An essay on the physiology of the iris : with a different view of its relations and sympathies from the one usually received : and an attempt to establish a new theory of the action of light upon the eye / by John Walker.

AN

ESSAY

ON THE

PHYSIOLOGY OF THE IRIS;

WITH A DIFFERENT VIEW

OF ITS

RELATIONS AND SYMPATHIES

FROM THE ONE USUALLY RECEIVED;

AND AN ATTEMPT TO ESTABLISH

A NEW THEORY OF THE ACTION OF LIGHT UPON THE EYE.

(READ BEFORE THE LITERARY AND PHILOSOPHICAL SOCIETY OF MANCHESTER, NOVEMBER, 1833.)

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ADVERTISEMENT.

THE following pages are presented to the public in the full expectation that they will not be found uninteresting. Every physiologist admits that the present theory of the dependence of the motions of the Iris upon the Retina, as well as that of the action of light on the Eye, is very unsatisfactory, and quite insufficient to account for many phenomena which are constantly witnessed. It is for the scientific world to determine, whether the present attempt to explain these phenomena is more satisfactory, or the theory now suggested at all superior to the old one.

J. W.

Princess-street, Manchester,
November, 1833.

AN ESSAY

ON THE

PHYSIOLOGY OF THE IRIS.

THE function of the Iris is, by most physiologists, admitted to be that of regulating the quantity and mode of transmission of light into the posterior chamber of the eye.

This office is usually considered as secondary, and placed under the immediate control of the Retina. Many circumstances lead to the supposition that this opinion is erroneous. The regular contraction and dilatation of the pupil, in numerous instances of total paralysis of the Retina, is one. This is frequently noticed. Mr. LAWRENCE, the latest writer on the eye, observes on this point—"In some instances, not merely of partial but complete amaurosis, the Iris not only retains a degree of motion, but occasionally its movements are perfect. In amaurosis caused by hydro-cephalus, when the Retina is completely insensible, so that the patient cannot distinguish light from dark, I have not unfrequently seen a perfect state of the motions of the Iris. The phenomenon in question is not confined to instances of that description." He adds—"These facts throw considerable doubt upon the received notions respecting the physiology of the motions of the Iris, and on the usual explanation of that familiar phenomenon, the changes in the dimensions of the pupil." Mr. TRAVERS remarks on the same—"I have seen the pupil act briskly, where the person has been totally devoid of the perception of light from bright sunshine, or the flame of a candle held before the eye."

Again; the Retina has its distinct office, that of being the recipient of the various forms, and impressions of surrounding objects, the real organ of vision, communicating with one nerve only—the optic.

If it be supposed to be the dictator to the Iris, as to how much or how little light is to be admitted through its aperture, then it would require a separate nerve for this purpose; as it is contrary to all analogy for one nerve to be subservient to two distinct ends. The obscurity, which exists on these points, is occasioned by confounding these two very different functions, the reception of images for transmission through the optic nerve to the brain, which is the function of the Retina,—and sensibility to light, which is common to the Iris and the external parts of the eye generally, and which is derived from their connexion with the fifth nerve. If this distinction be kept in view, all difficulty will cease: without it there is no satisfactory way of explaining the phenomena of vision and the sensibility and mobility of the Iris. How otherwise can we account for the state of the pupil in sleep? Then no light gets to the Retina, and yet the pupil is contracted.

It has been ascertained that the Iris may be paralyzed and rendered motionless without a corresponding insensibility of the Retina. Instances of this are related by Mr. Lawrence, at the same time he expresses his inability to explain the phenomenon. Others have been mentioned to me, by my colleagues, as having occurred in their practice. In these cases, instead of there being paralysis of the Retina, there was loss of power of those muscles of the eye which are supplied by the third nerve—the motor oculi. This can only be explained on the supposition of their mutual independence of each other.

That there is this independent action of the Iris, and external parts of the eye generally, will appear also from a consideration of certain excited states of the organ.

