Cataract, and its treatment, medical and surgical : a paper on the cause and cure of cataract, read before the Medical Society of London / by Jabez Hogg.

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AND ITS TREATMENT,

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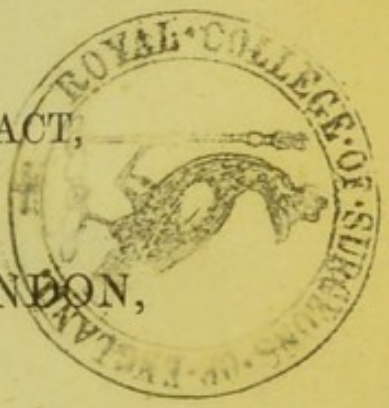

BY

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The Microscope, its History, Construction and Application;
Elements of Natural Philosophy; etc.

LONDON
HENRY RENSHAW, 356, STRAND.

1870.

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LONDON,
1, BEDFORD SQUARE,
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CATARACT,

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Mr. President and Gentlemen,

What can be said about Cataract and its treatment which has not been repeated over and over again? This is a question, I dare say, some present are ready to ask me. If I were to venture an answer to such an inquiry, I must acknowledge there is so little which has not been said, that I must throw myself on your indulgence while I endeavour to pass in review some few observations, which, I believe, may become useful to those engaged in ophthalmic medicine, may subserve the purpose of a more accurate diagnosis, and promote a more rational treatment of diseases of the refracting media of the eye.

It is an admitted fact, that the first care of the skilful practitioner is to make out an accurate diagnosis before he considers the necessary mode of treatment. At the same time, to arrive at a correct pathology, he must, by the aid of physiological investigation, ascertain the indications of the

disease, as well as mark those alterations in the nutrition of the blood and tissues, in which originate inflammation, degeneration, and morbid growth. Depraved nutrition and its results are, as yet, but imperfectly understood; nevertheless, I believe increased knowledge of physiology and pathology, more especially that gained by the help of the microscope and chemistry, must ultimately lead to some general principles by which the nature and constitution of disease may be recognized with as much precision as are the truths of natural philosophy. It has been truly said, that by the aid of the ophthalmoscope a new era has been inaugurated in ophthalmic medicine, and a more comprehensive and better-organized plan of ophthalmology and therapeutics has resulted. We have no longer to rely upon so imperfect a method in diagnosing cataract as the "catoptrical test." The slightest trace of opacity occurring in the crystalline body can be detected without difficulty or doubt; and the earliest indications of disease in the internal eye can be perceived with as much certainty as those of its more superficial or external coats. In the event of any abnormal changes of the capsule or lens having been brought about by an altered state of the specific gravity of the surrounding fluids, there is, happily, another discovery, in its way as important as that to which reference has already been made, by which doubts and difficulties may be cleared up, and on which implicit reliance may be placed. It has been proved that certain conditions observed in conjunction with opacity of the lens, depend partly upon changes, the result of simple physical forces; and this has furnished the practitioner with a "Synthesis of Cataract," which may be taken as a sure guide in the appliances of medical and surgical knowledge in the cure of lenticular disorder.

It is not a matter of surprise, that, by no better help than what was afforded by the light which shed its feeble rays

over the practice of former days, all remedial measures for the cure of cataract in any stage of the disease should have been deemed hopeless. A certain writer dogmatises in the following manner: "The cataractous lens being dead and disorganized, nothing short of *creative power* can restore it to life, or to a performance of its former functions." How could it appear otherwise to such an enquirer? It would necessarily be very difficult to conceive how a perfectly transparent body inclosed within a capsule, and without vessels passing into it, should, when it became opaque, be restorable to its former transparency. It is only within a short period that the way in which the lens derives nutrition from its surrounding structures has been clearly understood. Chemistry has made us more familiar with the law of osmosis, as well as other beautiful and subtle contrivances, by means of which many marvellous changes are brought about in the animal economy. By this process, which is constantly going on in the performance of certain functions, we see large quantities of effused fluids, in various parts of the organization, absorbed (as it is termed), and Nature once more resuming her healthy condition. Why, then, should it appear impossible to produce a change in the specific gravity of the fluids within the eye, which would allow of the lens regaining its transparency?

