensations are converted into perceptions, and give rise to ideas. Comparative anatomy; developmental anatomy; experiments on living animals; observations on its size and form, as indicated by the size and form of the skull; and last, but not least, pathology,—all afford a mass of overwhelming evidence that this portion of the brain, and *this only*, is the organ of intellectual power." He further quotes the authority of Müller in support of the position that the intellectual faculties reside in the hemispherical ganglia, and who says: "It has been proved by direct experiment that such is their seat. The experiments of Flourens are especially instructive, and Hertwig has on the essential points done no more than confirm them. The hemispheres are insensible both to puncture and incisions. That part of the brain in which sensations are converted into ideas, and the ideas are hoarded up, to appear again, as it were, shadows of sensations, is itself devoid of sensibility." Hence, as the exclusive centre of intellectual power, the seat of the understanding and the will, the cerebrum, in its totality, is the

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\* Solly, "On the Human Brain, its Structure, Physiology, and Diseases." Second edition, page 335, 1858. A work which every physiological psychologist ought carefully to study.



nervous apparatus both of the perceptive and intellectual consciousness.

The phenomena, indeed, of the perceptive consciousness require for their manifestation, beyond the mere sensory apparatus, an augmentation and elaboration of the nervous system; for whilst, in sensation, the ganglionic action is single and direct, the conscious mind feeling instinctively the physical impulse of the external object, and each sensory ganglion, as the seat of a special endowment or sensation, responding directly to its own appropriate stimulus,—in perception a double ganglionic action is involved; the nervous impulse is carried a stage farther; for the sensory impressions, and the intuitions of the special senses, whether sights, sounds, smells, tastes, or feelings, internal or external, in order that they may be *idealised, perceived, and registered*, require to be transmitted to a second ganglionic centre—the *hemispherical*; for it is there that ideation is effected and memory resides. “The cerebrum”, to use the language of Cuvier, “is the sole receptacle where the various sensations are consummated and become perceived by the animal, and where all sensations take a distinct form, and leave behind them lasting traces of their impressions, serving as a seat to the memory, and furnishing the animal with materials for its judgments.” The cerebral hemispheres are thus the crowning ganglia of the whole series, and the distinguishing feature of the cerebro-spinal system, manifestly superimposed on the sensory ganglia within the encephalon, and in close and direct commissural connexion with them, for the purpose of combining and associating instinctive actions and emotional sensibilities with perceptive activities, and for offices or purposes the noblest and most exalted in the economy of man. In the lowest, indeed, of the vertebrate series of animals, the representatives of these hemispheres are reduced to mere laminae or crusts; but they gradually increase in size, complexity of structure, and in the number of their lobes and convolutions, as the animal



rises in the scale of intelligence, until they reach their culminating predominancy in man; and then it is that they completely overlap and crown all the other encephalic ganglia. But wherever they do exist, and in however rudimentary a state of development, there we invariably find unmistakable evidence of the manifestation of the essential phenomena of the perceptive consciousness. In proof and illustration of this, we need only advert to the case of the fish, the lowest of the vertebrate series, and where these ganglia, as in the carp, are reduced to mere vesicular laminæ, incrusting the corpora striata, as affording clear and indubitable evidence of the exercise of *perception, memory, and volitional movements*, as opposed to mere consensual and instinctive actions; for, says Sir Benjamin Brodie, "we, at any rate, recognise in the stupid carp, which comes to a certain spot at a certain hour, or on a certain signal, to be fed, *the existence of memory and the association of ideas.*" (*Physiological Inquiries.*) But, as in the brain of the fish, so in that of the human embryo at two months, the rudimental cerebral lobes are the mere incrustations of a layer of vesicular tissue upon the corpora striata. Nature, indeed, begins the development of the encephalon with the sensory ganglia of the sensational apparatus; that is, with the formation of the parts which place us in immediate relation with the external world; viz., with the centres of smell, the quadrigemina for sight, and the medulla oblongata for hearing, taste, and feeling; for the hemispherical ganglia are not developed until after them, and then in direct commissural connexion with these centres, by special bundles of fibres, as has been so beautifully shown by Foville in his *Anat. et Phys. du Système Neureux*, Plate xviii, Fig. 1, NN, s, and CL, BBB.

Foville has invested the *locus perforatus* through which these fibres pass from the sensory ganglia of the special senses to the grey matter of the convolutions with peculiar interest, as being the central nucleus of the hemisphere, and whence all the longitudinal con-



volutions of the brain spring and are evolved. Still the vesicular laminæ spread upon the corpora striata in the brain of the fish are manifestly the homologues of the hemispherical ganglia of the whole vertebrate series, including man himself; for, as Schroeder Van der Kolk has justly remarked, "in the ascending scale of animals, all the fundamental parts retain their proper function, only others are added, which are more closely connected with the higher faculties." And if from the *general* to the *special* be the great law of progress which it is held to be, then must it be equally applicable to the development of the cerebral hemispheres as it is to every other organ of the body. The case of the fish is both interesting and instructive, not only from the closeness of the union of the perceptive and motor ganglia, but as being the earliest instance to which we can point of clear and distinct evidence of the exercise of perception, memory, and volitional movements, as opposed to mere consensual actions. Now throughout the whole of the vertebrate subkingdom, the type of the brain is the same; and, on a general survey of the series, it cannot escape observation that the longitudinal convolutions, from their first workings out, increase in number, volume, extension backwards, and in complexity of structure, as the animal rises in the scale of intelligence, and as the range of its perceptive activities widens. To unravel all the complexities of the intimate structure of the cerebral hemispheres has hitherto baffled the most eminent anatomists, with all the appliances that science can furnish; but Foville and Leuret have clearly shown that these hemispheres are chiefly made up of three distinct series of convolutions—the *longitudinal*, the *commissural* or *anastomosing*, and the *transverse series*. The longitudinal series are the first to be developed; and, according to Foville, they arise from a common central nucleus, the *locus perforatus*, and are closely banded together. It is indisputable that the internal convolutions are the primitive basement convolutions of the hemispheres, forming the broad lines of demarcation



between the sensory and perceptive ganglia, between the sensational and perceptive apparatus; they are the central organs of the perceptive consciousness, and therefore the common portals to intellectual action and volitional power. Now, since these basement convolutions are the first developed, and as the whole series of longitudinal convolutions arising from the same central part are most intimately connected and associated with each other, and are commissurally banded together, my own mind rests in the conviction that *an unifying bond of action pervades them*, and that the entire series of longitudinal convolutions, as an aggregate or whole, constitutes the nervous apparatus of the perceptive consciousness—in other words, the instruments of all our immediate or intuitive cognitions; not only the seat of the perceptive faculties, through the instrumentality of which, by the inlets of the special senses, we acquire a knowledge of external existences, their sensible qualities and physical attributes—of the differences and relations of things, their order or arrangement and numbers, and the phenomena of their action or events; but also of those purely ideational activities which form constituent elements in the composite nature of the personal or individual and social affections, and of the emotional, moral, and religious feelings of man.

In accordance with this view of the office or functions of the vesicular matter of the longitudinal convolutions, may we not in ascending planes of development, and as the animals rise in the scale of intelligence, trace corresponding extension and elaboration of the nervous apparatus of the perceptive consciousness? It may, at least, be legitimately inferred that the primitive basilar convolutions, as we have seen in the case of the fish, are the seat of the perceptive activities which are subservient to the formation of the inferior region of the true or conscious mind. Thus, as I have elsewhere observed (*Essay on Physiological Psychology*, p. 86), “the lowest plane of cerebral development, and of which we may recognise the analogies in the inferior



vertebrata, the perceptive apparatus seems limited to the basement or internal convolutions, with their anterior and basilar connexions; that is, to the common central organs of the perceptive consciousness, the seat of ideation, memory, and volition; to the anterior perceptive organs, through the instrumentality of which, by the inlets of special senses, we acquire a knowledge of the sensible qualities and physical attributes of external existence; and to those basilar organs which administer to the preservation and maintenance of animal life. The love of life is paramount; and around the organs of the alimentative propensity are marshalled and associated those of the propensities subservient to the defence, protection, and conservation of existence. It may, indeed, be fairly inferred that the intuitions of the special senses, and their allied feelings, appetites, and instincts, form the chief and predominant part of the mental life of the inferior vertebrata; while, at the same time, it must not be forgotten that these too constitute the inferior region of the true or conscious mind, and enter largely into the completed web of human existence.

“On a higher plane of development, and of which, too, we may recognise the analogies among the highest mammalian and quadrumanous groups, the longitudinal convolutions are carried upwards above the lower perceptive organs, and prolonged backwards even beyond the median lobes; and the perceptive apparatus is proportionately elaborated and extended. Leuret, in the demonstration of the convolutions of the Indian elephant, aptly remarks, ‘Suppose that all the superior convolutions, and the prolongation of the internal convolutions, were obliterated. The fourth anterior convolution might then be united to the fourth posterior convolution, the third to the third; and we shall have one of the groups of convolutions of the brain, of an inferior grade, of the ruminantia and solipedes.’ It is through these superior perceptive organs that we rise above the mere perception of external objects, their sensible quali-



ties and physical attributes, to that of the differences and relations of things, their order or arrangement and number, and to the phenomena of their action or events, with the adjuncts of time and place. The higher individual or personal affections too, such as the love of self or self-esteem, the love of approbation, and love for others, or benevolence, are then brought into play.

"But there is still a higher plane of perceptive development, exclusively human, in which the towering longitudinal convolutions reach the fulness of their evolution backwards, and the nervous apparatus of the perceptive consciousness its most elaborate and complete development. The moral and religious intuitions are the sole prerogative of man, and they constitute an immutable distinction between him and the whole animal creation. In man's moral and religious attributes the lower animals do not participate: equally destitute are they of those enduring, tender, and endearing relations which are the charm of his existence here."\*

This view of the nervous apparatus of the perceptive consciousness receives, as I think, not a little confirmation from the minute anatomical researches of Gratiolet, and especially in reference to the distribution of the optic nerve, and the ramification of its cerebral roots. Sight, it must be acknowledged, is the highest, most refined and objective of all the special senses; *for sight is knowledge*, and the visual impressions on the retina pass direct to the seat of the perceptive faculties, in the cerebrum. Now Gratiolet has demonstrated that, as an

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\* In my essay on "Physiological Psychology", I have, on the authority of Professor Owen (*vide* his paper "On the Character, etc., of the Class Mammalia," in the Journal of the Proceedings of the Linnæan Society, vol. ii, No. 5, 1857), been led to consider the posterior lobe of the brain as essentially human, and as such to be in consequence the seat of exclusively human affections. But Professor Huxley, in the Natural History Review, has fully exposed the fallacy of the statements of Owen, "that the third lobe is peculiar to the genus *Homo*, and that equally peculiar is the posterior horn of the lateral ventricle and the hippocampus minor, which characterise the hind lobe of each hemisphere", by demonstrating their actual existence in anthropoid apes and in some of the higher quadrumana, and thus proving beyond controversy that these parts are not peculiar to man.



animal rises in the scale of intelligence, as the range of its perceptive activity is enlarged and widened, so are the cerebral connexions of the optic nerves extended and multiplied; and that in man they radiate to every part of the convoluted vesicular surface of the hemispheres. He has shown that in the quadrumana, as in man, a large tract of fibres, quite independently of any connexion with the corpora quadrigemina and thalami optici, passes at once from the optic nerves to every part of the ganglionic tissue of the hemispheres; its fan-like expansion extending not only to the superior and posterior borders of the hemispheres, but also to their frontal extremities, making a special termination in that band of convolutions which extends along its superior border, and of which the high development is so peculiarly characteristic of the human brain.

And thus whilst, on the one hand, in the ascending series of animals, as in man, the proper cerebral termination of the optic nerve gains rapidly upon its sensorial roots, so on the other, in the marsupials, the cerebral ramifications are altogether wanting, and the roots of the nerves pass directly to the large tubercula quadrigemina and thalami optici; and so again in the monkey, where the optic nerves are large, the cerebral distribution is small, when compared to what passes to the corpora quadrigemina. In fact, as the cerebral roots diminish, those of the sensory ganglia augment in absolute amount; and as we descend in the vertebrate scale, it is worthy of note, the portion of the roots connected with the thalami optici diminishes, whilst that which passes to the proper optic ganglia (the tubercula bigemina) increases not merely relatively, but *positively*.