The inflammation of the external tunics, attended, as it usually is, with intolerance of light, and a contracted state of the pupil, where the Retina is totally unaffected, except, as it is expressed, from sympathy, affords a strong presumption of this. How, it may be asked, can there be increased or morbid sensibility to light where there is no previous natural sensibility? Where is the connecting medium between the sympathizing Retina and the exterior of the eye? The Retina and Optic nerve have no immediate nervous communication with the Iris or external parts of the eye; their functions being of a different order, and confined to the one all-important and paramount

office of receiving and transmitting to the sensorium a faithful picture of objects presented to them. If it had been intended that the Retina should likewise have possessed a sensibility to light, as a stimulus, it would also have been endowed with a branch of the nerve of sensibility—the fifth nerve.

The condition called snow-blindness may be adduced in support of this view. The Tartars and other inhabitants of the frozen regions, who find great inconvenience from the powerful reflection of light from the snow, protect their visual organs, from this source of irritation, by a kind of spectacles, which are so contrived as to exclude light from the external parts of the eye, and concentrate it into the pupil. This, it must be admitted, is a very indifferent way of protecting the Retina, if it could be made out that it required such a protection, and is evidently intended as a relief to the sensible, external parts of the eye and Iris.

The relief to the eye, when shaded by the hand or other screen, is often very great, while it does not in the least affect the perception of objects.

The sensibility to light during a state of sleep, when the pupil is contracted and the Retina in a state of repose, is probably conveyed to the brain through the medium of common sensibility, light being one of the agents capable of exciting it. Every one knows that there is this sensibility, and the absence of the stimulus of light in dark winter mornings is often a considerable inconvenience.

These facts contradict the common theory, which is summed up in the following words of Mr. Lawrence—"Light has no immediate influence upon the Iris; for if we direct a strong light upon that part, taking care that it shall not enter the pupil, no contraction of the aperture takes place. The Iris does not move, the pupil is not altered, unless the Retina be influenced." Has Mr. Lawrence instituted any experiment of this kind? It must be very difficult indeed to contrive such an experiment in the natural condition of the eye, because the means we should take to exclude light from the pupil must also lessen its supply to the Iris; and if the stimulus of light be diminished the pupil is expanded—its natural condition when we are awake. I have made such experiment by darkening the centre of glasses, so as to exclude the representation of objects on the Retina, without influencing the state of the pupil.

If we refer to the state of cataract, in its perfect condition, we find the opaque lens blocking up the pupil much more effectually than any mechanical contrivance can ever do, whilst the Iris is left to the full influence of light, and yet every one knows that, with this obstruction to the passage of light through the pupil, its motions are as perfect as ever. Here we are understood to speak of simple cataract, uncombined with any other morbid condition. Now surely, on the common theory, if we even admit that some few particles of light may insinuate themselves between the lens and Iris, still we ought to have a very feeble motion of the latter, and such motion as it had might be expected rather to dilate the pupil, to admit more light into the dark posterior chamber; but no, we find it still powerfully contracting on exposure to light, its sensibility unimpaired, its mobility undiminished. I have seen instances, where the pupil has been thus obstructed for years, by an opaque lens or capsule, where the latter has been partially adherent to the Iris, and where no perception of external objects existed, and yet the fibres of the Iris could be distinctly observed to contract on exposure to light, and this quite independently of any sympathy with the other eye. The same may be said of closed pupil from injury or disease.

In cases of central opacity of the cornea, where very little or no light could get into the pupil, the organ being in other respects healthy, I have frequently observed the distinct action of the Iris, and have sometimes been just able to discern the pupil open, but not more dilated than usual,—I might rather say contracted, from the increased sensibility to light usually attending such cases.

Instances, as before mentioned, have been observed where there has been complete amaurosis coexistent with regular contraction and dilatation of the pupil; and I have more than once noticed great intolerance of light where there was not the least perception of objects.

That the sensibility and mobility of the Iris, in cases of cataract, are not always a proof of a sound condition of the Retina is well known to those whose attention has been much directed to that disease. Operations for cataract have been frequently uudertaken, where the Iris has been perfectly active, and the eye sensible to light, and yet after all the proceeding has been useless, from some morbid state of the Retina, optic nerve, or the brain itself.