The synthetical investigation of disease teaches that by saturating the blood with various salts or substances, a change will be produced in certain tissues of the body. The eye at once shares in the derangement of function, nutrition is arrested, and saccharine or saline cataract ensues. By the administration of appropriate remedies such opacities may be removed, and the temporarily injured lens gradually cleared or restored. This remarkable discovery in relation to one form of cataract, I mean diabetic or sugar cataract, we owe to the sagacity of Dr. Mitchell of America; but it has been more prominently brought to the notice of the profession by the

investigations of our esteemed past President, Dr. Richardson. His enlarged and profound knowledge of animal chemistry has enabled him to demonstrate the universality of the subject; he has shown that a similar change will be brought about in the eyes of the lower animals by the employment of many of the other crystaloids, as well as sugar.

In spectroscopic investigations I look for important results. On burning a desiccated cataractous lens in the flame of a spirit lamp, and subjecting it to spectrum analysis, I observed the sodium band to be much exaggerated and intensified. The spectrum of cataract is as strikingly dazzling as that of metallic sodium, the absorption band occupying nearly the whole of the yellow, and deepening the red. This would seem to imply degeneration of the crystalline body from excess of sodium salts.

It is to such modes of investigation that I would particularly direct attention; as in this way I hope to see the labours of the physiological chemist leading the practitioner to a sounder and more philosophical method of therapeutics.

It is needless to enlarge on the labours of the older writers on cataract and its treatment. It will suffice for our present purpose to note the results achieved by surgical and medical skill in later years. As to treatment, without operation, while some believe it to be utterly valueless, others claim for it a large amount of success. For instance, Mr. Ware at one time indulged in the hope that means would be found by which an opaque lens should be restored to its transparency, and so avoid an operation. He conceived that stimulating applications to the eye, or occasional frictions over the lid, were remedies which would prove efficient. Dr. Jaëger, who possesses unusual opportunities for observation, attaches great importance to the treatment of opacities, as will be seen on reference to his reports of cases in the Austrian "Zeitschrift für proktische Heilkunde," 1861. And

if it is, as recent writers state, that the cataractous condition is chiefly due to a disordered state of the circulation, which is at all times preceded by an inflammatory stage, and followed by an atrophic alteration in the uveal tract, the iris, ciliary body, and choroid coat, no one can reasonably doubt the value of early medical treatment. The late Dr. Mackenzie entertained doubts of the value of remedies in the cure of cataract; as in his experience alleged cures have been performed in cases of mere sympathetic effusions on the surface of the capsule, or ruptured capsule, "in which the removal of the opacity was effected by the solvent power of the aqueous humour."* M. Gondret agrees with Mr. Ware, and sustains his views by several instructive cases. Majendie regarded the observations of Gondret as illustrative of his own views of the influence exercised by the fifth nerve over the nutrition of the eye. It is well known, he observes, that when the fifth nerve is divided, the nutrition of the eye is interrupted, and the *humours* as well as the cornea become opaque; and it is by no means unlikely that cataract, which in very many instances is admitted to be the effect of abnormal nutrition, may as often arise from a morbid action of the nerve which presides over the nutrition of the eye, as from any disorder directly affecting the source whence the lens derives its nourishment.

The time ordinarily allotted to the reading of a paper will not permit me to enter more fully into this interesting part of the subject. I must content myself by observing that cataractous disease has been attributed to many causes of a special, local, and general character. It is no new thing to observe secondary changes in the lenses of the eyes of patients suffering from other diseases; indeed, it was this fact which led to the division of cataract into *primary* and *secondary*. The first kind, it is believed, arises independently,

* Mackenzie's Practical Treatise on Diseases of the Eye, p. 766, 1854.

as that associated with a general decline in the powers of life; while the secondary form is the result of some previous disease which may be settled in the organ, or in a remote part of the body; as that of saccharine cataract, fatty degeneration, &c. Dr. Mackenzie's experience convinced him "that a perfectly uncomplicated case of cataract is rarely met with." It is most certainly true, that a very large number of the cases which fall under the care of the ophthalmic surgeon depends upon secondary causes. One of the best ascertained forms of secondary disease is that arising from diabetes, which, as I have stated, derives additional interest from the circumstance that the relationship which exists between the artificial and natural production of the disease has been so thoroughly and conclusively demonstrated. The practical results obtained during the experiments performed on animals, have increased the expectation that the time cannot be far distant when this change in the nutrition of the lens will be perfectly under the control of therapeutical agents.

Fifty years and upwards had already passed away after the appearance of Dr. Rollo's learned treatise on Diabetes, before another step was made to increase either our chemical or physiological knowledge of the disease. With, however, the advance of chemical science, large accumulations have been added, and many useful acquisitions have been made, which must lead to valuable results.

Dr. Rollo* was, I believe, the first writer who noticed opacity of the lens in connection with diabetes; and, since his day, numerous cases have been placed on record.

