III.—*On Hemiopsy, or Half-Vision.* By Sir DAVID BREWSTER, K.H., F.R.S.

(Read 20th February 1865.)

The affection of Half-vision, or Half-blindness as it has been called, was first distinctly described by Dr WOLLASTON, in a paper “On Semidecussation of the Optic Nerves,” published in the Philosophical Transactions for 1824. “It is now more than twenty years,” he says, “since I was first affected with this peculiar state of vision, in consequence of violent exercise I had taken for two or three hours before. I suddenly found that I could see but half the face of a man whom I met, and it was the same with every object I looked at. In attempting to read the name JOHNSON over a door, I saw only SON, the commencement of the name being wholly obliterated from my view. In this instance, the loss of sight was towards my left, and was the same, whether I looked with my right eye or my left. This blindness was not so complete as to amount to absolute blackness, but was a shaded darkness, without definite outline. The complaint lasted only about a quarter of an hour.” In 1822, Dr WOLLASTON had another attack of hemiopsy, with this difference, that the blindness was to the right of the centre of vision, and he has referred to three other cases among his friends; but in these, the affection was accompanied with headache and indigestion.

In republishing Dr WOLLASTON’s paper in the “*Annales de Chimie et Physique*,”* M. ARAGO says, that he knows *four* cases of hemiopsy, and that he himself had experienced three attacks of it, followed by headache above the right eye.

In the “Cyclopædia of Practical Surgery,” published in 1841, Mr TYRRELL describes Hemiopsy as “Functional amaurosis from general disturbance.” He informs us that “he has experienced this form of amaurosis several times,” and that he has been consulted by several fellow-sufferers of both sexes. In all these cases the affection was attended with severe headache, giddiness, and gastric irritation, sometimes preceding, and sometimes following, the attack.

In the accounts which have been given of these different cases of hemiopsy, no attempt has been made to ascertain the optical condition of the eye when it is said to be half-blind, or to determine the locality and immediate cause of the complaint. Dr WOLLASTON describes the blindness as a shaded darkness without definite outline. M. ARAGO says nothing about darkness; and the insensibility of the retina, of which he speaks, must mean its insensibility to visual and not to luminous impressions. Mr TYRRELL, on the other hand, simply states, that the

* 1824, vol. xxvii. p. 109.

obscurity takes place in different portions of the retina, and varies in its extent at different times.

Having myself experienced several attacks of hemiopsy, I have been enabled to ascertain the optical condition of the retina when under its influence, and to determine the extent of the affection, and its immediate cause.

In reading the different cases of hemiopsy, we are led to infer that there is vision in one-half of the retina, and blindness in the other. But this is not the case. The blindness, or insensibility to distinct impressions, exists chiefly in a small portion of the retina to the right or left hand of the *foramen centrale*, and extends itself irregularly to other parts of the retina on the same side, in the neighbourhood of which the vision is uninjured. In some cases the upper half of the object is invisible, the part of the retina paralysed being a little below the *foramen centrale*. On some occasions, in absolute darkness, when a faint glow of light was produced by some uniform pressure upon the whole of the retina, I have observed a great number of black spots, corresponding to parts of the retina upon which no pressure was exerted.

In the case of ordinary hemiopsy, as observed by myself, there is neither darkness nor obscurity, the portion of the paper from which the letters disappear being as bright as those upon which they are seen. Now, this is a remarkable condition of the retina. While it is sensible to luminous impressions, it is insensible to the lines and shades of the pictures which it receives of external objects; or, in other words, the retina is in certain parts of it in such a state that the light which falls upon it is irradiated, or passes into the dark lines or shades of the pictures upon it, and obliterates them. This irradiation exists to a small degree, even when the vision is perfect at the *foramen centrale*, and it may be produced artificially in a sound eye, on parts of the retina remote from the foramen, and as completely, though temporarily, as in hemiopsy. In order to prove this, we have only to look obliquely at a narrow strip of paper placed upon a green cloth, that is, to fix the eye upon a point a little distant from the strip of paper. After a short time the strip of paper will disappear partially or wholly, and the space which it occupied will be green, or the colour of the ground upon which it is laid.*

This temporary insensibility of the retina in the part of it covered by the picture of the strip of paper, or its inability to maintain constant vision of it, can arise only from its being paralysed by the continued action of light, an effect not likely to be produced, and never observed, in the ordinary use of the eye.