But the minute anatomical researches of Gratiolet have further demonstrated that, as the longitudinal convolutions become more distinct, numerous, and voluminous, and the convoluted arrangement of the vesicular stratum augmented, so is there found a corresponding complexity in the fibrous tracts connecting the different convolutions with each other, and connecting either



hemisphere with its fellow and with other parts of the encephalon. He has attempted to unravel the disposition of these tracts, but confesses that, in the frontoparietal region, the interlacements of the different strata are so complicated that they cannot be traced with absolute certainty. Still Gratiolet has done enough to indicate the closeness of the relationship which must subsist among the intuitive perceptive activities, and has thus shed a ray of light upon the doctrine of *the association of ideas*. From the mode in which the different parts of the vesicular tissue of the convoluted surface of the hemispheres are connected with each other, and with that of the other encephalic ganglia, may we not be led to form something of a better comprehension of how it is that, in the complicated web of conscious existence, our whole life should consist in a succession of ideas, and of feelings associated with them? It has been reasonably inferred by Dr. Laycock that the three alternate layers of grey and white matter of which the convolutions are made up have different functions or offices, for such is the law as to distinct groups or layers of cells; and that they are probably alternately regulative, or ideagonic, and kinetic or motor substrata; for it is in accordance with all the laws of development, he observes, that there are both *kinetic* and *regulative* or *associative*, as well as *ideagonic substrata*, in connexion with every psychical manifestation. (Dr. Laycock, *On Mind and Brain*.)

*Nervous Apparatus of the Intellectual Consciousness.*

To perceive and to think are distinct mental acts, but are inseparably connected; for the perceptive intuitions furnish the materials of thought, and without ideas there could be no thinking; while at the same time an intuitive reasoning process underlies nearly the whole of our mental operations. No sooner, indeed, are we able to perceive and to look upon objects which are in striking contrast with each other, than we intuitively begin to compare them; and every act of comparison in-



volves in its result the agency of the cogitative or reasoning faculties. Still it is, physiologically as well as psychologically, important to bear in mind that to *feel*, to *perceive*, and to *think*—in other words, that sensation, perception, and intellection, are different and distinct mental acts or states of consciousness ; and as such, that they must each severally have a distinct nervous organic instrumentality for the manifestation of their respective phenomena, though all in due co-ordination with each other, as these mental acts are all so inseparably connected. And thus, while perception, on the one hand, as intermediate between sensation and intellection, requires, as we have seen, an augmentation and elaboration of the nervous system beyond the mere sensory apparatus, in the evolution and development of a series of longitudinal cerebral convolutions, in order that *sensations* may be converted into *ideas*, and become the pabulum of thought ; so again, on the other hand, intellection requires new increments of vesicular matter, a further augmentation and integration, and the agency of a still higher ganglionic instrumentality, to the end that the perceptive intuitions may become subservient to the processes of thought and reflection, and for offices and purposes the noblest and most exalted in the economy of man ; for, as Mr. Herbert Spencer has justly argued, “No physiologist who calmly considers the question in connexion with the general truths of the science can long resist the conviction that different parts of the cerebrum subserve different kinds of mental action. Localisation of function is the law of all organisation whatever ; separateness of duty is universally accompanied with separateness of structure ; and it would be marvellous were an exception to exist in the cerebral hemispheres. Let it be granted that the cerebral hemispheres are the seat of the higher psychical activities ; let it be granted that among these higher psychical activities there are distinctions of kind, which, though not definite, are yet practically recognisable ; and it cannot be denied, without going in direct opposition to established physiolo-



gical principles, that these more or less different kinds of psychical activity must be carried on in more or less distinct parts of the cerebral hemispheres. To question this is not only to ignore the truths of physiology as a whole, but especially those of the physiology of the nervous system. Now, either there is some arrangement, some organisation in the cerebrum, or there is none. If there is no organisation, the cerebrum is a chaotic mass of fibres incapable of performing any orderly action. If there is some organisation, it must consist in that same physiological division of labour in which all organisation consists; and there is no division of labour, physiological or other, of which we have any example or can form any conception, but what involves the concentration of *special kinds of activity in special places.*" (Spencer's *Principles of Psychology*, p. 607, 1855.)

Now it is indisputable that the hemispherical ganglia, in their totality, are the centres of intellectual action; this is universally admitted. But, since special functions require special instruments, and as *perceiving* and *thinking* are different and distinct mental acts or states of consciousness, in this division of their labour I cannot resist the conviction, for the reasons already adduced, that the entire series of longitudinal convolutions have a unifying action as a whole, and constitute the nervous apparatus of the perceptive consciousness. And, after further observation and reflection, I have been led to another generalisation, for the establishment or refutation of which I would appeal to the observations of the naturalist, as well as to the anatomical researches of the comparative anatomist. My own mind, at present, rests on the conviction that the vesicular matter of the transverse convolutions on the surface of the hemispheres furnishes the material conditions, the substratum, for the manifestation of the highest psychical activities: in other words, that the transverse series, as an aggregate or whole, is the nervous apparatus of the intellectual consciousness.



It cannot be denied that the transverse are anatomically a distinct series of convolutions. They do not spring from the same central part as the longitudinal; they have not a common origin, nor any direct connexion with the *locus perforatus*, though the two series are most intimately connected and closely associated by a third, the commissural or anastomosing, through the instrumentality of which a co-ordinating and unifying action is maintained throughout the whole of the hemispherical ganglia. They are almost exclusively human, but not altogether and entirely so; still, wherever they do exist, as they manifestly do in the horse and the elephant, there we have unmistakeable evidence of the manifestation of *reasoning processes* being at times carried on. Now, as the longitudinal convolutions of the hemispheres increase in number, volume, and complexity of structure, in the same ratio as the perceptive activities of the animal increase in number, and as the range of their action is widened, so do I hold and believe that, on an appeal to nature, it will be found that the transverse convolutions, from their first appearance on the surface of the hemispheres, become more distinct and numerous as the animal rises in the scale of intellectual being, and as phenomena of the intellectual consciousness become more unequivocally manifested by it. In man, the transverse convolutions are the largest, the deepest, but at the same time the least symmetrical of all the convolutions of the brain, justifying the inference of Dr. Carpenter, who says: "When the cerebral hemispheres are fully developed, they offer innumerable diversities of form and size among various individuals; and *there are as many diversities of character*, for it may be doubted if two individuals were ever exactly alike in this respect." (Carpenter's *Human Physiology*.) They are the last in the order of time to be developed; the sensory ganglia are the first; and the perceptive apparatus is intermediate. This is in strict accordance, and harmonises well with the order and succession of the development of their functional endowments; for we



feel before we can perceive, and we perceive before we can think. And, while sensation is the earliest and lowest, so is ratiocination the latest and the highest of our mental manifestations. Thus the phenomena of the intellectual consciousness are the last to be evolved, and the latest to reach their maturity.

Now man, in regard to sensational and perceptive experience, stands on the same platform with the lower animals; for the mental process is alike intuitive in all, and the difference is one of *degree*, and not of *kind*. In some respects, indeed, they greatly outstrip him; for he has neither the far-seeing eye of the eagle, nor the scent-smell of the hound. But the difference between him and them rests specifically and fundamentally in the *greater number* and *higher order* of his psychical activities—in his intellectual, moral, and religious endowments, his reasoning and reflecting powers; for the lower animals are alike destitute of the highest plane of perceptive development—of the frontal, towering, and backwardly extending convolutions—the seat of the moral and religious intuitions—the *sole prerogatives of man*; and, through the whole series, with some rare exceptions among the highest mammalia, of those characteristically large and deep, but unsymmetrical transverse convolutions on the surface of the hemispheres, “adorning the human brow as with a diadem,” and which, as I believe, are the seat of the faculties of the intellectual consciousness—of imitation, imagination, ratiocination, and reflection—in fine, of the faculties of calculation, of order or arrangement, of comparison and causality, of ideality and wonder, “through the instrumentality of which he can number the stars, and, with instruments furnished by the higher mathematics, can weigh and measure the planets, assign their courses and times, mark out the path and anticipate the coming of comets, calculate the distances of the most distant nebula, and only terminate his investigations in the inaccessible depths of infinitude. Through them he arranges every object that comes within his cognisance,



whether material or mental; he perceives resemblances and differences, abstracts and generalises, analyses and combines, compares and infers, and ascends 'from Nature up to Nature's God'. From *ideality*, the imaginative faculty, the vivifying soul of music, poetry, and eloquence, refining, exalting, and dignifying every object susceptible of improvement, springs his sense of the *beautiful*; and from *wonder*, that of the *sublime*." (*Essay on Physiological Psychology*, p. 55.)

Now, among some of the feathered tribe we recognise the exhibition of the *imitative* faculty, and we detect traces of the *ratiocinative* among some of the higher mammalia. The varying strains of the mocking-bird, and the articulatory exhibitions of the parrot, present as conclusive evidence of the presence of the *imitative faculty* as any that we can have of the *ratiocinative* in the elephant or the horse from multiplied observations. Now, are there no transverse markings, no peculiarities, in the folding of the convolutions in the brain of the parrot or the mocking-bird? As to the case of the horse or the elephant, the existence of certain transverse convolutions on the surface of the hemispheres can no more be disputed than can their *reasoning* at times be denied. Still, to determine the functions of the primitive convolutions, longitudinal and transverse, is the great problem of physiological psychology, and it yet virtually remains unsolved. As to my own generalisations, they have not been made hastily, and I am open to conviction. I shall feel as grateful for being convinced of an error as I feel happy in embracing a truth.

Dr. Carpenter, in restricting the functions of the hemispherical ganglia solely to perceptive or ideational activities, and to intellectual operations, to the total exclusion of sensation or feeling, was the first physiologically to establish the composite nature of the animal propensities and affections, and of the emotional, moral, and religious feelings, and to point out that, in the exercise of each and of all, there was brought into play, a



perceptive or ideational element, as well as sensorial feeling. Mr. James Mill had, indeed, many years previously, in his able exposition of mental phenomena, apart from all physiological considerations, arrived at the same conclusion as to their composite nature. And surely it must be admitted, that this separation and localisation, within the encephalon, of the nervous centres of sensation and ideation, of feeling, and of thought, is a real and an important step in advance in physiological and medical psychology. But it is one which, I am strongly inclined to think, remains yet to be fully appreciated in all its practical importance, and in all the variety of its bearings, in relative psychological medicine. But, be that as it may, it is abundantly manifest that the perceptive consciousness in full play of its action, in relation to all that appertains to the active powers of man, as a social, moral, and religious being, involves both the organic instrumentalities of the hemispherical ganglia, and of the nervous centres of the emotional sensibilities or feelings. Now, the seat of the latter of these—the emotional sensibilities—I believe, with Dr. Carpenter, to be in the thalami optici and corpora quadrigemina; but for the grounds of this belief, I must refer to my *Essay on Physiological Psychology*. And I would only observe, in conclusion, that these two great centres of emotional sensibility, the thalamic optici and corpora quadrigemina, being placed, as they are, midway between the hemispherical ganglia and the external organs of sense, may be played upon and roused into action through either, from below or from above: upwards from the outer world, by the appropriate stimulus upon the nervous vesicular expansion of each of the external organs of sense; downwards from the hemispheres, from the inner or psychical world, by the flow of our thoughts, and the workings of ideodynamical, emotional, or moral activities in the cerebral organs.

Moreover, bearing in mind their anatomical and physiological relations, their connections upwards with



the hemispherical ganglia, backwards with the cerebellum, and downwards from the corpora striata, through the cerebro-spinal axis with the nerves both of sensation and of motion, we need be at no loss to comprehend, what we are so often called upon to witness, a highly disturbed state of these nervous centres, finding vent in a disruptive discharge of the nervous force, deranging all the sensitive as well as all the motor phenomena of the body, and even those of the intellect itself.

I have not alluded to Dr. Wigan's hypothesis that the mind itself is dual—in other words, that consciousness is double; and that, because we have two brains, a right and a left brain, so have we two minds, each performing its own functions, but in perfect accordance so long as the two brains harmonise in quality, structure, and action, with each other; for all the information furnished to us by the senses, tells of a mind “one and indivisible”; and in every instance in which there is a lateral doubling of the nervous centres, there we find a commissural band, like the corpus callosum, the office of which is manifestly that of a bond of union, associating the two sides of the cerebrum into one harmonious action.

