

remedy for psoriasis, I would add that arsenious acid seems to be the most active form as well as the one best borne by the stomach, at least in those cases where the disease resists a reasonable trial of small doses.

Description of the Plate.—I am much indebted to my friend, Mr John Grant, for the care with which he has reproduced two of the specimens exhibited to the Society. The upper figure represents a vertical section of skin, magnified 300 diameters, taken from a patch of psoriasis of long standing; it shows also the mode in which the processes of rete Malpighi invade the cutis. MP stands for Malpighian prolongations, C corium, and L leucocytes. Two wedge-shaped prolongations are seen in the centre making their way down; but they have not reached their full size, as can be determined by comparing the depth they have attained with that of two larger ones, the sides of which appear on the right and left of the figure, one immediately above L. The extent to which the fine meshwork of the cutis vera is opened out and infiltrated with leucocytes between these processes, is well shown. It was this rarefied cutis tissue which was mistaken by Neumann for an increase in the papillæ; and he represents the free surface as rising into a prominence, in one of his figures, to a much higher degree than I have seen. Below each prolongation is a mass of leucocytes; that on the right has an enlarged and dilated bloodvessel in its centre. The scales are not drawn, as they invariably fall off during the preparation of the section.

The lower figure shows a small part of one of the prolongations at its deepest portion, magnified 800 diameters, as it appears when viewed with one of R. & J. Beck's new $\frac{1}{16}$ inch immersion lenses, and Hartnack's No. 3 ocular. C here again stands for corium, B for the basement membrane on which the columnar cells rest, and P the denticulations sent up by it between the cells, and closely resembling those in the same situation next the cutis in the frog. The prickle cells of the second row come out well with this power.

Part Second.

REVIEWS.

Visions: A Study of False Sight (Pseudopia). By EDWARD H. CLARKE, M.D. *With an Introductory and Memorial Sketch.* By OLIVER WENDELL HOLMES, M.D. Boston: Houghton, Osgood, and Co. The Riverside Press, Cambridge: 1878. Pp. 315.

WE have perused this book with much interest and instruction. It is invested with a special claim on our attention, over and above

its intrinsic excellence, from having been composed and written to dictation when the author was contending with a fatal disease, accompanied by intense suffering and bodily prostration. It is preceded by a well-written introductory notice by an able and attached friend, who decided wisely, we think, in recommending its publication, and undertaking the duties of editor. The essay was not quite complete when Dr Clarke died; but it cannot be regarded as fragmentary, because the principles on which the subsequent deductions rest are so clearly, cautiously, and satisfactorily laid down, that the reader might almost forecast for himself the few remaining pages that the author might have written.

We regard the book as a valuable contribution to the physiology of the nervous system in general, although that of vision is chiefly elaborated, in accordance with the task he had undertaken. The author has carefully studied and assimilated the more recent researches of Ferrier, of Dalton, of Fournier, of Wundt, Carpenter, Charcot, and others. In gathering up results he exhibits a logical and conscientious accuracy of thought, takes nothing for granted, and compares, with much fairness, the deductions of other minds with the teaching of his own large experience. The book cannot be read without advantage, being replete with well-ascertained facts, suggestive thoughts, and speculations founded upon them. We perceive that the author was evidently a man of high tone, and we can readily understand the high place which he held among his countrymen as an eminent teacher of medicine, a wise physician, and a trusted friend. He died last November in his fifty-eighth year.

We shall try to give a brief, it must be very brief, account of the essay.

After alluding to the terms in ordinary use as applicable to visions, such as hallucination, illusion, delusion, and showing that they are not sufficiently precise and apt to be employed indiscriminately, he proposes and adheres to the following terms: "The normal process of vision may be appropriately called *orthopia*, from *ὀρθός* [and *ὀπτομαι*; and false perception, or vision, *pseudopia*, from *ψεύδος* and *ὀπτομαι*. According to this nomenclature, false perception, arising from the action of the intracranial visual apparatus, would be called subjective or centric *pseudopia*; that arising from disturbance of the eye alone, *ophthalmic pseudopia*; and that produced by the presence of external objects, objective or eccentric *pseudopia*. An individual conscious of the error in his perceptions would have conscious *pseudopia*, otherwise unconscious *pseudopia*. One advantage of these terms over the common ones of hallucination, illusion, and delusion is that they indicate the precise seat of the visual apparatus, whose structural or functional disturbance causes the false perceptions. Conscious centric (or subjective) *pseudopia*; unconscious centric (or subjective) *pseudopia*; conscious eccentric (or objective) *pseudopia*; unconscious

eccentric (or objective) pseudopia; conscious retinal pseudopia; unconscious retinal pseudopia, etc.;—all indicate with tolerable precision the part from which visual derangement proceeds, and, to some extent, the character of the derangement. Another and no slight advantage is, that no traditional or preconceived notions are associated with these terms.”