* It is remarkable that, although the disease is now much better understood than it was in Rollo's time, it is little better treated. This physician prescribed anodynes in various forms, opiates, &c. having fully satisfied himself of their value; it is a singular fact that opiates have lately been vaunted *as a new remedy* in the treatment of diabetes. Dr. Horne, of Edinburgh, preceded Rollo on this point: he was the first practitioner who prescribed opium for the cure of diabetes.

Mackenzie mentions having seen diabetic cataracts in the eyes of persons before they had arrived at the middle period of life. Von Graëfe tells us that such cases are very often met with in his practice; M. Hasner gives the particulars of ten; Dr. Lecorche, of five, which came under his notice in the course of a very short time. Mr. France, observing the frequency of the disease, published a valuable paper on the subject in the Medico-Chirurgical-Review. "The characters of diabetic cataract," he states, "have been sufficiently uniform to enable me to recognize them before any complaint of urinary disorder was preferred by the patient. The cataracts have in every example been symmetrically developed on both sides, the lenses have increased notably in their anterio-posterior diameter, so as to encroach on the depth of the anterior chamber, and even to interfere mechanically with the free play of the iris. The opacity has shown itself in portions of several strata of the crystalline at once, leaving intermediate spaces for a while transparent. The colour and bulk of the cataracts have invariably indicated their soft consistence, though the patients were respectively of middle and forty-eight years of age." To detect the disease, is to stay the hand and knife of the operator; as, in the last stage of the disorder, a very modified form of operation can scarcely be undertaken with safety or hope of partial success. So that the synthesis of sugar cataract will undoubtedly do much towards establishing a plan of meeting it far more successfully than has hitherto been done.

It is to Dr. Mitchell that we owe the discovery of the synthetical method of investigating cataract. He, it appears, while experimenting with the worrara poison, placed some frogs in the syrup, and, in a very short time, he found cataracts produced in their eyes; upon removing the animals from the syrup and placing them in water, and keeping them there for some time, all opacity disappeared. This fact led

to the conclusion "that cataract is a constant attendant upon sugar-poisoning." When speaking of the synthesis of cataract, I must not omit to mention the experiments of M. Kunde, whose researches are referred to by Claude Bernard, in his *Lacons sur les propertés physiologiques et les alterations pathologiques des liquides de l'organisme.* A brief notice, however, only appears of Kunde's experiments. Bernard particularly dwells upon the physiological importance of water in the animal economy. It is, he observes, not only a necessary component of living bodies, but a vehicle for the materials which enter into nutrition and growth; and, therefore, without which life cannot be maintained.

Independently of special properties, the organic fluids are allied by a more general character; and all owe their immediate physiological importance to the quantity of water, which, first taken as a fluid, at length becomes a vehicle for more solid materials. Nine-tenths of the constituents of the human body is water. In the vitreous body, the proportion of water is 98·40 hundredths. Bernard lays great stress upon the physiological influence of this large amount of water in the organism; and, whether it be added to or withdrawn from the animal body, it is of the utmost importance. To add water, in a chemical sense, to the body, might appear difficult of accomplishment. Nevertheless, Kunde succeeded in doing this in his frog experiments, and with singular results. He injected into the intestinal tract, a solution of sulphate of soda, and also fed the animals with it, or sugar: osmotic action was established, which caused a part of the water of the blood to flow towards the intestines. The blood being deprived of a large portion of its water, the first effect observed was tetanic movements of the limbs and body; this was followed by opacity of the lenses of the eyes, and, of course, blindness. On placing the animal in water, these changes gradually subsided. A similar result has been noticed in some of those

persons who have too rigidly followed out a system known as the "Banting system." Disease of the kidneys (Bright's disease) has manifested itself after a time, and proved fatal. A remarkable case of the kind fell under my observation rather more than a year ago. A lady, who had become uncomfortably stout, followed out the plan recommended, in all its details; she rapidly diminished in size, and appeared to be well pleased with her slim figure. Unfortunately, very soon after, her health began to decline, she became pale and anæmic; faintings repeatedly troubled her; vision grew dim, and her sight quickly diminished. The ophthalmoscope revealed the nature of the fatal malady. In less than a month she was hopelessly blind; and, in a short time afterwards, died from uræmia. Here the injurious effects of large losses of fluids is made apparent. When these are more than the system can simultaneously repair, the vital functions become depraved, as well as depressed, and a state of cachexia as well as of anæmia is induced; and thus trifling causes suffice to determine grave states of disease.