In a case, on which I operated, the patient was sensible to light

only, and the pupil contracted on exposure to it. The opaque body was removed out of the axis of vision, but no improvement of sight followed. After some time external inflammation of the eye succeeded, the Iris participated, and, as a consequence, the pupil has since been fixed and broadly dilated. This case seems worthy of notice. It explains how it is that the Iris is so frequently motionless in cases of amaurosis. We here observe the two processes separated, which are generally combined. We have first the diseased action and paralysis of the Retina, followed, after a very considerable time, by the same conditions of the Iris. We know that generally internal inflammation of the eye affects the whole of the internal structures—the Retina, Choroid and Iris. Their contiguity to each other easily accounts for this. When the Choroid and Retina are affected, without any evident marks of the same affection of the Iris, except by its becoming motionless, we may easily imagine that the ciliary nerves may participate, and thus destroy the function of the Iris without its bearing the external characters of inflammation. We can easily conceive, likewise, how lightning would be likely to destroy, at once, the nervous energy of both Retina and Iris: that the one occasionally suffers from these sources, without the other participating, strengthens the opinion of their independence of each other; whereas, if this were not so, the injury must always be mutual, as surely as occurs in other nervous communications.

Cases of congenital absence of the Iris may be referred to as likely to illustrate the question, as to the seat of sensibility to light. We might expect in such cases, supposing the Retina to be endowed with this sensibility, and that in the degree in which it is commonly supposed, with a full flood of light constantly pouring upon it, that intolerance of light would here exist in its highest and most perfect form. This however we shall not find to be the case. That something of this kind should be observed is not surprizing, since, in addition to the natural sensibility of the outer coverings of the eye, an unusual, or what to others may be, an ordinary degree of light, must confuse and disarrange the impressions made upon it, if we consider the absence of the Iris as merely an optical defect. I have not seen more than one instance of this original deficiency, and it is now several years since, but I have a distinct recollection (and I may say the same of Mr. Windsor, whose case it was), that the

child exposed its eyes voluntarily to the light, and followed the movements of a watch, which was held up before it. Mr. Lawrence says of two cases which he has seen—"they did not bear exposure to light well," an expression that would scarcely lead one to suppose that there was much dread of light. In one instance, quoted from a foreign writer,* nothing is mentioned of this except the term "weakness of sight" can be so considered. In another† there was "only a rudiment of an Iris at the lower margin of the cornea. The full light of day was offensive to him, and his sight had become impaired *lately*, &c." This person had also three daughters who had no Iris, these did not bear the light so well, but still appear to have had some degree of vision. These cases seem evidently to point more to an optical deficiency, and the inconveniences resulting from a want of power to regulate the entrance of light into the bottom of the eye, than any intolerance of light considered as a stimulus.

The state termed mydriasis, in which the pupil is always broadly dilated, may be noticed. In individuals thus affected, there is no greater sensibility to light than in others, but their vision is not perfect: they require optical assistance.

The action of belladonna, &c. upon the Iris produces, temporarily, a state similar to the two last mentioned. Sometimes the pupil is so dilated as to reduce the Iris to a mere circle around the ciliary margin. Nothing but imperfection of vision is observed, no intolerance of light is complained of.

The confusion of vision following a sudden change, from a dilated to a contracted state of the pupil, seems to be accounted for by the momentary derangement of the optical focus.

Instead of sympathy existing between the Retina and Iris, we find extensive evidences of a close and intimate relation between the latter and the external parts of the eye and eyelids. In proof of this we may again refer to sleep. What is the condition of the eyelids? They are closed. What is the state of the pupil? It is contracted. When the eye is exposed to a strong light, or on looking at a minute or near object, the same thing happens; here the Iris acts in sympathy with the parts supplied with the fifth nerve, the orbicularis palbrebrarum, corrugator supercilii, &c. which all contract to defend the eye. This action is also observed in inflammation of the brain.