A series of cases are then related which illustrate most of the physiological and pathological conditions of pseudopia, and reference is afterwards made to them by way of scientific explanation. We shall quote Case IV.; it is one of conscious centric or subjective pseudopia, and is admirably described by the lady herself. “My earliest recollections are of a life made miserable by the daily companionship of a crowd of dreadful beings, visible, I know, only to myself. Like Madame de Staël, I did not believe in ghosts, but feared them mortally. When I was about fifteen we went to Europe for two years, and the change of scene, and of constant external interest, broke up my invisible world, and I have only entered it since in times of excitement or great fatigue. Of late years, the most distinct visions have appeared only when sharp mental pain or anxiety has been added to bodily exhaustion. My sense of hearing has never deceived me, except that during my girlhood, in frequent nervous states of mind, all sounds would strike my ear discontinuously, that is, with a time-beat as sharp and rhythmical as the movement of the bâton by an orchestral conductor.

“Several years ago one of my sisters was taken ill with typhoid fever. I was not strong enough to be of any assistance in her chamber, so I undertook to finish some work which she had commenced, and became daily more and more worn out in my endeavours to carry it on. Anxiety, added to fatigue, finally brought back the old visions, which had not troubled me continuously for some years. Animals of all kinds, men, women, glaring-eyed giants, passed before or around me until I often felt as though I were surrounded by a circle of magic-lanterns, and would sometimes place the back of my chair against the wall that at least my ghosts should not keep me constantly turning as they passed behind me. One evening, feeling too tired to sit up for the latest report of my sister, which my mother brought me regularly, I went to bed leaving my door wide open, so that the gas from the adjoining entry sent a stream of light across one-half of my little chamber, leaving the rest somewhat in shadow. Soon I saw my mother walk slowly into the room and stop at the foot of the bed. I remember feeling surprised that I had not heard her footstep as she came through the passage. ‘Well?’ I said inquiringly. No answer; but she took slowly two or three steps towards the side of the bed, and stopped again. ‘What is the matter?’ I exclaimed. Still no reply; but again she moved slowly towards me. Thoroughly frightened by this ominous silence, I sprang up in bed saying, ‘Why *don't* you speak to me?’ Until then her back

had been turned to the door, but as I last spoke she turned, almost touching my arm, and the light falling on her face showed me an entire stranger. She had heavy dark hair, and her face, quite young, was pale, and though calm, very sad. Over her shoulders was a child's woollen shawl, of a small plaid not familiar to me, which she drew closely about her as though she were cold. Her right hand, which pressed the shawl against her side, was very white, and I was struck by the great beauty of its shape. The thought passed through my mind, Can she be a friend of the nurse? But *why* has she been sent so mysteriously to me? As I stared at her in speechless amazement, she fell to the floor. I instantly stooped over the side of the bed. To my consternation there was nothing to be seen! Accustomed as I was to ghosts, if there had been anything in the least shadowy about my visitor I should have suspected her tangibility; but so well defined was she, so vividly was her reality impressed upon me, that I could not believe that she had vanished. I looked into every corner, and glanced under the bed; it seemed even more credible for a moment that the floor had opened, than that my visitor had been less flesh and blood than I.

“It seems to me that the remarkable cases of nervous disturbance which you have related to me have all occurred in the evening, as did that incident which I have just described. This visitor stayed with me longer than any other of her kind that I have ever received; but, usually, the visions seen by sunlight have been the most distinct and deceptive, and have haunted me the most persistently. It was in the daytime, too, that I walked beside my own double; and on one bright afternoon that I lost my way in a country town as familiar to me as was Cambridge to your college friend.”

Dr Clarke makes a remark in connexion with this case which may be noted. “The early appearance of the hallucinations indicates probably some congenital cerebral condition which favoured their manifestation. If such be the fact, it raises a question as to how far the brain in childhood is more susceptible than in adult life to subjective impressions, and consequent hallucination and delusion. The screaming and strange terrors, and frightened looks and actions, which some children exhibit when there is no apparent cause for terror or alarm, may sometimes result from cerebral processes, which surround them with invisible objects of horror and distress.”

In expounding the physiology of vision with the view of explaining the various forms of pseudopia, we must confine ourselves almost entirely to the *results* of inquiry, passing over the elaborate statement of anatomical facts and the chain of reasoning by which they are reached. The apparatus of human vision consists, we may say, of five organs or sets of organs closely connected and in intimate communication with each other. (1) The eye

with its iris, lenses, retina, and other structures; (2) the tubercula quadrigemina and associated nerves; (3) the cerebral centres of vision in the hemispheres, probably the angular gyri; (4) the gray matter of the frontal convolutions; (5) the connecting nerves of communication. Each portion of this apparatus performs a special function. Each is supposed to do its own part honestly, that is, so to speak, never to send a report to a station above, which it has not received from below; and this is very rarely done. Nevertheless, in disease, disturbed by drugs, or modified by the brain itself, confusion sometimes occurs, untrustworthy reports reach headquarters—pseudopia is the result.