The fact itself of the duality of the brain is indisputable. The brain is a double organ, and the symmetrical disposition of the parts of the encephalon on each side of the median line must be admitted. But, at the same time, this doubleness of the brain is in harmonious accordance with the doubleness of all the organs of sense; and, indeed, is just what *à priori* reasoning would lead us to expect as necessary to the functions of the special senses, as double inlets to knowledge. But the work of Dr. Wigan, *On the Duality of the Mind*, is highly suggestive; and, when fairly interpreted, by the physiological psychologist, is calculated to throw much light upon alternating states of consciousness, delusions, and irregular volitions, as well as upon other obscurities, connected with the phenomena of mind.

Sir H. Holland, in his valuable *Chapters on Mental*



*Physiology*, has an admirable essay on the Brain as a Double Organ, showing its compatibility as such with the unity of consciousness.

### III. *On the Psychological Phenomena or Symptoms of Disease.*

HAVING passed in review the leading phenomena of the mental states, and followed up the survey with an inquiry into, and an attempt to specialise, the nervous apparatus or instrumentality through which they are manifested in this life, it now remains to take a cursory glance at the bearings of our inquiries upon practical medicine, and especially in reference to mental phenomena as symptoms of disease.

I rejoice in the conviction that the philosophy of the mind, like the philosophy of nature, is now cultivated in a manner worthy of its objects; and that its relations to psychological medicine are better understood and more fully appreciated. But I have neither the ability nor the leisure to attempt a systematic exposition of the abnormal phenomena of the different phases of consciousness. All that I propose to myself is to make some general remarks bearing on the subject of the mental manifestations as symptoms of disease in general. In such works as the *Manual of Psychological Medicine* by Drs. Bucknill and Tuke, and as Dr. Noble's *Elements*, will be found able and valuable expositions of purely mental diseases, systematically arranged and discussed. Since, indeed, my own thoughts on the subject were thrown into shape, two interesting and important works have appeared—one by Dr. Laycock, Professor of Medicine in the University of Edinburgh, *On Mind and Brain, or the Correlations of Consciousness and Organisation*; and the other, *On Obscure Diseases of the Brain*, by Dr. Forbes Winslow, D.C.L., editor of the *Psychological Journal*. The first must be invaluable as a text-book for the students of the professor's university class, and can scarcely fail of arousing their attention to the works of that great metaphysician, Sir William



Hamilton. It is the most elaborate and comprehensive work that we have on the subject, a remarkable and valuable contribution to psychology, claiming a place in the library of every philosophical medical practitioner. And in the other is contained a fund of interesting information. As a prefatory essay to another promised pathological work by the same author, *On Softening and other Types of Organic Disease of the Brain*, it reminds one, from its bulkiness, and its interest and importance, of Mr. Buckle's Introduction to his *History of Civilisation*.

*Abnormal Subjective Phenomena.* There are certain subjective phenomena, associated with the different organs of sense, with which we are all familiar, and which are evidently dependent upon some local functional derangement of the nervous apparatus of the sensational consciousness. Such are the *muscæ volitantes*, which float before the eyes; and such the sounds in the ears, like the noise of the ocean or the ringing of bells, etc. There are ocular spectra, too, dependent on the same causes, and recurring, as in the case of Sir Isaac Newton, and the spectrum of the sun, in the darkness of midnight.

Not unfrequently, *false perceptions*, as they are commonly called, occur—in other words, *spectral illusions and delusions*—as the consequence of functional disturbance or derangement of some of the perceptive faculties, and most generally of those faculties which, through the visual organs, are subservient to our knowledge of the physical attributes of external existences, such as their size, form, colour, number, etc. Now, when there is no mental hallucination present—that is, no belief in the actual existence of something external to the mind itself as the cause, and as giving rise to the phantasms, the abnormal phenomena may be considered as *purely illusions* of the perceptive consciousness; and, no doubt, of such cases, the observation, if not the personal experience, of every medical practitioner, can furnish an abundance of illustrative instances. The



following is related by Dr. Abercrombie. A lady, whom he had attended in a slight feverish attack, saw distinctly a party of ladies and gentlemen sitting round her bed-chamber, and a servant handing something to them on a tray. The same continued in a greater or less degree for several days, and was varied by the spectacle of castles and churches of a very brilliant appearance, as if they had been built of finely cut crystal. The whole was in this case entirely a visual phantasm, for there was no hallucination of the mind. On the contrary, the patient had from the first a full impression that it was a morbid affection of vision connected with the fever, and amused herself and her attendants by watching and describing the changes in the scenery. When, however, there is hallucination of the mind, and the spectral illusions or abnormal phenomena are believed to have a real existence in nature, the derangement is not limited to the nervous apparatus of the perceptive, but also involves that of the intellectual consciousness. In such cases, it but too frequently happens that the hallucination is followed sooner or later by other and more general indications of psychical derangement.

But, as I have said, there are *delusive perceptions*, as well as *spectral illusions*—cases in which the imaginative faculty, in the absence of mental hallucination, conjures up and embodies out of the actual objects by which it is surrounded *ideal existences*. Dr. Abercrombie mentions the case of two friends of his who, while travelling in the Highlands, had occasion to sleep in separate beds in one apartment. One of them, having awaked in the night, saw by moonlight a skeleton hanging from the head of his friend's bed, every part of it being perceived in the most distinct manner. He instantly got up to investigate the source of the delusion, and found it to be produced by the moonbeams falling upon the drapery of the bed, which had been thrown back in some unusual manner, on account of the heat of the weather.



We are indebted to Dr. Abercrombie for a number of interesting and instructive cases of spectral illusions. As illustrative of the analogy that exists between them and dreaming, he cites the following case of an eminent medical friend. "Having sat up late one evening, under considerable anxiety about one of his children, who was ill, he fell asleep in his chair, and had a frightful dream, in which the prominent figure was an immense baboon. He awoke with the fright, got up instantly, and walked to a table which was in the middle of the room. He was then quite awake, and quite conscious of the articles around him; but close by the wall, at the end of the apartment, he distinctly saw the baboon, making the horrible grimaces which he had seen in his dream; and the spectre continued visible for about half a minute."

As abnormal psychological phenomena in bodily disease, he has given illustrative instances of spectral illusions in cases of affections of the brain, delirium tremens, epilepsy, and in fever. We are all acquainted with the singular case of Nicolai, the Berlin bookseller; and with that of Dr. Gregory's epileptic patient, in whom the paroxysm was generally preceded by the appearance of an old woman in a red cloak, who seemed to come up to him and to strike him on the head with her crutch at the very instant that he fell down in a fit.

Of spectral illusions it is needless to multiply examples. I might adduce the case of John Hunter, as related by Sir Everard Home in his biographical memoir prefixed to Hunter's work *On the Blood and Gunshot Wounds*; but I shall content myself by giving some particulars of a more comprehensive case, not less interesting, and still more instructive. "A young lady, under twenty years of age, of good family, well educated, free from superstitious fears, and in perfect good health of body and soundness of mind, was occasionally troubled, both in the night and day, with visions of persons and inanimate things. First she saw a carpet spread out in



the air, which descended near her, and vanished away. Afterwards she began to see human figures in her room as she lay wide awake in her bed, even in the daylight of the morning. These figures were whitish, or rather grey, and transparent, like cobweb, and generally about the size of life. At this time she had acute headaches; and the pain was confined to the front part of the forehead, on each side of the root of the nose; and she described it as if sharp knives were being run into the part. The pain was increased when she held her head down, and was much relieved by holding her face upwards. On being asked if the pain were confined to one spot, she said that at times it extended to the right and the left along the eyebrows, and a little above them, and completely round the eyes, which felt often as if they would have burst from their sockets. When this happened, her visions were varied. The whitish or cobweb spectres assumed the natural colour of the objects; but they continued often to present themselves, though not always, above the size of life. She saw a beggar one day out of doors, natural in size and colour, who vanished as she came up to the spot. At times, bright spots, like stars on a black ground, filled the room in the dark, and even in daylight. Suddenly, sometimes, a gradual illumination of the room during the night would take place, so that the furniture in it became visible. Innumerable balls of fire seemed one day to pour like a torrent out of one of the rooms down the staircase. On another occasion, the pain between the eyes and along the lower edge of the brow struck her suddenly with great violence, when instantly the room filled with stars and bright spots. On that occasion, while attempting to go to bed, she said she was conscious of an inability to balance herself, and felt as if tipsy, and actually fell, having made repeated efforts to seize the bedpost, which in the most unaccountable manner eluded her grasp by shifting its place, and also by presenting her with a number of bedposts instead of one. For nearly two years this young lady was altogether



free from headaches, and for the same period was not troubled by visions and illusive perceptions. Subsequently her health gave way, and all her distressing symptoms returned in great aggravation. The pain was more acute than before along the frontal bone, and around and in the eyeballs; and all the perceptive faculties situated there recommenced their game of illusion. Single figures of absent and deceased friends were terribly real to her both in the day and the night, sometimes *cobweb*, but generally coloured. She sometimes saw friends in the street, who proved phantoms when she approached to speak to them; and instances occurred where, from not having satisfied herself of the illusion, she affirmed to such friends that she had seen them in certain places, at certain times, when they proved to her the clearest *alibi*. The confusion of her spectral forms now distressed her. The oppression and perplexity were intolerable when figures presented themselves before her in inextricable disorder, and still more when they changed, as with Nicolai, from figures to parts of figures, faces and half-faces, and limbs, sometimes of inordinate size and dreadful deformity. Real but inanimate objects have assumed to her the form of animals, and she has often attempted to lift articles from the ground which eluded her grasp. She experienced a great aggravation of her alarms when, like Nicolai, she began to hear her spectral visitors speak. At first her crowds kept up a buzzing and indescribable gibbering, and occasionally joined in a loud and terribly disagreeable laugh, which she could only impute to fiends. These unwelcome sounds were generally followed by a rapid and always alarming advance of the figures, which often on these occasions presented very large and fearful faces, with insufferable glaring eyes close to her own. All self possession then failed her, and the cold sweat of terror stood on her brow. Her single figures of the deceased and absent then began to *gibber*, and soon more distinctly to address her; but her



terror prevented her from understanding what they said." (Vide *Phrenological Journal*, vol ii, p. 290.)

Without dwelling on this interesting narrative, but which is worthy of careful consideration, I cannot help adverting to the significancy of the facts—first, of the coincidence in point of time of the young lady's severe headaches with the ocular spectra, for during the two years she was free from headaches, she had no annoyance from them; and, secondly, of the location of her painful sensations in the anterior and inferior part of the brain—in the region recognised as the site of those perceptive faculties of the mind which are subservient to our knowledge of the physical attributes of external existences.

Now, while we have abundant evidence of the occurrence of ocular spectra, or false perceptions, as purely illusions of some of the faculties of the perceptive consciousness, it is important to bear in mind that, in all cases of delusions, the intellectual consciousness is involved; and that in every instance of delirium from the mere wanderings of the thoughts, as soon as the controlling influence of the will is in abeyance, in the first light-headedness of fever, to its highest development in delirium tremens, there is undoubted functional disturbance in the nervous centres of intellectual action and volitional power. The delirium of fever has been aptly designated the insanity of disease.

*Delirium and Coma.* Of all the psychological phenomena of disease, delirium and coma preeminently claim our attention; for, as Dr. Todd, in his valuable *Lumleian Lectures* for 1850, has justly observed, "the mental states of delirium and of coma involve so complete a departure from the normal condition of the intellect and of consciousness, and, as experience teaches us, are so apt, one or the other, to accompany diseases of organs *other* than those which form part of the nervous system, that surely nothing can be of higher practical moment than that our views of the pathology of these states—of the precise nature of the derangement of the physiolo-



gical action of the body which is capable of producing them in their various degrees—should be *definite* and *settled*, lying, as they must do, at the very foundation of our knowledge of the derangements or diseases of the nervous system." He reasonably asks: "Can it be expected that we shall be able to form any correct idea of the effects which inflammation or other disease of the brain is capable of producing, if we know nothing of the intrinsic nature of the conditions which give rise to delirium and coma?"