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* Baratta. † In Ammon's ZEITSCHRIFT.

Again. What happens when we awake from sleep? The eyelids are separated, and at the same time the pupil *widely dilates*. The latter is a remarkable fact, and, as far as I know, has never been noticed; but nevertheless admits of easy proof. The same occurs in opening the eyelids, after exposure to a glare of light. This is the natural state of the pupil, as well as the eyelids, during the period when we are awake and looking about us.* When the brain is oppressed from effusion, as well as after death, we find the pupil dilated and the eyelids open. This results from a sympathetic action with the levator palpebræ, &c. which are supplied from the third nerve. Thus it appears evident that the circular fibres of the Iris, those which contract the aperture, act in conjunction with the muscles supplied by the fifth nerve, and that the radiated fibres, those which dilate the pupil, act with the muscles whose energy is derived from the third nerve.

This double connexion is satisfactorily accounted for by its relations with both pairs of nerves, through the medium of the lenticular or ophthalmic ganglion, from which the nerves of the Iris, the ciliary nerves, are derived. This ganglion seems to form the centre of a circle of nervous communications with the ciliary nerves, the Iris, the brain, the third and fifth nerves, and through the latter with the portio dura; and in this way only can we account for the various actions and sympathies of the Iris. That the nerves of the Iris have these relations is well known; for what purpose, it may be asked, if not for bestowing upon it sensibility and the power of motion, and what kind of sensibility, if not that of light, to which it is almost continually exposed?† Nor can there be any thing very wonderful in the idea of light acting as a stimulant upon the Iris and external parts of the eye. The latter derive their sensibility from the same source as the former. The action of light is similar to that of other stimulants. Why should not the branches of the fifth nerve be sensible to this stimulus as well as to that of others, and in

* A contrary opinion is ascribed to Fontana,—viz. that the natural condition of the pupil is that of contraction. This cannot be admitted except the closure of the eyelids and the state of sleep be also the natural condition.

† In proof that the Iris has common sensibility also, I may remark that I have seen it powerfully contract, when in contact with instruments, in cases where belladonna had not been used.

those going to the eye more particularly, since the organ is so much exposed to the action of light, from its form and position, as well as the delicacy of its structure, which must be easily permeated by it? Can light act upon vegetable fibres, as we know it does, and shall those of animals be said to be insusceptible of its influence? Shall the early rays of the sun expand the beautiful structure of flowers, and the shades of evening cause them to contract, and shall the same influence be denied to the corresponding opening and shutting of the equally beautiful organ of vision, and its sympathizing appendages?*

If from a consideration of the perfect eye of man and the higher animals, we descend in the scale of our enquiries, we shall find the organ, in insects and the mollusca, devoid of any appearance of eyelids or Iris. Insects fly about in the sun's rays, their delicate optic nerves unprotected by any external or internal defence, except the translucent, outer covering, and the dark choroid in the bottom of the eye, be so considered.

In fish we find the Iris perfectly formed, but motionless, and no eyelids. In the amphibia the Iris is also present with a feeble, languid motion; and here we have the first rudiments of eyelids; these consist of folds of the common integument with which the animal occasionally covers the eye, placed anteriorly and posteriorly, and resembling the third eyelid of birds and the mammalia. As we ascend the scale, we find the complication of the eye greater, and its movements more perfect, according to the increase of the wants and dangers of the animal.

In birds we have the first appearance of perfect eyelids, and an active Iris.—"The Iris is very delicate, but capable of active motion, to a certain extent voluntarily, and corresponding to the action of the eyelids. According to KEISER, even when the eyelids are cut away, the contraction of the pupil accompanies every fruitless attempt to close them. Does not this consonance of motion in the eyelids and Iris, as well as the developement of mobility in the latter at the same time with the first appearance of eyelids, go far towards prov-

* In the cases of two children, who have lost both eyes from purulent ophthalmia, and in whom there is no perceptible difference between the cornea and selerotica, attended with partial staphyloma, their mothers inform me that they always cry, and exhibit other marks of uneasiness when they are in the dark, and that they usually awake with the commencement of day-light and regularly become sleepy at the close of day. It is needless to add that they cannot have the slightest perception of objects.

ing its muscularity?"* It also gives additional strength to the opinion of their mutual action and relation.