The converse of Kunde's former experiment resulted on injecting water into the veins of a dog. This increased the normal fluidity of the blood; but the experiment could not be carried far without dangerous results. The secretions were first diminished, and then, on injecting more water, were entirely suspended. Tetanic convulsions were also produced in this instance, and ultimately death. It is thus shown that, although the fluid and solid constituents of the blood may be materially altered before injurious consequences ensue, so soon, however, as a certain limit is passed, physiological changes follow which seriously compromise the functions of life.

During the formation of sugar cataract, Dr. Mitchell concluded that direct contact of the sugar with the lens is essential for its production. This scarcely seems to me to

be so. The vitreous body, to maintain its integrity, should, as I have shown, secrete a large proportion of water; the transparency of the lens depends upon the same element, and this is probably derived from the vitreous, or the source whence the latter obtains its supply. A very small increase in the quantity of albumen may imperil the transparency of the lens. The same result follows, if sugar become largely mixed in any of the secretions; and Dr. Richardson found "that whatever soluble substance increases the specific gravity of the fluids, will induce this condition. Thus, we can cause *saline cataract* as well as *sugar cataract*." To produce cataract artificially, it is only necessary that the specific gravity of the fluid injected into the circulation exceeds 1,045. In Dr. Richardson's experiments, if the specific gravity of the blood was much exceeded, an abnormal density was produced in the lenses of the eyes, which lasted as long as the blood remained impaired. The inductions to be drawn from such experiments appear to me to be in perfect accord, and strengthen M. Bouchardat's views as to the cause of diabetes.*

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* Bouchardat's investigations certainly show that the disease is the result, not exactly of the ingesta of an excessive quantity of amaylaceous food, but rather of a rapid and excessive conversion of the material with glucose; that this is in part due to a hypersecretion of the pancreatic juice, and to some extraordinary activity of the ferment contained in it; and also from the stomach (as I pointed out some twenty years ago) taking on a perverted action, by virtue of which it secretes a fluid containing a ferment analogous to that of the pancreas, which converts the starch into glucose. The excess of glucose in the blood, however, more frequently results from incomplete oxidation of that which is usually present; and, under usual healthy conditions, this does not exceed an amount which can be retained by the vessels, and oxidized by the ordinary acts of respiration. But, in the diabetic patient, there is an excess of glucose in the blood; and, in Dr. Richardson's words, as soon as this exceeds a certain defined amount, osmosis is established through the walls of the vessels.

It should be remembered that M. Bouchardat does not regard the liver as a sugar-former, but rather as a moderator of its formation, and that always after the pancreatic ferment has converted the starch into dextrine and glucose.

Should not diabetic cataract be regarded as a direct physical effect on the lens produced by the surrounding fluids? It is, doubtless, osmotic, causing in this way a specific derangement of the lens fibres; although other forces must be at work in bringing about the cataractous disease, as we often find an increase of lens substance, but differing in character from that observed when the lens of the dead eye is placed in water. This may be due to a pathological change in the globulin and albumen of the organ; and, it is not only possible, but quite probable, as Dr. Richardson points out, that an opposite state would result from a lowered specific gravity of the fluids: by such means the refracting media would assume another tint, becoming disorganized by excessive transudation (endosmosis) and distension.*

The extraordinary rapidity with which the nutritive processes are carried on in the body is beautifully exemplified under certain conditions in the refracting media of the eyes.

Dr. Bence Jones found that a small dose of lithium, in the course of a few minutes, passed through the circulation, and into every particle of the body, even into those parts most distant from the central blood supply. The living eye gives the earliest indication of the presence of this remedy. When sulphate of quinine is administered, like lithium and other substances, it rapidly passes from the blood into the textures of the body. Within a quarter of an hour, increased fluorescence is noticed in the nervous texture, in the aqueous humour, and in the lens. This observation led to the discovery that a substance resembling quinine is always present in the animal body. It is believed that this animal quinine is descended from albumen; and, doubtless, is an alkaline fluorescent substance of the utmost importance in the animal economy. When the eye is brought into the focus of the ultra-violet rays, immediately cornea and lens

* Dr. Richardson, F.R.S. "On the Synthesis of Cataract." Brown-Séquard's Journal of Physiology, p. 449, 1860.

begin to glimmer with a fine opalescent light. Examined by a prism, the dispersed light gives a spectrum in which the red is wanting, and in which the blue tone predominates.* Professor Brücke states that the lens absorbs nearly all the blue rays of light, and that the cornea and aqueous humour do so only to a less extent. Do not such experiments explain the apparent opacity of the glaucomatous eye? And is not so-called *spurious cataract* due to fluorescence of the lens? To the observer, the electric light, as it is made to pass into the human eye through a colourless solution of quinine, imparts to the lens the colour of a blue-green cataract.†