Now in coma, indeed, when profound, there is a *complete abolition of consciousness*, and the phenomena of life are reduced to a mere series of automatic movements. The patient, for the time being, neither feels, nor wills, nor thinks; and he awakes from this state as from a deep sleep. He knows not where he has been, and he feels as if, during a certain interval, he had ceased to exist. "Delirium", to use the words of Dr. Todd, "exhibits great variety as to the extent to which the perturbation of the intellectual powers has taken place, in some instances amounting to a simple wandering of the thoughts, and an inability to fix the attention and to maintain a continuous train of thought; in others consisting, as it were, in an extraordinary exaltation of the thinking faculty, with an extreme excitement of feeling and temper, leading in many instances to violent maniacal paroxysms, under the influence of which the patient exhibits a degree of muscular power which is very apt to deceive the practitioner as to the extent of intrinsic strength which he possesses. Great, indeed, is the difference of degree between the highest and the lowest forms of delirium—between the slight wandering, or, as the nurses and patients are apt to call it, *light-headedness*, and delirium ferox or acute mania, in which the patient threatens with destruction himself and all around him. The state of delirium, indeed, in its highest degree, is a complete disturbance of the intellectual actions. The thoughts are not inactive, but rather far more active than in health: they are uncon-



trolled, and wander from one subject to another with extraordinary rapidity; or, taking up some single subject, they twist and turn it in every way and shape with endless and innumerable repetitions. The thinking faculty seems to have escaped from all control and restraint, and thought after thought is engendered without any power of the patient to direct or regulate them. Sometimes they succeed each other with such velocity that all power of perception is destroyed, and the mind, wholly engrossed with this rapid development of thoughts, is unable to perceive impressions made upon the senses; the patient goes on unceasingly raving, apparently unconscious of what is taking place around him; or it may be that his senses have become more acute, and that every word dropped from a bystander, or every object presented to his vision, will become the nucleus of a new train of thought; and, moreover, such may be the exaltation of his sensual perceptions, that subjective phenomena will arise in connexion with each sense, and the patient fancies he hears voices or other sounds; ocular spectra in various forms and shapes appear before his eyes, and excite to farther rhapsodies of thought." (Vide *Lumleian Lectures* for 1850, delivered at the Royal College of Physicians, London, by R. B. Todd, M.D., F.R.S.)

Now, the morbid mental phenomena of delirium and of coma, varying, indeed, in different degrees, are concomitants in so many forms of bodily disease—in epilepsy, chorea, hysteria, anæmia, the exanthemata, erysipelas, gout; fevers, rheumatic, puerperal, and typhus; in diseases of the kidneys, delirium tremens, etc.—that these derangements of the intellectual consciousness are invested with peculiar interest and great practical importance, both in relation to the diseases with which they are associated, and to the pathological condition of the cerebral organs through which they are manifested. We unfortunately see so much of the *delirium à potu*, and are so often called upon to witness and to treat the symptoms or morbid phenomena of true delirium tre-



mens, that a more familiar illustration could not possibly be adduced, nor perhaps a better or more instructive one, than what such cases present, of the delirium and coma consequent upon the derangement of the nutrition of the nervous centres of the encephalon from the poisoning of the blood by alcohol. How constantly do we see the occasional drunkard, in his early cups, noisy, loquacious, and merrily drunk; but, at the end of his carouse, stupid, dead drunk, and comatose!

Dr. Todd has ably pointed out the distinctive differences between the *delirium è potu* and that of the true delirium tremens; but on these I need not dwell. However, it too often unfortunately happens that the victim of an occasional outbreak or casual excess sooner or later degenerates into the habitual drunkard; and then a sequence of consequences the most sad and direful are sure to follow—horrors, hallucinations, vigilia, tremors, etc. Dyspepsia in the stomach is soon succeeded by disturbance of nutrition in the brain. He becomes sleepless, nervous, fidgetty, and restless, accompanied with a peculiar tremor in nearly all the voluntary movements. His hands tremble, so that he cannot write steadily; and, in extreme cases, he exhibits a marked degree of nervousness and anxiety on almost all occasions.

With deranged digestion and the want of sleep, the memory and the powers of thought begin to fail; the patient loses his control over his thoughts; he is apt to wander; illusions take possession of his mind; subjective phenomena of vision or hearing are continually occurring. In the graphic language of Gough, in his *Confessions*, quoted by Dr. Carpenter in his prize essay, "hideous faces appeared on the walls, on the ceiling, and on the floor; foul things crept under the bedclothes, and glaring eyes peered into mine. I was at one time surrounded by millions of monstrous spiders, who crawled slowly over every limb; whilst beaded drops of perspiration would start to my brow, and my limbs would shiver until the bed rattled again. Strange



lights would dance before my eyes, and then suddenly the very blackness of darkness would appal me by its dense gloom." (*Vide Autobiography of J. B. Gough.*)

When once the stomach gets so irritable that all food is rejected, then it is that delirium becomes fully developed, and its victim often furious and unmanageable, sometimes destroying himself by jumping out of the window; but very often he sinks suddenly from sheer exhaustion—at other times, from epileptic paroxysms, or by coma. Some years ago, very early one fine summer's morning, I was hastily called to a public house in my neighbourhood, to see a gentleman well known to the landlord, who, in a state of the greatest agitation and fright, had rapped violently at his door for instant admission, under the delusion that some one was pursuing him. He had been drinking for many days, and had made his escape from his own home. He was perspiring profusely, and in a state of general tremor and nervous agitation. No trouble was spared to quiet and soothe him, but without effect. His father was sent for, and shortly afterwards I was summoned. On my arrival, his father met me at the door, and said, "Now he is quiet at last; only look at him; but pray do not disturb him." I approached quietly to his bedside. He was past disturbance, for he was dead; he had sunk from exhaustion.

During the past year I witnessed the death of another victim to delirium tremens, in coma, after a succession of strong epileptic paroxysms. I had several times previously attended him for delirium tremens, as he had for many years been an inveterate and habitual drunkard. His last attack was complicated with bronchitis; and he sunk comatose, at the close of a rapid succession of epileptic paroxysms during the last two days of his life.

The delirium and coma *à potu* are, nevertheless, both interesting and instructive; for they are unquestionably due to the presence of alcohol in the blood, and to its action upon the vascular matter of the encephalic



ganglia. They differ only in the degrees, indeed, of the poisoning of the blood by alcohol; the lesser imbibition giving rise to and exciting *delirium*, the greater resulting in *coma*. They accordingly may be considered as typical of the *toxic delirium* and *coma* of the exanthemata, erysipelas, gout, typhus, and other constitutional affections in which the encephalic ganglia suffer in their nutrition, or have their healthy functions disturbed and deranged by the introduction of a morbid poison into the system.

But in the delirium of such cases there is often a difference not only in degree, but also in character and kind, and arising not solely from the difference which exists in the precise nature of the poisons introduced into the blood, but also from their different elective affinities for the vascular matter of special ganglia of the encephalon whose functions they disturb and derange. Thus a morbid action or deranged nutrition may be set up in one or in several of the cerebral organs; and, as its necessary consequence, the manifestation of functional disturbance will follow in such of the mental faculties as these organs subserve. This is a point of some practical importance; for, although the peculiar and emotional character of delirium in the puerperal form has arrested the attention of the obstetric practitioner, the subject presents a wide and unexplored field for observation and research. M. Flourens, I believe, was the first to point out the tendency which certain morbid agents exhibit, when introduced into the current of the circulation by the blood, to act *primarily* and *specially* on *one* nervous centre in preference to that of another, by virtue of some special elective affinity between such morbid agents and certain ganglia of the encephalon. Thus, in the tottering gait of the tipsy man we see the influence of the alcohol he has swallowed, upon the functions of the cerebellum, in the impairment of its power of coordination. Further advanced in his cups, we hear his merry and noisy delirium, as the centres of intellectual action come under its domi-



nion; and, in the end, we behold him lying prostrate, insensible, and comatose, no longer able to move, to articulate, or to think, until he has eliminated and exhaled the alcohol from his system—in other words, slept off the effects of his intoxicating potions.\*

Again, if we contrast the effects of belladonna and opium, we see that both affect primarily the nervous centres of the sensational consciousness; but that belladonna, on the one hand, causes blindness and dilatation of the pupil, from acting primarily on the nervous centres of the implantation of the optic nerves; while opium, on the other hand, causes contraction of the pupil, by exerting its influence on the centres in which the third pair of nerves is implanted. In a paper "On the Inhalation of Chloroform, its Anæsthetic Effects, and its Practical Uses", which was read before the Royal Medical and Chirurgical Society on April

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\* The physiological action of alcohol has been the subject of much discussion; and, on this point, the experimental researches of Dr. Edward Smith are interesting and important. The value, indeed, of alcohol, as a therapeutical agent, in some cases of delirium, and in certain forms of exhausting disease, cannot be questioned, and the claim of *good wine*, to be *the milk of old age*, admits of as little dispute. It is against its abuse and its improper exhibition, whether as a *viande* or a medicine, that we have to protest and contend. Like chloroform, ether, and amylene, alcohol acts directly and primarily on the nervous centres. The recent experimental researches of MM. Lallemand, Perrin, and Duroy, have determined the true nature of its action, on the animal organism, to be that of a *local excitant* to the tissues, and that it is a *non-assimilable substance*. Ingested alcohol is absorbed; on entering the current of the circulation, it pervades all the tissues; by virtue of a kind of elective affinity, it accumulates in the nervous centres of the brain and the liver, but it is eliminated again as alcohol from the system by the lungs and the skin, but chiefly by the kidneys. In a few minutes after ingestion, its presence may be detected as exhaled with the breath from the lungs. Its accumulation in the nervous centres of the brain and the liver is in accordance with the well known pathogenic influence which alcohol exerts in certain constitutional and organic diseases of the liver and brain. MM. Lallemand, Perrin, and Duroy, in the course of their researches, made the unexpected discovery, that the blood did not contain the largest amount of the alcohol absorbed. On the contrary, they found, in the same animal, that, where the proportion of alcohol was 1 in the blood, it was 1.48 in the liver, and 1.75 in the brain, but there was scarcely a trace to be found of it in the muscles. (*Vide* M. Rayer's report of the work of MM. Lallemand, Perrin, and Duroy, presented to the French Academy, and for which a prize was awarded, as quoted, in the BRITISH MEDICAL JOURNAL, February 8th, 1862.)



22nd, 1851, and afterwards published in the *London Medical Gazette*, I have attempted to trace the order and sequence in the effects of the inhalation of the vapour upon the different nervous centres of the encephalon, and through them upon the sensational, perceptive, and intellectual phases of consciousness. The sensational consciousness is first obliterated. I have observed that, "while it is reasonable to infer that, in circulating with the blood through the encephalon, the presence of the chloroform, like that of any similar morbid agent, must more or less affect all the sensory feelings and psychical manifestations, it is nevertheless abundantly manifest that a kind of elective affinity exists, by virtue of which the vesicular matter of one centre of action becomes affected before that of another; for, during the slow and gradual inhalation of the vapour, the function of sensation is suspended before that of intellectual action; the *consciousness of feeling* is obliterated, and consequently immunity from pain secured, before *intellectual consciousness* is totally abolished.

"The first few inhalations are attended with feelings which indicate disturbance in the action of the sensory ganglia, as 'singing in the ears, a sense of numbness, and tingling of the surface of the body, etc.,' but which are soon succeeded by a transient stage of more general excitement; of delirium in the hemispherical ganglia, for instance—as singing and incoherent talking, and of excited emotional impulses, and consensual movements in the sensory ganglia—as laughter and uncontrollable motorial actions; this is speedily followed by suspension of the function of sensation, *the consciousness of feeling*, while as yet some degree of intellectual activity remains. Sensorial impressions *from without* are no longer transmitted from the sensory ganglia to the cerebrum; but this 'suspension of ordinary sensational impressions, as in sleep, with persistent intellectual activity, is the typical characteristic of dreaming;' and dreams often occur. The commissural fibres between the cerebrum and



these ganglia—*Reil's nerves of the internal senses*—being still in action, they transmit downwards the *residual intellectual activity* from the cerebrum to the sensory ganglia, and frequently give rise to manifestations which impress the mind of common observers with the belief of pain and suffering being felt under the knife of the surgeon, while in reality there are none.