In the mammalia, the organization of the eye and eyelids is perfect, as in man. Like man they possess the pupillary membrane, which blocks up the Iris, until they are prepared for the use of the eye; and the eyelids are, in like manner, closed by a similar membrane. In animals which are blind at birth, the pupillary membrane remains as long as the eyelids are united. Thus we find additional arguments, from the facts of comparative anatomy, in support of the theory of the sympathy of the Iris and palpebræ.

I cannot help here quoting the following note by Mr. Gore, from his translation of Carus, p. 272.—"In those mammalia in which the eye is in a rudimentary state, the true optic nerves are wanting, together with the nerves of the third, fourth, and sixth pairs; such are the Sorex araneus, Talpa europea, Chrysochlorus capensis, Mus typhlus, Mus capensis, &c. M. Serres has shewn that the parts described by Carus and Treviranus as optic nerves, are in fact not nervous, and not continued to the eye. Among many other interesting particulars, he states, that in these animals the optic foramen of the sphenoid bone is wanting; that the nerve actually entering the eye is a branch from the first or ophthalmic part of the fifth pair of nerves; and that the ophthalmic artery is merely a twig from the internal maxillary, instead of a branch of the internal carotid. The same transposition of the nerve supplying the eye, exists under similar circumstances in the Proteus anguinus, Syren lacertina, and Cœcilia viscosa, among reptiles. Physiologically considered, however, the most remarkable circumstance connected with these facts is, that the animals in question are not blind, as might have been supposed. The experiments of M. M. Serres, Delalande, G. St. Hilaire, and Durondeau, quoted by the former, prove that vision exists, at least in the Mole, Shrew, Mus capensis, and Proteus; though it may be reasonably doubted whether, in these instances, it be not limited to the mere perception of light (a modification of common feeling,) without attaining to the character of a specific sensation. These anomalies, if they may be called such, become still more important when taken in connexion with others of a similar

* Gore's Translation of Carus's Comparative Anatomy.

description; for instance the character of auditory nerve assumed by a branch of the fifth pair in many fishes, and the great influence that the same pair of nerves exerts over the organs of sense in vertebral animals in general, as proved by the experiments of M. Magendie." These facts are important in illustrating the question as to the sensibility of the fifth nerve to the stimulus of light.

Some difficulty has been found in explaining the voluntary power possessed by some individuals, in common, as we have seen, with birds, of influencing the motions of the pupil. It is easily explained on this view of the relations of the Iris with the eyelids. It is probable that those who *will* the dilatation of the pupil effect it by calling into action the muscles of the third pair, elevating the upper lid, and at the same time producing a corresponding contraction of the radiated fibres of the Iris; on the contrary, when the *contraction* of the pupil is willed, it is accomplished through the agency of the fifth nerve, the act of closing the pupil being effected by an attempt at shutting the palpebræ. This is the same as is noticed in looking at a distant object: then the pupil is dilated and the eyelids are separated, and *vice versa*. This, I think, nearly corresponds with the explanation given by Dr. Roget, who possesses this voluntary control over the Iris in an unusual degree. He says—"The effort of which I am conscious, when performing the voluntary contraction of the pupil, is the same as that which accompanies the adaptation of the eye to the vision of near objects, and is of course productive of an increase of its refractive power. This very same power of moving the Iris is, in fact, possessed, in a greater or less degree, by every person who enjoys the faculty of distinct vision at different distances. * * * * * * It is still more easy for me, while an object is placed near my eye and distinctly seen, immediately to relax the organ, so as to fit it for the distinct vision of the most distant objects, and these changes I can effect in succession with considerable rapidity, each change being accompanied with a corresponding enlargement or diminution of the pupil."* This habit may be easily acquired; and no doubt in those individuals who frequently practise it, it will be accomplished with much less corresponding action of the external muscles; but, I believe, it can never be achieved