Let us consider rapidly the various portions of the complicated and delicate apparatus.

(1.) *The Eye*.—Light, whatever it may be in its essence, is the stimulus or force which sets the visual machinery in motion. Without it, in the normal condition of the system, the apparatus cannot work; but we shall see, farther on, that there are abnormal conditions of the brain, which can make the other portions of the apparatus of vision perform their functions, without its agency, and without the presence of extra-cranial objects. The eye performs a purely mechanical or automatical task, in which consciousness takes no part, and over which volition has no control.

(2.) *Functions of the Tubercula Quadrigemina*.—"Physiology teaches that the functions of this part may be divided into four classes: those connected with the muscular apparatus of the eye; those connected with the muscular apparatus of the whole body, and particularly with the apparatus of locomotion and equilibration; those remotely connected with emotion and intellection; those connected directly with the sense of sight." "When a sempstress undertakes to thread a needle, the pupils of her eyes are adjusted to the surrounding light, her eyeballs to the appropriate axis of vision, the position of her head to the requirements of her eyeballs, and the movements of her arms and fingers to the act of entering the thread into the eye of the needle." The experiments of physiologists justify the assertion, that the optic tubercles are not only essential to vision and to irido-ocular motion, but that they form an essential part of the central mechanism, by which visual impressions are co-ordinated with equilibrium, locomotion, and all muscular effort requiring light for its best results." But the most important function of the *corpora quadrigemina* remains to be mentioned. "Visual impressions first come within the sphere of consciousness when they reach the *tubercula quadrigemina*. Then they are first perceived by the eye. The eye, with its lenses, membranes, tubes, and cells, silently and unconsciously performs the task of collecting visual data, which data the optic nerve with equal unconsciousness transmits to the tubercles. Arrived at that point they are recognised by consciousness." The *corpora quadrigemina* are ganglia of the nervous apparatus, and resemble in their construction and

function other ganglia. They receive, and, so to speak, decipher messages from one direction (from the eye), and despatch corresponding messages in another direction. Normally, no message is ever despatched, say to an upper station, except in response to a message from the lower, viz., the eye. In certain abnormal conditions, however, it is possible for the ganglion to act spontaneously and send an order without having received one. We see the bearing of this on pseudopia. The *corpora quadrigemina* may be regarded "as ganglionic workshops placed between the eye and the hemispheres, and charged with the functions which have been described. Their apparatus, like that of other ganglia, consists of cells, fibres, bloodvessels, and connective tissue, enclosed by a protecting membrane."

The following conclusions are considered trustworthy by the author:—

"1. The *tubercula quadrigemina* are a visual centre, charged with the office of receiving visual impressions from the eye, and of forwarding them when received to certain motor centres and to the hemispheres. 2. The visual impressions received by the *tubercula quadrigemina* are not physically the same as those made upon the retina of the eye, but are the result of a stimulus, which, propagated along the optic nerve, produces a peculiar molecular action in the tubercles. 3. Every object, colour, and grouping of objects, capable of affecting the eye, produces in the *tubercula quadrigemina* a definite sort of chemical, mechanical, or thermal change, which is the hieroglyphic or cipher of that object, colour, or grouping, and is the representative of no other object, colour, or grouping. 4. The *tubercula quadrigemina* co-ordinate sight with irido-ocular movements, and, aided by the *optic thalami*, with all muscular movements, whether of locomotion or otherwise, for the perfect and harmonious performance of which sight is necessary. 5. If the *tubercula quadrigemina* are separated from the hemispheres by the destruction of the latter, or by interrupting the communication between these two regions, the tubercles are still capable of performing their functions independently; and, conversely, if they are destroyed, the hemispheres remaining uninjured, blindness, loss of irido-ocular co-ordination, and imperfect co-ordination of the general muscular system result. 6. Simple perception of light and of visible objects is a function of the *tubercula quadrigemina*, but is perception without memory, intellection, or volition—without any recognition of the character or relations of the objects seen. 7. The *tubercula quadrigemina* are essential to the process of vision, but are not centres of conscious vision."