“The function of the cerebrum, as the centre of intellectual action, is next suspended ; a state of coma is induced, *a complete abolition of consciousness, reducing life to a series of automatic movements.* After this, the medulla oblongata and true spinal centres become involved, reflex action is stopped, and breathing by the ribs suspended. The ganglionic system is the last to be implicated; but, with the arrest of the peristaltic action of the heart, life ceases.”

In all cases of blood-poisoning, it would appear that the sensory ganglia or nervous centres of the sensational consciousness become primarily affected, and before those of intellectual action or volitional power.

A true humoral pathology satisfactorily accounts for and fully explains the different varieties of toxic delirium and coma, and establishes the fact that, in such cases, the delirium and coma are but varying degrees of the same state; the latter being only an advanced stage of the former affection, a small dose of the narcotic causing functional disturbance in some of the faculties of the intellectual consciousness, and an over-dose paralysing and abolishing the action of them all.

In relation to this subject, it has been justly remarked of my friend, the late Dr. Snow, by Dr. Richardson, in his biographical notice, “that his generalisations and insights into the relations of allied phenomena mark the man of true power; and that his greatest deduction on these matters, and the proofs on which it is based, are to be found in his observations, where he explains that *the action of volatile narcotics is that of arresting or limiting those combinations between the oxygen of the arterial blood and the tissues of the body,*



*which are essential to sensation, volition, intellectual action, and all the animal functions*; for he demonstrated that these substances (volatile narcotics) modify, and, in large quantities, arrest the animal and mental functions, in the same way and by the same power as that by which they modify and arrest combustion—the slow oxidation of phosphorus, and other kinds of oxidation, unconnected with the living body, when they (the narcotics) are mixed with the atmospheric air.”

*Cerebritis and Pressure.* There is, however, a form of delirium and coma dependent upon other and very different pathological conditions, and which it is of the utmost importance in practice to recognise and detect. I mean the *delirium* which is manifested in inflammation of the superficies of the brain and its investing membranes, and the *coma* that is caused by compression of its substance, whether from the effusion of blood or of serum. Inflammation of the superficial cerebral substances, and of the meninges of the brain, is a fearful, but happily, in adult life, a most rare disease. In the traumatic form, it is occasionally met with; and sometimes, idiopathically, among children of a strumous habit. While I agree with Dr. Abercrombie that it is impossible to separate, either in diagnosis or treatment, inflammation of the arachnoid and pia mater, I am quite of Mr. Solly's opinion, that it is equally as impossible to diagnosticate inflammation of the membranes from that of the superficies of the brain. Nor need this be a matter of surprise, seeing that no part is more abundantly supplied with blood-vessels. “The pia mater, which lies in contact with the whole of the undulating surface of the convolutions, is a membrane of blood-vessels, from which innumerable minute vessels penetrate the vesicular matter. A piece of this grey matter of the convolutions, successfully injected, appears perfectly red, from the multitude and proximity of these blood-vessels.” Dr. Abercrombie, in my opinion, justly considers the *phrenitis* of former writers to be *meningitis* or inflammation of the membranes of the brain,



and "as characterised by fever, watchfulness, acute headache, impatience of light, suffusion of the eyes, and maniacal delirium."

Out of a number of well-marked cases of inflammation of the brain and its membranes among children, which have come under my own observation in general practice, as an illustrative instance, I shall give the particulars of one, and also of a case of coma from pressure, without delirium, and both of which to me, at the time, were alike interesting and instructive.

The first case was one of local tubercular deposit upon the surface of the hemispheres, occurring in a fine, intelligent, but strumous boy, of two years old, who died at the end of six weeks from the time I was called to him. I brought the case under the notice of the Royal Medical and Chirurgical Society, and it is published in vol. xxv of the Society's *Transactions*. My friends the late Dr. Todd and Mr. Bowman were present at the autopsy, and the following is Dr. Todd's account of the *post mortem* appearances.

"The scalp was pale and bloodless, like the rest of the body, which was much emaciated. The dura mater was healthy. The vessels on the superficies of the brain were tinged with dark blood, but there was no subarachnoidal effusion. The arachnoid cavity was natural. On the surface of the right hemisphere of the brain, both under the arachnoid and pia mater, there was a deposit of tubercular matter, in patches of irregular shape and size, but the whole occupying a surface of about two inches square. The deposit was most abundant upon the surface of the convolutions; it nevertheless descended into the sulci between them—a circumstance which proved its connexion with the deep surface of the pia mater. The cortical substance of the brain in contact with the tubercular matter was *reddened* and greatly softened, and, on microscopic examination, evinced a nearly total destruction of the tubules in it; a great enlargement of the proper globules of the grey matter, and of the pigment-granules which adhere to



them. The softening extended a slight way into the subjacent white matter. On the edge of the left hemisphere, corresponding to the diseased patch on the right, a slight tubercular deposit had taken place in a similar manner, producing a red softening of the grey matter in contact, but not occupying more than half an inch square in surface. The ventricles contained more water than natural—about double—and did not collapse when laid open. The cerebral substance throughout, excepting at the diseased part, was firmer than usual at the patient's age. The firmness was, no doubt, owing to the compression of the fluid, which probably, at an earlier period of the disease, was more abundant."

In this case, the motor phenomena were peculiar and striking, and induced the belief of the existence of tubercle. When I was first called to the child, he had awoke as usual between six and seven o'clock in the morning, and his mother was alarmed by observing his left hand begin suddenly to twitch and jerk convulsively. The intellectual faculties were not then affected; the child was laughing and talking, and perfectly sensible. He had fallen down stairs fourteen days previously to the attack. On the third day from the first occurrence of the convulsive action of the arm, there was an imperfect paralysis of the hand and arm. On the fourth day, the convulsive jerkings were not confined to the arm, but involved the whole of the left side, with twitchings of the eye and angle of the mouth. As the fits increased in violence, he became excited and delirious, cried and screamed out violently. They were followed by profound sleep for several hours. Towards the close, he continued delirious; his head was hot; face flushed; pulse hurried; pupils dilated; eyes squinting, insensible to light; eyelids constantly open, and only able at times to recognise the persons about him. He sank comatose. Now, the motor phenomena in this case were most probably due, in the first instance, to a local irritation or disturbance in the integrity of that part of the medullary substance of the hemisphere situated im-



mediately beneath the tubercular deposit, and which had possibly been occasioned by the fall which the child had met with; for at first there was no constitutional derangement nor mental excitement. But with the accession of fever came irritability of mind and temper, delirious excitement and fits of screaming, and an extension of the convulsive movements to the whole of the left side of the body, indicating the spread of the membranous irritation, and the implication both of the grey matter and of the medullary substance in the inflammatory process.

There was a peculiarity—a psychological phenomenon—in this case, which is worthy of record. Both the parents of the child, for four or five months previous to his attack, had been particularly struck with a marked change in his disposition which had been gradually taking place. From being a happy, placid boy, he had become irritable, peevish, and petulant, impatient of control, very determined to have whatever he set his mind upon, and not to be driven from his purpose; in a word, to use their own language, he had become a most *self-willed and obstinate little boy*. So marked, indeed, was this change in his disposition, that it had become a subject of serious consideration with them whether it was to be attributed to some latent disease under which he might be labouring, or to mere infirmity of temper; but, as the child continued to eat, drink, and sleep well, and did not appear to be suffering from any bodily complaint which they could detect, they did not take any medical opinion, but contented themselves with endeavouring to correct, by moral discipline and management, what they were induced to consider rather as an infirmity of the mind than of the body.

Now, it is certainly a significant fact, and worthy of notice, that the tubercular deposit should be found to be situated on that part of each of the hemispheres where Gall and Spurzheim have located their organ of *firmness*; it extended a little, perhaps, beyond the boundary line, especially on the right side, and en-



croached upon the site of the organ of *self-esteem*. In such a case as this, it is but reasonable to infer that among the first of the morbid effects arising from the tubercular deposit would be an irritating excitement in the grey substance, which would lead to an abnormal development of its functional power; and, as obstinacy is an abuse of firmness, if we associate the change of disposition which had taken place in the child with the structural disturbance induced by the tubercular deposit, we cannot resist the phrenological inference as to the site of the organ of *firmness*. The attempt, indeed, to trace the connexion between structural diseases of particular portions of the substance of the brain, and deranged, impaired, or obliterated manifestations of the mind, however it may be beset with almost insuperable difficulties, is nevertheless one of vast interest and great importance; and, to this end, I cannot suppress my conviction that it is an incumbent duty upon the medical practitioner to make himself thoroughly acquainted with the principles and facts of phrenology, and with the respective sites or localities of the different organs in the cerebral convolutions; and to let no opportunity slip of bringing phrenological doctrines to the test of experience. If I am not greatly mistaken, it is to *post mortem* examinations of the brain, and to pathological investigations, more than to any other source, that we are to look, not for the discovery of normal functions, but for evidence in support or refutation of the dogmata of phrenology. In the case I have related, while the peculiarity of the motor phenomena at the beginning of the attack led to the belief of the existence of tubercle in the brain, the psychological phenomenon, or observed change in the disposition of the child, was the *only* indication of the *local* seat of the disease.

The case of coma from compression of the brain was that of a tradesman of middle age, living near to me. I was called to him on Monday, Nov. 12th, 1855; and he died from coma, at the end of a fortnight. He was a man of a placid disposition and regular habits; but,



during the last year of his life, he had, in consequence of filling some parochial offices, been subjected to a good deal of irritating excitement and annoyance. On the Wednesday of the week before I was called to attend him, he first began to complain of pain on the left side of his head. The night previous, he had attended one of those stormy parochial vestry meetings which are not unfrequent, and had been unusually excited. He got about his business, however, as usual, and on the Saturday night took a dose of aperient medicine. On the Sunday evening, he went to church with his wife; but such was the feeling of drowsiness, that his wife assured me he slept the greater part of the service, and very heavily throughout the night afterwards. In consequence of this excessive lethargy, I was sent for on the Monday evening. He then complained of the pain on the left side of the head, and great drowsiness. He was perfectly collected, nor was there any febrile disturbance. His pulse was quiet and regular, but he was heavy and depressed. Leeches were applied to the seat of the pain, and a brisk mercurial purgative was given. I found him the next day about in his business as usual, in better spirits, and not so lethargic; but the day following he became worse, and complained of sickness of stomach, great sleepiness, and depression of mind. He was cupped from behind the left ear to eight or ten ounces, and I began giving him a grain of calomel every four hours. The following morning, finding him in a semi-comatose state, hemiplegic on the right side, with marked rigidity of the muscles of the arm and leg, I had a consultation with Dr. Todd, and the advantage of his assistance in the future treatment of the case. It was a point of discussion between us, whether the symptoms were due to the pressure of a superficial apoplectic clot, or to a patch of inflamed brain on the left hemisphere. I had looked upon the symptoms from the first as indicative of pressure, but Dr. Todd had a leaning towards the latter condition. We agreed, however, to push the mercury to salivation,



and to keep up counter-irritation by blisters. Under this treatment, for six or eight days, he appeared gradually to improve. He recovered his consciousness, although retaining a certain degree of somnolency; the paralysed limbs regained a greater degree of power; and the muscles became less rigid. We looked hopefully forward as to his ultimate recovery; and, as the gums had become affected, thought that the mercury was telling for good. But our hopes were short-lived. A sudden relapse into continued lethargy, with paralytic symptoms in a more severe form, ended in profound coma, under which he succumbed.

At the *post mortem* examination, we found a considerable apoplectic clot on the surface of the left hemisphere, causing a deep indentation on the convolutions, which did not disappear when the clot was removed, such was the degree of pressure on the cerebral substance. On cutting through the clot, it was seen to consist very distinctly of two portions, one brownish in colour, and looking old; the other consisting of dark currant-jelly-like coagulum, which had only been recently effused. Thus it was evident that the original cause of the symptoms was a meningeal effusion of blood compressing the brain to a very great extent. The shock which the brain had received at the first effusion of blood having subsided, and the watery part of the coagulum having been absorbed, a restoration of consciousness and a general improvement in the other symptoms took place. These, however, gave way before the second hæmorrhage, which led to the fatal issue.