Dr. Bence Jones, who I believe was the first to direct attention to the remarkable phenomenon of fluorescence in the human eye, observes:—"If the chemical circulation can carry alkaloids even into the non-vascular tissues, is it not reasonable to suppose that medicines pass through the blood and act on the textures? And is it not most probable that they take part in every chemical change that occurs outside the blood vessels, as well as in the blood itself? Still further, may we not expect that, among the multitude of new

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* The diagnosis of substances—fluid, solid, and gaseous—by spectrum analysis, is the discovery of Professor Stokes. By passing a ray of light through various materials, and viewing them with a prism, certain portions of the spectrum are extinguished, while others are altered in colour; and "such changes in the spectrum indicate that those bodies so alter the motion of a certain part of the light, that it is unable to produce effects upon the retina of the eye: the change is termed absorption." Amongst solid bodies coloured glasses readily show the phenomena. I mention this fact because it has been found that blue glasses give a particular obscuration; and, as these enter very much into the formation of spectacles, it is a reason for noting it here. Cobalt is the chief colouring matter employed in making blue glass; and this metal produces a great amount of absorption of the red and yellow end of the spectrum, as well as a certain obstruction in the green part, with a slight prolongation of the blue. Blue glasses, for this reason, exclude from the eye that great mass of colours or light which produce the most exciting effects upon the retina.

† By the aid of this splendid method of investigation, Dr. Thudichum says, "I have been enabled to identify many known substances, and to discover, at least, five new bodies in the human tissues."

substances which synthetical chemistry is now constantly forming, some medicines may be discovered which may not only have power to control the excessive chemical changes of the textures in fevers and inflammations, but may be able to remove the products of insufficient chemical action, even in diseases which affect the non-vascular textures; as, for example, in cataract and in gout?" With regard to cataract, I am fully persuaded that further investigations will show, that, as long-continued impoverishment of the blood impairs the nutritive functions of the lens, in such a way as to produce opacity of that body, so may we expect that, by supplying to the organism its lost material, osmotic nutritive action will be restored, and the further progress of disease be arrested.

Certainly, no synthesis could be more perfect than that of sugar cataract; and it is impossible not to see the important similarity which exists between the artificially induced and the natural disease. It only remains for the medical practitioner to draw reliable physiological deductions from the important facts revealed.

Of the symptomology of saccharine cataract, little need be said: the progress of the disease is variable. It has been known to occur in a few days; at other times a slow and insidiously formed opacity takes place, often before the patient has been made aware of the existence of the disease he is suffering from in any other way. Whenever a patient assures me that a dark web or cloudiness of vision has suddenly taken place, I suspect some renal complication and request an examination of the urine. Striæ are often complained of by the patient, and probably may proceed occasionally from crystals of sugar, splitting up the lens fibres. Patients suffering from this disease prefer, or rather seek, a strong light, which alone enables them to see tolerably well; while, on the other hand, those affected with the ordinary soft or hard cataract see better in a dull light, as twilight.

The retina often shares in the mischief; and the vessels, if the case is seen at all early, are anæmic. A very large number of cataracts supposed to come on suddenly or spontaneously must, I am confident, be classed among those arising from secondary causes. Richter relates the case of a patient suffering from an attack of gout, who during the night exposed his feet to an unusual degree of cold: a retrocession of the disease occurred, and he became suddenly blind; when he was seen in the morning, a complete pearl-white cataract had been formed. Mr. Wathen gives two instances of suddenly formed cataracts in the eyes of mechanics after long exposure to the light and heat of large fires. Dr. Martin, of Portlaw, Ireland, relates two remarkable cases of suddenly formed cataract, one of which occurred in a woman after sitting up for several nights with an invalid mother, and crying a good deal; she awoke one morning nearly blind; semi-opaque stellate cataracts had formed in both eyes. The other case was that of a man, who, having been married, and freely indulged in the fun of an Irish wedding, but whose eyes were perfect when he retired to bed, awoke early in the morning blind from the sudden formation of cataracts.

Those members of the profession who, like myself, are engaged in eye practice, must have seen numerous cases, which are supposed to have arisen in a manner as sudden as those narrated. A short time since, a gentleman came to me, who stated that, the day before, while walking home, he discovered, for the first time, that he was blind of one eye; he could only attribute his loss of vision to a violent fit of sneezing. Upon examination, I found a cataract so nearly fully formed that it appeared almost impossible that it should have escaped notice had it taken much time to form.