* Letter in Traver's Synopsis of the Diseases of the Eye.

without such action of the palpebral muscles at the same instant. I have heard a contrary doctrine advanced; it has been said, that this is the course adopted by nature for the contraction and dilatation of the pupil, and that the effort of the will is quite another thing. But certainly, I conceive that no voluntary action can ever take place by the mere effort of the will without setting in action the apparatus provided to effect it involuntarily. It would be the same thing to say that we can voluntarily close our eyelids without exciting contraction of the fibres of the orbicularis.

The action of belladonna upon the Iris may be accounted for in the same way. The effect of this narcotic, when applied over the eyebrows and lids, is to paralyze or diminish the sensibility of the sphincter fibres of the Iris, and thus temporarily suspend their sympathetic action with the eyelids. This sympathy being arrested, the radiated fibres, which have a much firmer attachment than the circular ones, and which are consequently less under the influence of narcotics, widen the aperture. This view is further strengthened by the fact, that the narcotic is always applied to parts whose sensibility is derived from the fifth nerve. The extreme delicacy of the Iris, particularly its circular fibres, which are unattached to any firm point, seems to render it more obnoxious to narcotic influence than other muscular fibres of firmer consistency,—hence its sensibility is suspended by a sedative power which is insufficient to affect, in this way, other parts subjected to the same amount of influence. A poisonous dose of belladonna, taken internally, will also paralyze the muscles of the third nerve, as well as the fibres of the Iris, from oppression of the brain, as takes place in apoplexy, &c. Here we should expect both sets of fibres to be paralyzed, and the pupil dilated midway and motionless. Opium, on the contrary, seems rather to add to its sensibility, as the pupil is generally found contracted, with indisposition to light, after it has been administered largely.

There seems no question but that the Iris sympathizes with the action of the muscles of the face in expression. In a state of placid enjoyment, when the temper is unruffled, the pupil will be dilated; when in a condition of rage or anger, when the brow and eyelids contract, the pupil will likewise be diminished. The dull inexpressive appearance of the eye, when the pupil is broadly dilated, and

its activity destroyed, is very remarkable. Its sympathy with the face is gone, its connexion with the fifth nerve being cut off. This dull appearance is not observed in those cases of amaurosis, where the Iris retains its sensibility and power of motion; so that persons in this state would hardly be supposed blind, from casual observation. The free communication between the branches of the fifth and those of the *portio dura* explains this, as well as the sympathetic action of the Iris generally, with the *orbicularis palpebrarum*, &c.

The only attempt at an explanation of the supposed dependance of the Iris upon the Retina which I have met with, is the following by Mr. TRAVERS—"The sympathy of the Iris with the Retina must be ascribable to a communication between the Retina and the ciliary nerves which supply the Iris. The small lenticular ganglion from which these nerves are derived, lies upon the optic nerve, and is probably the medium of communication." This supposition coming from a less talented individual would be unworthy of notice. As well might we say, that nerves elsewhere influence the parts with which they are in contact, in passing to their final destination. Mere apposition or contiguity can never bestow nervous influence. We might just as well say, in this instance, that the optic nerve could in the same way communicate to the Iris the sense of sight.

The result of some of M. MAGENDIE'S experiments seems to accord with this view. In dog sand cats after dividing the fifth nerve the pupil became dilated. In rabbits, on the contrary, it remained contracted. This is accounted for, in the latter, by the fact that the Iris has no ciliary nerve from the fifth pair. In one experiment of cutting this nerve, M. MAGENDIE seems to have imagined that the sight of the animal was destroyed. He applied a lighted taper to the eye, but no sensibility was observed. He increased the glare of light by reflectors, with no more success. At last he tried the sun's rays and converged them into the pupil, when at length an impression was produced, the animal closed its eyelids. Very powerful stimulants, we know, will cause contraction of other muscles even after death. What is most strange is the confusion here made, in not distinguishing between the sensibility to light, which was destroyed by the injury of the fifth nerve, and vision, which is effected through the optic nerve. Here it seems to have been taken for granted, that because the animal was insensible to the stimulus of light, it there-