Dr. Burrows, in his valuable *Lumleian Lectures*, delivered at the College of Physicians in 1843, and which I had the pleasure of hearing, has proved to demonstration that the blood in the brain is a *varying quantity*; and has shown that in certain diseases of the heart, even where there is no evidence of any deterioration in the quality of the blood, the disturbance of the balance in the cerebral circulation occasioned by the embarrassed action of the heart is a frequent cause of deli-



rium. But, in cases of gout, the delirium is greatly aggravated by the circulation through the brain of an impure and impoverished blood with diminished force; for, as Dr. Todd has well observed, "the cerebral battery being excited by a thin watery blood, deficient in its colouring matter, and perhaps also in some other of its staminal principles, and which at the same time contains a poisonous element, it is easy to understand how it will exhibit more rapid and active chemical and physiological changes; and, consequently, will develop the nervous force with a rapidity and force which disturbs the mind, exciting repeated and irregular acts of thought, and refusing to be controlled by it. In gout, and especially in the more aggravated cases, as in asthenic gout, we have a deranged state of the blood—a poorness of blood, from deficient colouring matter; and a poisoned condition, by lithic acid, or whatever other material it may be which forms the *materies morbi* of this disease."

There can be as little doubt that an anæmic condition of the brain gives rise to delirium, as that a sudden stoppage of its circulation is followed by syncope and coma. There was a time, indeed, when delirium was considered an unerring sign of inflammation of the brain, and when pressure was thought to be the chief, if not the sole, cause of coma; but now every obstetric practitioner must give his adhesion to the doctrine of Dr. Marshall Hall, "that *loss of blood* is by far the most frequent and influential source of delirium and coma in the puerperal state". "If a woman", says he, "has a profuse hæmorrhage after delivery, she will probably have a distressing headache, with throbbing in the head, noises in the ears, a colourless complexion, and a quick, weak, often thrilling pulse, all which symptoms are greatly increased by any exertion." He adds: "I have seen blood taken away from the head, and it has afforded relief for a few hours; but then the headache, throbbing, noises, have returned worse than ever. The truth is, that this is the acute stage of what in a minor degree



and in a more chronic form occurs in chlorosis, by which I mean pale-faced amenorrhœa, whether at puberty or in after life." There is abundance of evidence that delirium is but too often the consequence of an *excessive loss of blood*, and that an inadequate supply to the brain is as surely to be followed by coma.

To Dr. Marshall Hall and Dr. Gooch we are also indebted for pointing out the true nature of a comatose condition arising from *exhaustion*, with which every general practitioner is so familiar, but which had previously been thought to be occasioned by inflammation and effusion. It is chiefly met with in infant life, and has accordingly been designated by Dr. M. Hall "an hydrencephaloid affection of infants, arising from exhaustion"; but it is not confined to the period of infancy. He divides the affection into two stages—"the first, that of irritability; the second, that of torpor. In the former, there appears to be a feeble attempt at reaction; in the latter, the nervous powers appear to be more prostrate." If improperly treated, by leeching and purgatives, instead of nourishment and cordials, "the countenance becomes pale, and the cheeks cold; the eyelids are half-closed; the eyes are fixed, and unattracted by any object placed before them, the pupils unmoved on the approach of light; the breathing, from being quick, becomes irregular and affected by sighs; the voice becomes husky; and eventually the strength of the little patient has been subdued, and the vascular system exhausted, by the abstraction of blood."

Now we have seen in what a large class of diseases, and how in all cases involving a deterioration or poisoning of the blood, quite independently of that dire affection, inflammation of the brain and its membranes, the mental phenomena of delirium and coma are so frequently if not constantly developed, in varying degrees, but closely associated in the sequence of effects or consequences. Here a correct diagnosis is of paramount importance in respect to the treatment we ought to pursue. It makes all the difference whether the delirium



is due to inflammation of the cerebral substance, or to mere functional excitement; for, I would ask, how can the delirium or coma of the pale-faced chlorotic, or where uterine hæmorrhage has been excessive, be benefited by any form of depletion? And, again, how can the morbid element in toxic delirium or coma be eliminated from the system by blood-letting, local or general? Mr. Solly has well observed, "that one of the most important laws of vital action, which pathology has unfolded to us in relation to the nervous system, is this—that the first effect of the first stage of inflammation of *neurine* is to excite and exalt to an unnatural degree exactly the same kind of power which we have reason to believe resides in it in a normal state. For instance, the first effects of inflammation of the surface of the brain is to excite the mental faculties, to produce great irritability of temper, and constant restlessness or desire for action. If the inflammation be arrested at this point, the patient recovers his reason; but if it pursues its ravages undisturbed, limiting its destructive effects to the spot where it commenced, without extending to that portion of the brain which is beneath it, it *annihilates the intellect*, but does not affect the muscular system; while, on the other hand, if the inflammation extend farther, reaching the instruments by which the will travels to the muscles, it produces *convulsive action* on those muscles, which afterwards become paralytic; in this case, the integrity of the *neurine*, through which volition traversed to call these muscles into action, is compromised, and its power, therefore, as an instrument for the production of voluntary motion, destroyed." (Solly on the *Brain*.)

I cordially agree with him in ascribing the mental disturbance, excitement, excessive pain, intolerance of light, delirium and insanity, which have been observed as the diagnostic marks of inflammation of the arachnoid and pia mater, not to a simple lesion of either a serous or vascular membrane, but to the *injury* which that portion of the brain that is in contact with these



membranes has received from the inflammatory process ; and still farther, that " the condition of the intellectual faculties has not hitherto been sufficiently attended to, as a part of our chain of evidence, when we attempt to diagnose affections of the brain."

*Sleep.* I cannot dismiss the important mental phenomena, in disease, of coma and delirium, without observing how difficult, if not impossible, it is, on the one hand to diagnosticate between natural sleep when profound, and the sleep merging into coma induced by opium and other narcotics ; and, on the other hand, to distinguish between the phenomena of true delirium tremens, and certain recognised forms of insanity. As to sleep itself, it may well, as Sir Henry Holland has justly remarked, be called " one of the most wonderful functions of life—a state in which personal consciousness and sense of identity are scarcely maintained ; in which memory and reason are equally disturbed ; and yet one in which the fancy works variously and boldly, creating images and impressions which are frequently carried forward into waking life, and blend themselves deeply and strongly into every part of our mental existence. It is our familiarity with this great function of our nature which prevents our feeling how vast is the mystery it involves." He advocates the opinion that, in no case whatever of natural sleep, however profound, is consciousness wholly suspended. " It is not an unity of state with which we are dealing under the name of sleep ; but a series of fluctuating conditions, of which no two successive moments are, perhaps, strictly alike. And whatever interpretation we may give to this most mysterious phenomenon of life, it seems certain that the state of consciousness, or recollected dreaming, is that which comes into closest connexion with our waking existence. It forms a passage or gradation from one state to the other ; an obscure and broken link, it may be, yet belonging to that chain which gives succession and continuity to all the phenomena of our being."

On the psychological phenomena of sleep, though so



interesting and curious, as in dreaming, somnambulism, and the vagaries of the imagination, when the controlling influence of the will is suspended, it is not my intention to dwell; but in certain diseases, the character of the sleep affords us an indication of great practical importance, graduating, as it does at times, into coma. In cases, indeed, of moderate compression, from effusion of blood upon the surface of the brain, it often is difficult to recognise any other distinction between sound sleep and coma, beyond that of the duration and persistence of the state; though, from the difference of the inducing cause, other variations must necessarily exist. Dr. Wilson Philip held that no sleep from which we cannot be readily and easily aroused is healthy. Now, it is true, that sleep may be too profound, and merge into coma; but then it may be too light to be refreshing. Its relations to affections of the brain are most important; and in some other functional derangements of the system, and especially in disease of the kidneys, we are aware of the importance and practical value of the indications which it furnishes to us.

As to its proximate cause, the most recent contribution on this subject is in a valuable essay on the Physiology of Sleep, by my friend Mr. A. E. Durham, read before the meeting at Oxford of the British Association, and published in *Guy's Hospital Reports* for 1860. From some well devised and carefully conducted experiments upon some of the lower animals, Mr. Durham had the opportunity of observing the condition of the cerebral circulation, both in their sleeping and waking states. He has proved to demonstration that venous pressure is not the cause of normal sleep; for during sleep the cerebral veins are not distended, and venous pressure produces other phenomena than those of sleep. His experiments establish the important fact that "there are two distinct normal conditions of the cerebral circulation; the one corresponding to high functional activity in the brain, the other to its repose. The one may be termed the circulation of function; the other, the cir-



ulation of nutrition. In the circulation of function, the quantity of the blood is greater, and the rapidity of its motion increased; in the circulation of nutrition, the quantity of the blood, and the rapidity of its motion are both diminished." "During sleep the brain is in a comparatively bloodless condition; and the blood moves through the encephalic vessels with diminished rapidity. This condition, from physical causes, is the one most favourable to the nutrition of brain-tissue; and, on the other hand, the condition which prevails during waking, and associated with mental activity, is that which is most favourable to the oxidation of the brain-substance, and to various changes in its chemical constitution." He maintains that oxidation of the brain-substance is concomitant with, and directly proportionate to, the development of the cerebral activity. To the important question, "what is the proximate cause of the temporary suspension of cerebral activity which follows each period of healthy mental exercise?" he suggests, in reply, the recognised analogical fact, that the products of chemical action interfere with the continuance of the action by which they are produced.

Sleep is the period of the brain's repose, giving opportunity for the nutrition of the brain-substance, as well as for the nutrition of other parts of the bodily system.

Upwards of forty years ago, Dr. Carmichael of Dublin published in *Tilloch's Philosophical Magazine* a valuable essay on Dreaming, including conjectures on the proximate cause of sleep, which is well worthy of a careful consideration. He says truly: "We cannot reflect on the nature of sleep, without being satisfied that it involves some important vital process, so indispensable as to be of daily occurrence, and of such general influence as to engage every part of the frame, but particularly the organs of thinking, sensation, and voluntary motion. If we ask ourselves, what process is of prime necessity to these organs, we can answer without difficulty, that which repairs their waste, and preserves their consist-



ence and vigour—the process of assimilation. Whatever may be the result of its operation in the bones and muscles, and the other coarser parts of the body, we can scarcely reflect on its action upon the delicate texture of the brain and nerves, without perceiving that it must be accompanied by powerful and overwhelming effects. These are the fragile instruments of thought, feeling, and motion; and no wonder, that a change which affects these very structures should be attended with a cessation of their functions, and the actual paralysis of sleep. We may clearly comprehend the different, yet strangely analogous, modes of action of vegetable poisons, intense cold, external injuries, and the assimilating process on the brain. They all render it comatose, torpid, and paralysed; but none of them, except the last, are endowed with any but destructive powers. The assimilating process alone can renovate and restore the drained and exhausted organ; and even though the effect of its activity is to sink us in stupefaction, that very stupefaction is natural, refreshing, and vivifying sleep." (*Tilloch's Philosophical Magazine* for 1829, p. 257, vol. liv.)

*Loss of Speech or the Power of Utterance.* Among the abnormal phenomena of the intellectual consciousness, we may now turn from the noisy ravings of delirium, in febrile and other diseases, to the consideration of an opposite state, depending upon other and varying pathological conditions—that of dumb silence; not, however, of insensibility and coma, in which the phenomena of life are reduced to a mere series of automatic movements; but to that which results from the loss of articulate speech—a lack of the power to give utterance to the thoughts, feelings, and emotions of the mind. Now, the loss of speech or power of utterance may arise from a variety of causes, and may be quite independent of any cerebral lesion, or implication of the intellectual consciousness. For, aphonia is not unfrequently the consequence of disease of the larynx or vocal organs; at other times, the loss



of voice is occasioned by pressure upon, or change of structure in, the lingual and glosso-pharyngeal nerves; either at their origin or in their course. From the close and intimate connection between the corpora olivaria and the nuclei of the hypoglossal nerves, Schröder van der Kolk has been led to infer that the former are auxiliary ganglia to the latter, in the production of certain combinations of movements in the acts of articulation and speech. "For," says he, "speech and the articulation of words require such a multitude of peculiar motions of the tongue, and such an infinite number of varying combinations of its muscular movements, that it cannot appear strange that two auxiliary ganglia should be required for the performance of these functions." After stating his conviction that all motor nerves take their origin from certain groups of multipolar ganglionic cells, he goes on to observe, "that he is acquainted with no other part of the extra spinal cord or brain where the multipolar ganglionic cells are so densely accumulated as in the nuclei of the hypoglossal nerves"; and then adduces pathological evidence in support of his opinion that the corpora olivaria are the organs for the articulation of the voice. But he by no means considers the corpora olivaria as the organs through which the will directly acts; for these he admits to be, chiefly, the corpora striata, any injury to which is invariably followed by paralysis; and he adds that, "when the organs of the will are disturbed, the paralysis of the tongue and of the neighbouring parts renders the utterance of words wholly impossible."