Morgagnian cataracts have been observed to take place suddenly: this kind is supposed to arise from a

disintegration of the intra-capsular cells, or of the superficial laminæ of the lens. The cataract often presents only a faint cloudy appearance, as if milk and water had infiltrated the capsule; sometimes the capsule has become so distended with fluid as to press upon the iris and impede its motion. Beer, who saw cases of this kind of cataract, observes of it that it is sudden in its accession. The late Dr. Mackenzie saw an instance in a lady who embarked at Liverpool with her sight quite perfect; she was very sick during her passage to Greenock, and next day landed there with a cataract in one of her eyes; in appearance, it corresponded to the description of commencing Morgagnian cataract. "On attempting to operate upon such cataracts," observes Dr. Mackenzie, "severe vomiting and inflammation have been known to follow, with entire loss of vision."

Siliculose capsulo-lenticular cataract is sometimes confounded with the preceding. This form of cataract is occasionally met with in childhood; it then arises from congenital defect, the lens and capsule remaining nearly the same as they were at birth. It is more often seen later in life, and then, probably, the defect will not be made out by the medical practitioner. This kind of opacity, when light is thrown upon it by the ophthalmoscope, gives the lens a pale-coloured striated appearance. I have a patient under my care suffering from this kind of affection. The youth, eighteen years of age, is extremely myopic, only able to count fingers at six inches, cannot distinguish colours, and is quite unable to read ordinary sized type. No relief whatever is obtained by glasses.

Differing in origin from the siliculose capsulo-lenticular cataract before mentioned, I have occasionally seen a similar result take place after a slight penetrating wound inflicted by a sharp-pointed instrument. The aqueous humour having been admitted into the capsule, the external portion of the

lens is dissolved, leaving only a nucleus behind. In a case which came under my care, the wound was inflicted by the wife of my patient in the following singular way: The lady was busy sewing, and her husband, standing near the back of the chair, in an unguarded moment bent over her right shoulder to whisper something in her ear, when the needle being suddenly raised, touched his eye and penetrated the capsule of the lens, producing cataract.

Many cases of common capsulo-lenticular cataract are met with which undoubtedly have a secondary origin. Morgagnian effusion, inflammation of the capsule and hyaloid, or even some slight traumatic injury, will give rise to this form of the disease. In some instances I have observed, on dilating the pupil, only a very slight opacity; nevertheless, but a small improvement of vision takes place after the instillation of atropine. Fluidity of the vitreous is often an accompaniment of this kind of cataract; very feeble sensibility to light at once indicates that any attempt at an operation will in all probability leave the patient worse than he was found.

There are cataracts called by the olden writers *spurious*, but which are the usual products of an effusion of lymph. Such apparent opacities often originate in inflammation of the iris, associated with rheumatism, and mostly terminate in adhesions of the pupil. It has been observed that the body of the lens retains its transparency, and the capsule remains perfectly clear, except within the central area of the pupil.

Purulent cataract arises from lymphatic effusion; and the sanguineous, from vessels of the choroid becoming ruptured during some severe internal inflammation. These several forms are all more or less the secondary effects of other diseases.

It is not quite clear how often capsulo-lenticular opacity results from secondary causes. I have seen remarkable changes take place in the capsules of persons just past the

adult period of life, which can only be accounted for by supposing that they have proceeded from a slow disorganization of the capsule and lens. By osmosis the white blood corpuscles probably pass through the walls of the capillaries, and, finding an abnormal quantity of chloride of sodium secreted, mix, become changed, and in that way affect the transparency of the lens and capsule: or minute particles of fat may produce a similar change. It is no unusual thing to discover, on making a microscopical examination of a lens after extraction, fat globules mixed up with the shreds of its disintegrated substance.

General and remote complications of cataract are indeed endless. Among the most frequent are rheumatic affections, gout, syphilis, struma, &c. It is, then, of the highest importance to make oneself acquainted with the history of the patient's previous state of health—whether suffering from organic disease of the heart, lung, etc.—as all these complications would render operations of any kind hazardous, especially so, that of extraction. "If," writes Mackenzie, "the progress of life of a patient has been attended with serious disease of the system, so that the general tone is much lowered, the influence of such a state may prove unfavorable; so that in all cases of lenticular opacity the question is, not whether an operation is likely to cure or benefit the patient, but rather is there nothing about the general health likely to *frustrate the success of an operation*, no local disease in another organ likely by sympathy to affect the eye and bring on inflammation." I am aware that this advice is not quite in accordance with the heroic practice of the day. There are some practitioners who disregard such precautions; because, as they believe, their skill will enable them to avert all subsequent complications. The dangers of secondary affections are, nevertheless, not so exceptional nor unimportant.