(3.) "*Visual centre of the hemispheres—Angular Gyrus—Pli Courbe.*—The third station on the way from the eye to the frontal lobes of the brain, from the objective world of matter to the subjective world of ideas, from the not me to the me, is the *angular gyrus*, or centre of vision in the hemispheres. Here seeing really takes place. . . . It is with the grouping of cells in the *angular*

gyrus that we see and not with our eyes." That this is the visual centre of the hemispheres has been demonstrated by two series of experimental investigations—one by destroying it, the other by stimulating it in living animals. Like the *tubercula*, the *angular gyrus* is composed of groups of corpuscles, granules of protoplasm, cells enclosing nuclei and nucleoli, interlacing nerve-fibres, blood-vessels, and connecting tissue. It is important to bear in mind that these cells of the higher nerve-centres have the power of retaining or of registering impressions. In accordance with this law or power of cerebral registration, impressions made on these cells are retained with a definiteness and permanence proportional to the frequency and intensity of the impressions. In this way the cerebral cells are modified by impressions made on them, and the modification becomes in some unknown way a part of the organization, persisting, in spite of the continual metamorphoses to which they are subjected,—and reminding one of a cicatrix on the skin, retaining its place and structure, through all changes of nutrition from childhood to old age. In this centre the *angular gyrus*—visual impressions—receive their final elaboration before being presented to the mind; and here they are registered and preserved for revival or reproduction. "Whatever report it sends up the mind accepts as true." This is justified in the vast majority of cases; but sometimes the angular gyri act independently of the external world. We see what confusion this will breed, rendering it doubtful whether the seeing be objective or subjective, orthopia or pseudopia, sights *ab extra* or *ab intra*.

(4.) *The Frontal Lobes*.—"Numerous connecting nerve-fibres unite the centres of the hemispheres with the cells of the frontal lobes, to which all visual impressions having been elaborated, classified, and carefully arranged in these centres, are immediately reported for inspection and ideation. The nerve-fibres, which connect the *angular gyri* with the frontal lobes, serve not only to bear visual messages from the former to the latter, but the reverse." "The *angular gyrus* presents the physical, and the frontal lobes give the mental side of a visual impression."

We have already seen that cell-groupings may be revived in the visual centres—the *corpora quadrigemina* and the *angular gyrus*—of external objects which are not objectively present to the eye. "When this occurs, the frontal lobes receive the same visual report which they would receive if the objects were present. The lobes are deceived into the formation of visual ideas without the presence of any objective reality. This is pseudopia."

Perception attains its highest development and enjoys its largest range in the frontal lobes of the brain. Leibnitz called it *apperception*, or perception that reflects upon itself. We can understand then that sight is intracranial, being a function of the brain, not of the eye, and that internal seeing is of two kinds—one sensory, the other ideal; one photographing, so to speak, external objects without reflecting upon them, the other receiving the

photographic impression and reflecting upon it; one normally preceding the other, but with the possibility of a reversed order.

The following case is quoted as an illustration of this physiological interchange and reinforcement of ideal and sensory intercranial pictures. It is related by Dr Abercrombie in his *Intellectual Powers*. "In the church of St Peter at Cologne, the altar-piece is a large and valuable picture by Rubens, representing the Martyrdom of the apostle. The picture having been carried away by the French in 1805, to the great regret of the inhabitants, a painter of that city undertook to make a copy of it from recollection, and succeeded in doing so in such a manner that the most delicate tints of the original are preserved with the most minute accuracy. The original painting has now been restored, but the copy is preserved along with it; and even when they are rigidly compared, it is scarcely possible to distinguish the one from the other." Dr Clarke goes on to remark: "In this case, cell-groupings representing Rubens's picture had been frequently called together in the *angular gyri* of the Cologne artist by the visual stimulus of the picture; and the impressions had been stamped into them by close and careful observation of it. Habit and association had conspired to facilitate the assembling of the same visual groups. As often as a sensory picture had been formed in the cerebral visual centres, a corresponding ideal picture was formed in the frontal lobes. Here, also, habit and association had facilitated the formation of the same cell-groupings. Each group had learned to appear simultaneously, and to listen to each other's call. When the Cologne artist wished to recall and reproduce the original painting, to which he was denied access, his will summoned his ideal picture, that is, the cell-groupings of his frontal lobes corresponding to it, which assembled with greater or less facility to the call. These, when assembled, sent down along an *efferent* nerve a notice of their gathering to the *angular gyri*. The cells of this centre, accustomed to be grouped in a form representing the desired picture, assembled automatically, and sending up a visual stimulus by an *afferent* nerve, reinforced the efforts at cell-formation of the frontal lobes. This process went on till a grouping was formed in the *angular gyri*, which was the exact hieroglyphic of Rubens's painting. He copied the picture in his brain, without the objective presence of the original work."

The latter half of the book embraces a number of points closely connected with the portion of which we have given some account; the action of drugs on the cerebrum, the effects of disease, and many illustrative cases bearing on the whole subject. But our space forbids us to enlarge. It is worth mentioning, however, in conclusion, that while the author believes he can explain most cases of pseudopia on physiological principles, he confesses that there are instances in the experience of dying persons of visions, well authenticated, which cannot be so interpreted. In this we agree with him. We cordially recommend his book for the reasons already given.