fore could not see,—a great mistake in my opinion. This is the more surprising, because M. Magendie previously states his opinion to be decidedly against the sensibility of the Retina; but it is evident that he is not sufficiently aware of the distinction, although many of his experiments go directly to prove its insensibility.—"A false idea (he says) is generally entertained respecting the sensibility of the Retina, it is represented as the prototype of sensible organs. It is affected even by the *very light* it is said."* No doubt blindness will be one of the consequences of cutting the fifth nerve, from the changes which the organ undergoes, but I very much doubt the inference, that the animal could not discern objects for some time after the operation; since, as I have endeavoured to shew, it is one thing to be sensible to light, and another and a very different one, to receive impressions of the form and condition of objects. A familiar explanation of this may be referred to in looking directly at the sun. A painful sensation is felt in the exterior of the eye, whilst the effect on the Retina is perceived by a luminous appearance, which remains after the external impression is gone.†

The extreme difficulty and consequent uncertainty of such experiments as those of M. Magendie, must detract considerably from our confidence in their results. Besides, the arrangement of the nerves of the eye, in various animals, is but little known. It is evident that it is different in the rabbit and guinea pig, from that of the dog and cat, and until we are better acquainted with the comparative anatomy of these nerves, with respect to their distribution, we shall continue unable to account for the various phenomena observed, when the subject of experiment. It is equally evident that M. Magendie's experiments were not always followed by the same appearances. For instance, speaking of the division of the optic nerve, he says—"*generally* the pupil is large and immoveable after its division," implying of course that this was not the case at all times. He speaks likewise of having divided the optic nerve close

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* Quoted from the Report in the Lancet.

† Since the above was written, I find that Dr. Bostock, in his work on Physiology, inclines to this view of the separate function of the Retina. He says—"We may presume that the specific and sole purpose of the optic nerve is to convey the visible impressions received by the Retina, for it may be presumed, that all the other functions to which the nervous system is subservient, are performed by the other nerves, with which the eye is so plentifully furnished."

to the eyeball, which was followed by paralysis of both Retina and Iris. Would it be possible in such an experiment to avoid cutting or injuring the ciliary nerves, at the same time, surrounding, as they do, the optic nerve? And what was the particular arrangement of the nerves of the eye, in the animal experimented upon.

Upon a review of the whole of the facts and arguments adduced, it appears to result,—First, that the motions of the Iris depend, not upon impressions made on the Retina, but upon its own sensibility to light, as also upon its association with the muscles of the eyelids, through the medium of the lenticular ganglion:—Second, that these motions are for the purpose of adapting the eye to the perception of objects at different distances:—Third, that the Iris acts also in some measure as a defence to the more internal parts of the eye, as the palpebræ do to the external, forming, in fact, an internal eyelid:—Fourth, that the external parts of the eye generally, as well as the Iris, are sensible to the stimulus of light:*—and Lastly, that the Retina is insensible to the ordinary impressions of light, as a stimulant; but that its functions may be impaired or destroyed by the more powerful concentration of light, as from the sun's rays, the *coup de soleil*, or from lightning, in the same manner as the brain and other parts of the nervous system are injured or paralyzed from the like causes.

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* During the last few days, I have witnessed a case of affection of the nerves of the face, which illustrates this question of the sensibility to light in a very satisfactory manner. The mouth and tongue were drawn to the left side—there was diminished sensibility of the right side of the face and mouth, with loss of taste: the eyelids of the right side could not be closed, and did not wink in concert with the opposite: vision was perfect, but on placing this eye close to a strong gas light, NO UNEASINESS WAS FELT, and no attempt at winking followed. The sound eye could not bear the same light an instant. This case was seen also by my friend Dr. Kay, who observed all these phenomena.

THE END.

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