Let it, then, be steadily kept in view that the com-

plications of cataractous disease are numerous; and that, in a large proportion of cases, medical treatment is not only desirable, but absolutely necessary.

I will now direct attention to the practical lessons which may be deduced from certain other physiological investigations into the cause and cure of lenticular disease.

The first observations on the cure of cataract which attracted my notice were those of Sir David Brewster, who, in the year 1836, contributed papers on the "Theory and Cause of Cataract" to the Reports of the British Association. A later paper appeared in the Transactions of the Royal Society of Edinburgh, 1865, "On the Cause and Cure of Cataract," in which he tells us that he cured himself of an incipient attack, which, for some time, had been the means of causing him great annoyance and anxiety. A statement of the kind, coming from one deservedly ranking high as an authority upon matters pertaining to optical science, as well as the physiology of vision, and whose reputation as an original thinker and investigator was European, should be received with profound respect.

Before, however, I had the opportunity of attentively perusing the last-mentioned paper, I felt a strong desire to give medical remedies a trial. I therefore wrote to Sir David, asking for information on the subject; to which he at once replied, kindly and courteously (June 30, 1865): "The cure is effected—1st. By the repeated evacuation of the aqueous humour, in the hope of a more healthy secretion being supplied. Or, 2nd. By injecting water, or a fluid equivalent in composition to the aqueous humour, after evacuation of the natural secretion. 3rd. By injecting, in cases of soft cataract, a fluid containing more albumen than exists in the aqueous humour, if simple evacuation is not successful. 4th. By employing some medical agent. In my own case, the pulvis salinus compositus was the remedy."

On receipt of this communication, I proceeded to put his views to the test of experience, both in private and Hospital practice. Before I state anything about the results obtained, it is necessary that I should refer somewhat in detail to Brewster's paper, as it appears in the Transactions of the Royal Society; as from it we shall learn how his attention came to be directed to the medical aspect of the cure of cataract. "Writing from memory," says Sir David, "about forty years ago I experienced an incipient attack of cataract, and was thereby led to study its progress and cure. While engaged at a game of chess with a friend, I amused myself at intervals with looking at the streams of light which appeared to radiate from the flame of a candle in certain positions of the eyelids. Observing this for a short time, I was not a little surprised to find the flame of the candle surrounded with lines of light of an imperfectly triangular form, some parts of which were deeply tinged with the prismatic colours. On another occasion, while walking home, I observed figures most distinctly round the moon and other sources of light; and, upon making a careful examination, I soon discovered that all this proceeded from the crystalline lens, which had become slightly separated near its centre, the fissure extending towards the margin into the laminæ."

This condition of the lens Sir David believed to be due to the "Albuminous fluid," the liquor Morgagni, which so wonderfully unites into one transparent body, as pure as a drop of water, the mass of toothed fibres which compose the crystalline. "These not being sufficiently supplied with fluid, if this process of desiccation continue, the whole laminæ of the lens would have separated, and that state of white opacity would be induced which no attempt has ever been made to remove, except by operation."

Under the advice of his medical attendant, Sir David made trial of various remedies, without deriving benefit

from them. He, however, was not disheartened; and, knowing the sympathy subsisting between the stomach and the eye, ultimately came to the determination to give a final trial to the pulvis salinus compositus. In about eight months from the date of the first administration of the remedy, all the apparitions that had so long annoyed him disappeared; and, remarkable to relate, one day "The laminæ of the crystalline body were suddenly brought into optical contact."

Pondering over the cataractous condition, and the process by means of which the crystalline is supplied with the necessary quantity of fluid, Sir David came to the conclusion "that it might be derived from the aqueous humour, and thus cataract be produced when there was too little water and too much albumen in the fluid which filled the aqueous chamber;" and upon this hypothesis he argued that incipient cataract might be cured in two ways:—

1st. By discharging a portion of the aqueous, in the hope that its fresh secretion might contain a less proportion of albumen, and so counteract the desiccation of the lens.

Or, 2nd. By injecting distilled water into the anterior chamber after evacuation, to supply the quantity discharged, and thus change its specific gravity.

The first of these methods is known to be both practicable and safe; and, from the fact that conical cornea is often treated by tapping, and that the aqueous is as often and as speedily renewed, it must have suggested itself to his mind. Injecting distilled water into the anterior chamber had also been resorted to, without having been productive of injury of any kind, although a very delicate operation—Sir David having frequently experimented upon dead eyes, and found, on immersing them in water, that the water readily passed through the elastic laminæ, and in the course of a few days the capsule became ruptured and broken up.