The insensibility of the retina, in cases of hemiopsy, and the consequent irradiation of the light into the space occupied with the letters, or the objects which disappear, though a phenomenon of the same kind as that which takes place in

* Letters on Natural Magic. Let. II. p. 13.

oblique vision, has yet a very different origin. The parts which are in these cases affected extend irregularly from the *foramen centrale* to the margin of the retina, as if they were related to the distribution of its blood-vessels, and hence it was probable that the paralysis of the corresponding parts of the retina was produced by their pressure. This opinion might have long remained a reasonable explanation of hemiopsy, had not a phenomenon presented itself to me, which places it beyond a doubt. When I had a rather severe attack, which never took place unless I had been reading for a long time the small print of the *Times* newspaper, and which was never accompanied either with headache or gastric irritation, I went accidentally into a dark room, when I was surprised to observe that all the parts of the retina which were affected were slightly luminous, an effect invariably produced by pressure upon that membrane. If these views be correct, hemiopsy cannot be regarded as a case of amaurosis, or in any way connected, as has been supposed, with cerebral disturbance.

Dr WOLLASTON endeavoured to explain the phenomena of hemiopsy, and the fact of single vision with two eyes, by what he calls the semidecussation of the optic nerves, a doctrine which Sir ISAAC NEWTON had suggested, and employed to account for single vision.* A fibre of the right-hand side of the optic nerve is supposed to decussate or divide itself into two fibres, sending *one* to the right side of the right eye, and *another* to the right side of the left eye, while a fibre on the left-hand side of the optic nerve also decussates, sending *one* fibre to the left side of the left eye, and *another* to the left side of the right eye. Hence, Sir ISAAC NEWTON drew the conclusion, that an impression on each of the two half fibres would convey a single sensation to the brain; and hence, Dr WOLLASTON concluded that hemiopsy in one eye must be accompanied with hemiopsy in the other.

Ingenious as these explanations are, the anatomical facts by which alone they could be supported have not been established. Dr ALISON,† who has adopted the opinion of NEWTON, and reasoned upon it, admits that the anatomical evidence is still defective; and the late Mr TWINING‡ has adduced nine cases of disease in the optic nerves and thalami, which stand in direct opposition to the hypothesis of semidecussation. Dr MACKENZIE, too, adopting the same view of the subject as Mr TWINING, distinctly asserts that “the great mass of facts in Pathology and Experimental Anatomy, touching this question, go to prove that injuries and diseases affecting one side of the brain, instead of *hemiopsia* in both eyes, produce amaurosis only in the opposite eye.”

The two great facts of hemiopsy in both eyes, and of what is called single vision with two eyes, do not require the hypothesis of semidecussation to explain

* Optics, p. 320.

† Edinburgh Transactions, vol. xiii. p. 479.

‡ Trans. Med. Soc., Calcutta, vol. ii. p. 151; or, Edin. Journal of Science, July 1828, vol. ix. p. 143.

them. If hemiopsy is produced by the distended blood-vessels of the retina, these vessels must be similarly distributed in each eye, and similarly affected by any change in the system; and, consequently, must produce the same effect upon each retina, and upon the same part of it.

In explaining single vision with two eyes, we have no occasion to appeal to double fibres in the optic nerves, or to corresponding points on the retina. There is, in reality, no such thing as single vision, that is a single image seen by both eyes. With two sound eyes every object is seen double, and it appears single only when, by the law of visible position, the one image is placed above the other. But even in this case the object is seen double, by means of two dissimilar images of it which are not coincident. By shutting the right eye, we lose sight of a part on the right side of the double image, which is seen only by the right eye; and by shutting the left eye, we lose sight of a part on the left side of the double image, which is seen only by the left eye. If one eye gives a better picture than the other, the duplicity of the apparently single image is more easily seen. By shutting the good eye the imperfect picture is seen, and by shutting the bad eye we insulate the perfect picture. It is difficult to understand how optical writers and physiologists should have so long demanded a single sensation for the production of a single picture from the two pictures imprinted on the two retinas. If we had the hundred eyes of Argus, the production of an apparently single picture would have been the necessary result of the Law of Visible Position.