During the past year, an interesting case came under my notice. The patient was an intelligent man, a law-stationer; of temperate, regular, but sedentary habits, aged 61 years when he died in September last. In April 1858, he had an apoplectic seizure, which left him, for some time, hemiplegic on the right side; but from this he gradually, and to all appearance completely, recovered; so that, in the course of five or six months, he was again actively engaged in his business. In May



1859, he had a second attack ; but this left permanent effects behind it. He never properly recovered the use of his arm or leg. He could sign his name, and get about the house with assistance. He experienced some difficulty in deglutition, and there was an impediment in his speech. A third seizure in June last year left him utterly helpless as to his arm and leg, unable to articulate a word distinctly, or so as to be understood, and only able to swallow liquids, and these with difficulty, threatening, at times, suffocation. Still to the last he was sensible, and easily moved to tears, and suffered from emotional excitement. No *post mortem* examination was permitted, which I much regretted. As there had been three distinct seizures, it would have been interesting to have noted the records which they had left behind them ; and to have seen how far the corpora olivaria were implicated.

In another case, a young lady, of a delicate constitution, who had suffered from repeated rheumatic attacks, and who had, in consequence, disease of the mitral valves, under a severe attack of bronchitis, became suddenly hemiplegic and speechless. She soon recovered consciousness and sensibility, so that she perfectly understood whatever was said to her, and noticed all that was going on about her ; but she was hemiplegic and without power of utterance. A few days afterwards, and at the time quite unexpectedly and suddenly, she expired.

Here, too, no examination was permitted. But, from the suddenness of the death, and of the loss of speech, how interesting and instructive it would have been to have seen the actual condition of the cerebral arteries, and the *locale* of the rupture, in reference to the corpora olivaria and striata ; and to the observations and researches of Dr. Kirkes. How often, in private practice, I cannot help remarking, does it happen that we are denied the satisfaction of a *post mortem* examination in cases where we have had the opportunity of carefully watching the patients during life, and of noting every



appreciable change in their symptoms, so that they have, in consequence, become invested with an interest in our minds, which nothing short of a knowledge of the pathological conditions can fully satisfy. In private practice, we have neither the appliances nor opportunities for pathological investigation, which the physicians and surgeons of our hospitals can command and do possess; but still it is gratifying, and it ought to be encouraging, to reflect what may be done, and what an Abercrombie actually did accomplish single-handed in the walks of private practice.

Now, in all cases of loss of speech or the power of utterance, which are of cerebral origin, there is involved functional derangement or structural change in the nervous apparatus of the intellectual consciousness; for "perfect speech—that is, the power of expressing our thoughts in suitable language—depends upon the due relation between the centres of volition and of intellectual action." (Dr. Todd.) I had a striking illustration of this, in the young woman's case to which I have had occasion so frequently to refer; for she continued speechless so long as her perceptive and intellectual faculties were in abeyance. It was in a moment of strong emotional excitement that her power of utterance was suddenly regained. The sight of her mother in excessive anguish and distress forced open the flood-gates of her inner sensibility, volition was aroused, and the barrier was swept away which had so long kept her spell-bound in silence; like a disruptive discharge of the nervous force, she suddenly, though hesitatingly, ejaculated, W-h-at's the matter?

The faculty of speech, as an instrument of thought, is an attribute of, and, in consequence, must necessarily have its seat in "the nervous apparatus of the intellectual consciousness." A special cerebral organ has been assigned to this faculty. Gall was the first to locate it, in the anterior lobes of the brain, and his allocation has found advocates in many distinguished physiologists, Serres, Paul, Grandchamp, Belhomme, Bouillard, and



others. My own pathological investigations have led me to espouse it. It may be disputed, whether there is a special cerebral organ for articulate speech; but there can be none about language being, as an instrument of thought, an attribute of the nervous apparatus of the intellectual consciousness; and hence, its connection and close association with the anterior lobes of the brain, and with the transverse series of convolutions.

I brought this subject under the notice of the Royal Medical and Chirurgical Society, in a paper on a Case of Hemiplegia with cerebral softening, and in which loss of speech was a prominent symptom; read June 25th, 1850, and published in the *Lancet* Oct. 22nd and Nov. 2nd of the same year. The case was that of a lady aged 66 years, who had suffered from three attacks of apoplexy. The first, which occurred in Oct. 1844, seemed "congestive" in its character, and passed away without any other permanent consequence than this, that she continually used one word for another, not applying appropriate names to the things or persons she desired to signify. The second attack, in May 1847, left her permanently hemiplegic on the right side, the power of voluntary motion being completely abolished; and but little sensibility being preserved, though reflex movements could be excited in the lower extremity by tickling the sole of the foot. For the rest of her life, she remained altogether incapable of speech, not being able to say yes or no in reply to a simple question, and never getting beyond the utterance of the monosyllable *dat-dat*; and yet all her senses were intact; the motions of the tongue were free, and there was no difficulty of deglutition. She did not seem to have lost any of her intellectual powers; but her emotional sensibility was certainly increased. Her general health continued good up to the time of the last fatal seizure, which occurred in April 1850, without any premonitory symptoms.

At the *post mortem* examination, the upper two-thirds of the anterior lobe of the left hemisphere was found to be in a state of complete destruction, with colourless



softening; while the middle and posterior lobes were sound and healthy; but the greatest change was in the ganglionic masses at their base, and in the commissural structure. The upper half of the corpus striatum on the left side was destroyed by softening; the optic thalamus was shrunken to less than half its natural size, its upper surface being greatly wasted; while, on the right side, a small and recent apoplectic clot was seen on the upper and anterior surface of the corpus striatum, the whole of the upper half of which was in a state of *ramollissement*; while on the upper surface of the thalamus also were noticed some indications of white softening. The corpus callosum was destroyed, except at its anterior and inferior reflexion, and the anterior commissure and fornix were gone. Microscopic examination of the softened parts presented an abundance of compound cells and of fatty matter with capillaries. Now, in this case, it was quite evident that, with the disorganisation of the left anterior lobe, its functional power was entirely abolished; and, although the right hemisphere was healthy, and there was every evidence, from the history of the case, that it maintained and exercised a functional power, as a centre of intellectual action, still the volitional agency was wanting to give utterance to the passing thought, for the corpus striatum on the same side was not in its integrity.

In this paper, I observed, "It is never to be forgotten that the power of giving utterance to our thoughts and ideas, in appropriate language, depends upon the due relation, between the centres of intellectual action, and the encephalic motor centres through which the volitional power is exercised in speech. Thoughts and ideas may be moulded for expression in the seat of intellectual action; but the due agency of the volitional power, to give them utterance, requires the integrity of the commissural fibres, and of the motor centres, through which the volitional impulses operate in speech."

The imperfect power of articulation, to which we have our attention so constantly called, in hemiplegic patients,



there can be little doubt is most generally due to some structural lesion in the motor centres of volition, that is in the corpora striata, or among their commissural fan-like fibres which radiate from them to the cerebral hemispheres.

There is not, I believe, a single instance upon record, in which the power of utterance was retained intact, however sound and healthy the great hemispherical ganglia may have been found to be, where both the corpora striata were diseased. And thus, the conflicting evidence which has been adduced as to the seat of the faculty of speech admits of a satisfactory explanation; for, as we have seen, the loss of speech, when of cerebral origin, may alike result from disease of the anterior lobes; that is, in the nervous apparatus of the intellectual consciousness; or of the corpora striata; or their commissural radiating fibres, the motor centres of volition.

I could give many illustrative instances of the sudden loss or perversion of speech which have come under my notice, as the effects of shock to the nervous system, from a want of co-ordination in the action of the nervous centres of intellectual action, and of emotion or volition; in other words, an interruption to the pre-established harmony which should obtain between the subjective intelligence and the organs of speech.

I have lately had under my care, a married woman of the nervous temperament, and great emotional susceptibility, the mother of a large family; and who, during the latter months of her last pregnancy, met with a sudden and painful nervous shock, the effect of which was to deprive her of the power of speech, and to produce giddiness and confusion of mind. When I first saw her, some hours afterwards, she had recovered the power of articulation, and regained the integrity of her reasoning faculties; she knew every one about her, and was perfectly sensible to what was going on around her; but had lost the memory of the names of those about her, and of words. She could not recollect or give the name of the commonest article of household furniture,



as a chair or table, etc.; and, sensible of her inability, she frequently burst into tears. This state continued for some time after her *accouchement*. One evening, after having heard a stirring sermon from Dr. Cumming, which had greatly aroused her emotional sensibility, she was seized, on getting home, with a severe and well marked epileptic fit, of long duration, which proved salutary; for since this disruptive discharge of the nervous force, there has been a marked improvement, both mental and bodily, in her general health.

To another instance, of which I have given an account in my *Essay on Physiological Psychology*, I would briefly advert, as the lady died afterwards in an apoplectic seizure; but no *post mortem* examination could be obtained. In her case, a day or two after the seizure in the street, the perceptive and thinking powers were regained. She knew where she was, and all the family about her, as well as myself; but the memory of words was for some time in abeyance. She could not recollect the name even of her own daughter, who was constantly with her. She had a perfect recollection of past circumstances and events up to the time of her seizure; understood whatever was said to her; felt deeply conscious of her own inability to recollect names and common words when talking, and gave expression, in consequence, to emotional distress or feeling in tears. As I have elsewhere observed, "in this case, it may be fairly inferred, that the sudden shock to the nervous system in the first instance deranged the organic actions and normal correlations of the emotional and intellectual centres. The delirium was of short continuance, coherence of mind was soon regained; and the powers of thinking and reasoning were gradually though slowly restored." But there long remained—indeed, up to the time of her death—a manifest dislocation of the memory of words, to use an expressive term of Sir Henry Holland, on the slightest emotional excitement or mental agitation. Such attacks are but too often the precursors of apoplexy, or of serious disease of the brain. She died of an apoplectic seizure.



*The Phenomena of Memory in Disease.* Memory, as the associate of ideation and volition, is an attribute both of the perceptive and of the intellectual consciousness; for, as I have already observed, wherever the hemispherical ganglia exist, and in however rudimentary a state of development, there we invariably have unmistakable evidence of the manifestations of memory. Thus, it is the common inheritance of the lower animals; of the whole of the vertebrate subkingdom, as well as of man; and however inscrutable its phenomena, they are evidently dependent upon organic instrumentality for their manifestation. But in the consideration of this subject, we must never forget the distinction that exists between simple memory, as displayed by the lower animals as well as by man, and which is an attribute of the perceptive consciousness, and the faculty of recollection which man alone possesses—that power of the intellect of reviving, recalling, and combining, by an act of volition or the will, previous mental conceptions, trains of thought and states of consciousness; for this is an attribute of the intellectual consciousness, and like speech, the sole prerogative of man. “There is no reason to believe that any animal, however high in the scale of intelligence, exercises or possesses the recollective faculty of the will.” (Sir H. Holland.)

How we can, by an act of volition, revive past states of consciousness and trains of thought, or how it can happen, as in cases of injury to the brain, and in fevers, that the knowledge, for instance, of a language, apparently obliterated and long forgotten, should be suddenly recalled, can only admit of a satisfactory explication on the assumption, that our mental possessions, when duly registered, are, like matter and the physical forces, indestructible. Dr. McCosh has well observed:—“What is true of material particles is no less true of the physical forces. Man cannot create a physical force, and as little can he destroy it. If it be in a statical state, he may bring it forth into a dynamical one; if it be in activity, he may contrive to counteract it; but he cannot create



it, on the one hand, nor put it out of existence, on the other. The force which came from the sun to the planets in the form of heat, in the geological age of the coal formation, is not lost; it was received by the vegetable organisms; it was laid up in the strata of the earth; and it is ready to burst forth, on the needful conditions being supplied in fire and flame, and to be a source of mechanical force in steam." He then asks: "If no material particle is ever lost, and no physical force lost, is it consistent with the analogy of nature to suppose that mental force is lost?"\* (Dr. McCosh on the *Intuitions of the Mind*.)

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\* On the permanent impression of our words and actions on the globe we inhabit, Mr. Babbage observes:—"The pulsations of the air once set in motion by the human voice cease not to exist with the sounds to which they gave rise. The waves of air thus raised, perambulate the earth and the ocean's surface, and in less than twenty-four hours every atom of its atmosphere takes up the altered movement due to that infinitesimal portion of the primitive motion, which has been conveyed to it through countless channels, and which must continue to influence its path throughout its future existence. Thus considered, what a strange chaos is the wide atmosphere we breathe! Every atom, impressed with good and with ill, retains at once the motions which philosophers and sages have imparted to it, mixed and combined in ten thousand ways with all that is worthless and base. The air itself is one vast library, on whose pages are for ever written all that man has ever said, or woman whispered. There, in their mutable but unerring characters, mixed with earliest as well as with the latest sighs of mortality, stand for ever recorded, vows unredeemed, promises unfulfilled, perpetuating, in the united movements of each particle, the testimony of man's changeful will.

"No motion impressed by natural causes, or by human agency, is ever obliterated; the furrow which is left, indeed, on the surface of the disturbed ocean, by every canoe and vessel, is instantly filled up by the closing waters; but they draw often those other and larger portions of the surrounding element, and these again, once moved, communicate motion to others in endless succession. The solid substance of the globe itself, whether we regard the minutest movement of the soft clay which receives its impression from the foot of animals, or the concussion arising from the fall of mountains rent by earthquakes, equally communicates and retains, through all its countless atoms, their apportioned shares of the motions so impressed. Whilst the atmosphere we breathe is the ever living witness of the sentiments we have uttered, the waters and the more solid materials of the globe bear equally enduring testimony of the acts we have committed. If the Almighty stamped on the brow of the earliest murderer the indelible and visible mark of his guilt, he has also established laws by which every succeeding criminal is not less irrevocably chained to the testimony of his crime; for every atom of his mortal frame, through whatever changes its severed particles may migrate, will still retain some movement derived from



The assimilative power of the blood is not less mysterious and inscrutable to us, than the permanent and indestructible character of our psychical possessions. How, for instance, the vaccine virus, introduced into the blood in infancy, should produce such an abiding and organic change in its constitution and character, as to exercise a protective influence against small pox in after life, and while the blood is undergoing and has undergone countless changes and modifications. "The stamp once impressed by an inoculable disease is retained; the blood, by its non-formative power, exactly assimilating to itself, its altered self, the materials derived from the food. The tissues once affected, may, and often do in such cases, recover; they have gained their right or perfect composition; but the blood, by assimilation, still retains its taint, though it may have in it not one of the particles on which the taint first passed; and, hence, after many years of seeming health, the disease may break out again, from the blood, and affect a part which was never before diseased. In all such cases, we have proofs of the surpassing precision of the formative process—a precision so exact that, as we may say, a mark once made upon a particle of blood or tissue is not for years effaced from its successors." (Paget's *Surgical Pathology*.)

"But it has been asked," says Mr. Paget, "how can

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that very muscular effort by which the crime itself was perpetrated. The soul of the negro, whose fettered body, surviving the living charnel-house of his infected prison, was thrown into the sea to lighten the ship, that his christian master might escape the limited justice at length assigned by civilised man to crimes, whose profit had long gilded their atrocity—will need, at the last great day of human account, no living witness of his earthly agony. When man and all his race shall have disappeared from the face of our planet, ask every particle of air still floating over the unpeopled earth, and it will record the cruel mandate of the tyrant. Interrogate every wave which breaks unimpeded on ten thousand desolate shores, and it will give evidence of the last gurgle of the waters which closed over the head of the dying victim; confront the murderer with every corporeal atom of his immolated slave, and in its still quivering movements he will read the prophet's denunciation of the prophet-king—'And Nathan said unto David: Thou art the man.'" (*The Ninth Bridgewater Treatise*, by Chas. Babbage, Esq., pages 108 to 117.)



the brain be the organ of memory, when you suppose its substance to be ever changing? Or, how is it that your assumed nutritive change of all the particles of the brain is not destructive of all memory and knowledge of sensuous things, as the sudden destruction by some great agency is?" And his answer is: "Because of the exactness of assimilation accomplished in the formative process; the effect once produced by an impression upon the brain, whether in perception or in intellectual act, is fixed and there retained; because the part, be it what it may, which has been thereby changed, is exactly represented in the part which, in the course of nutrition, succeeds to it. Thus, in the recollection of sensuous things, the mind refers to a brain in which are retained the effects, or rather the likenesses of changes that past impressions and intellectual acts had made. As, in some way, passing far our knowledge, the mind perceived and took cognisance of the change made by the first impression of an object acting through the sense organs on the brain, so afterwards it perceives and recognises the likeness of that change in the parts inserted in the process of nutrition."

An able critic has sagaciously asked: "Who shall tell, that it may not yet be shown that the memory is a material garner, in which are stored, as an actual presence, the images it recalls? It is not the eye that sees, or the microscope, or any other optical instrument. These merely transmit the representation which is to be received elsewhere. The eye may be perfect in its structure; but some pressure behind, on the optic nerve, or on the sensorium, prevents the conveyance or the perception of the image, and there is no vision; for it is clear that, to produce this, the picture must be carried in its integrity to the point at which it becomes cognisable. The skill of the photographer has rendered us familiar with pictures, in which considerable groups of figures, with their adjuncts, are so inconceivably minute, that they are only visible, yet then distinctly visible, when under a powerful microscope. Who then shall say



that sees these triumphs of art, and knows the greater wonders of nature, that memory does not work through the impression of an actual photograph inscribed and retained within the brain; as if it were but a part of the very limit of our faculties, that we discover nothing in art which has not previously existed in nature? We possess no analogies for similar impressions from other sources; but there is nothing contradictory in the idea that sound, more turbulent in its movements than light, may also, in its own way, impress its phonograph or phonotype on the brain, and so of the other senses. To recal a scene then, or a set of features, or a landscape, or a strain of music, may be merely to direct the faculty which first perceived, on that point where the impression was first perceptible, and where it has since remained; and if age bring back the recollections of youth better than those of yesterday, it is but because the undeteriorated apparatus sufficed better, at the one period than at the other, to transmit and to preserve the necessary impressions, which the mind is otherwise still sound enough to appreciate." He concludes: "When we stand in wonder before that ineffable power which has joined matter to intelligence, and which has made it conscious not only of self-existence, but of other existences, so as to enable it to act upon these through observation and reason, we shall be ready to own with Tillotson, that a perfect knowledge of nature is nowhere to be found, but in the Author of it; and that no less wisdom and understanding than that which made the world, and contrived the vast and regular frame of existence, can thoroughly understand the philosophy of it, and comprehend so vast a design." (*British and Foreign Medico-Chir. Review*, vol. XIX, p. 103.)

The young woman's case to which I have so often alluded has an important bearing in reference to memory and the imperishable nature of our mental acquisitions. The first fit which she had after she had been dragged out of the river left her deprived of the power of speech and hearing, and of the senses of taste and



smell; with her mental faculties quite benumbed or paralysed, her only medium of communication with the external world being through sight and feeling. All her former knowledge and past experience appeared to be obliterated, or, at least, for the time to be buried in oblivion; with one exception—a feeling of fright or dread in connexion with water. But after a time, as I have detailed in the narrative, she began again *de novo*, like a child, to acquire knowledge and to register experience. She made some progress while in this abnormal state; but after the second fit, which occurred more than twelve months afterwards, and which to her proved critical and sanitary, it was found that, when the insensibility had passed off, she was no longer spell-bound; the veil of oblivion was withdrawn; and, as if arousing from a sleep of twelve months duration, she awoke in the possession of her natural faculties and former knowledge, but without the slightest remembrance of anything which had taken place during the interval from the invasion of the first fit to her awaking up from the second.

Dr. Forbes Winslow, in his chapters "On the Morbid Phenomena of Memory", in his work *On Obscure Diseases of the Mind and Brain*, has collected together a mass of curious information, highly interesting to the medical practitioner; but I must content myself by briefly adverting to the influence which some of the ordinary forms of disease, coming daily under our notice in general practice, have in impairing the memory or in destroying its integrity. Memory being an attribute both of the perception and of the intellectual consciousness, I can readily understand how it is, as all metaphysicians have agreed, that we remember qualities better than we remember names; from the fact that the one is an intuitive experience and the other an intellectual act.

The morbid phenomena of memory, as might be expected, are most marked and striking in cerebral diseases—for instance, as in *ramollissement* of the superficies



of the brain; for the hemispherical ganglia constitute the nervous apparatus both of the perception and intellectual consciousness. "A certain vague wandering and difficulty of recollection often occur as the first indications of this disease coming on; while its progress is attended with increasing incapacity either for receiving new impressions or recalling and combining those of earlier date. Such cases of slowly progressive cerebral disease are well worthy of close attention, from the sort of analysis they afford of mental acts and functions, not equally separable in the healthy state." (Sir H. Holland.) In all cases of pressure on the cerebral substance, whether as an accident from depression of bone, from local extravasation of blood on the superficies, or general congestion of the cerebral vessels, we almost invariably find the memory affected. Apoplectic seizures have often, as precursory warnings, singular lapses of memory; and these, when present, ought always to arrest our attention. On the other hand, anæmic conditions and a feeble circulation through the brain are often accompanied with disturbance and impairment of the memory. Such, too, are the effects of exhausting diseases, which may leave it long enfeebled, though not permanently affected and weakened.

With the effects of paralysis and epilepsy on the memory we are all familiar, though the phenomena of the former are of a very varying character, and among some of the most curious that come under our notice. "Strange infirmities of the memory are associated with cerebral disease, and justly to be regarded among its symptoms; huge blanks in the backward gaze; fitful suspensions of the remembering power; partial glimpses of the past; resurrections of thoughts long buried in oblivion! Even in its natural decay from age, there are curious things to be noted. Recent events are retained with difficulty and soon forgotten, while those of older date are easily and accurately recalled; as if the effort of attention stamped characters upon the material fabric which are deep and lasting in the youthful brain, faint



and soon effaced on the aged. But disease may revive things long forgotten; a language long unspoken and unthought on; or blot out entirely all traces of definite portions of time gone by." (Dr. Watson, *Practice of Physic*.) "Sudden, transient, and paroxysmal attacks of the loss of memory ought to be regarded as important symptoms, in relation to a questionable state of the brain. These temporary and apparently trifling conditions of impaired retention are often the preludes to serious manifestations of cerebral disease—the dark and threatening clouds that occasionally envelope, obscure, and often eclipse the mind, previously to fatal attacks of paralysis, softening, apoplexy, and insanity." (Dr. Forbes Winslow, *On Obscure Diseases*.)

The other morbid phenomena of the intellectual consciousness—those of volition or the will, the imagination, and the reasoning and reflecting powers—are not within the scope of my object in these papers, though highly interesting to the medical practitioner, and, of all others, the most so to the psychological inquirer. They belong to the category of mental diseases, and the best information respecting them will be found in such works as Dr. Conolly's valuable treatise *On the Indications of Insanity*. The delirium of fever may be considered as the insanity of disease; and I have already observed how difficult, if not impossible, it is to distinguish the morbid phenomena of true delirium tremens from certain recognised forms of insanity.

CONCLUSION. In closing these papers on medical psychology, written at spare moments, amidst the distractions of an active medical practice, I would briefly observe that my object will be realised if they should act as a stimulus to thought, and arouse the attention of my professional brethren in general practice to the importance of the psychological phenomena or symptoms of disease; if they conduce to the study of the phenomena of the mental states in health and disease, and lead to the investigation and specialisation of the ner-



vous apparatus or organic instrumentality through which these phenomena are manifested in this life. My own meditations and opinions I have freely and candidly put forth; nor have I hesitated—but never, I trust, without due acknowledgment—to quote from and to give the opinions of others. If mistaken in anything I have advanced, I am open to conviction; always feeling as thankful for being convinced of an error as I am happy in embracing a truth.



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