Such a phenomenon seemed to him to have a bearing of obvious importance in reference to the cause and cure of at least two kinds of cataract. The aqueous, he argues, "is in immediate contact with the capsule of the crystalline. When, therefore, the humour contains too little water, the lens has not a sufficient supply of the fluid which keeps its fibres and laminæ in optical contact, and hence the laminæ separate, and the lens becomes opaque and hard. When, on the contrary, the aqueous contains too much water, the capsule permits the excess to pass into the lens substance, and produce the more dangerous affection of soft cataract."

To cure the first of these kinds of cataract, we must discharge a portion of the aqueous humour, and either supply its place by injecting distilled water, or leave it to nature to supply a secretion made more healthy by the administration of certain remedies. To remove the second kind of opacity, we must supply the place of the discharged humour with a solution of a different density, containing albumen; or, as in the former case, induce nature to produce a more albuminous secretion.

It has been well ascertained that many kinds of lenticular opacities, such as radiating striæ, with ramifications proceeding from the centre to the periphery of the lens, believed by the patient to be of a dark colour, but which are white and with pearly spots distributed over the surface, appear suddenly, and increase for a time, varying from a few days to months, and then as suddenly disappear. The striated appearances increase as age advances and partly explain the progress of diminished sight. But when they appear, as it were, suddenly, and with equal rapidity disappear, this at once proves the entoptical character of the phenomena. With one so well versed in optical appearances as Sir David, it would scarcely have been possible to have mistaken such defects.

A careful consideration of the facts disclosed in this paper give increased confidence to the belief that we ought to obtain perfect success in the treatment of cases of capsular and lenticular cataracts.

I have notes of a great many cases medically treated with considerable success. The majority of persons, however, who present themselves at the out-patient department of the Ophthalmic Hospital belong to the very poor. The health of such persons is usually low, anæmia prevails, and among the first and most important considerations in prescribing are those which relate to the improvement of the blood, and the renewed tone and vigour of the system. It is very well understood that if alimentary matters are not furnished in a sufficient quantity, and of a proper quality, the blood is rendered abnormal; and it necessarily follows that the materials given off will be abnormal also, and subsequent transformations more or less modified. Experience enables me to confirm what I have before stated, that early failure in the powers of life is frequently a direct associate of cataract; and in such cases we should not look for much good resulting from the administration of uncombined saline medicines.

I prescribe iron largely and in various forms; and, following out this plan, have had the satisfaction of delaying the formation of cataract, and often succeeded in preventing cases passing from the incipient stage. I have also noticed striæ diminish in density; and, if I can pronounce an opinion from the time which has elapsed since the patients were under treatment, I believe I have arrested the disease. In the case of a lady, about fifty-six years of age, whose sight was rapidly decreasing during some four years and upwards, treatment has been extremely useful. The striæ in the right eye have nearly disappeared, and vision is altogether so much improved that she reads and sews with comfort. A gentleman,

aged seventy, who only first noticed the great deterioration of the sight of the right eye after a severe shaking in a railway accident, to which cause he attributed his loss of sight, but which, I believe, arose from a severe attack of rheumatism which had on a former occasion impaired his vision, and now produced a marked opacity, has, by a judicious course of treatment directed to his rheumatic diathesis, attention to diet, &c. improved his vision a good deal. In very many other instances the treatment adopted has been very successful. I need not, however, enter further into particulars: I will simply add, that you must not expect either miraculous or even rapid cures in such cases; since it is always found that deposits or opacities in the delicate textures of the eye are slowly and almost imperceptibly removed. Constant observations with the ophthalmoscope, and a careful comparison made from time to time with test types, will alone reveal the work which the remedy is effecting for the patient.

A few observations only are necessary to introduce the second part of Sir David Brewster's proposition, that of evacuating the aqueous humour of the anterior chamber by repeated paracenteses oculi, to the value of which much independent testimony has been borne. In the first place, let me direct attention to the experience of Dr. C. Sperino, of Turin, who gives the results of fifty-five cases which have been unusually successful.

Dr. C. Raymond, of Paris, has lately tried Sperino's method in a variety of diseases—cataract, irido-choroiditis, and other inflammatory conditions, and with, he assures us, a large amount of success. A similar report appeared in one of the medical periodicals, from the pen of a gentleman practising in India: he also wrote in terms of praise of the operation of paracentesis and quickly repeated evacuations. I confess that a more careful perusal of Sperino's writings convinced me that his proposal of repeated paracenteses

has not been fully understood in this country. It differs from the ordinarily practised paracentesis oculi, as much so as that of section of the ciliary structures does from paracentesis pure and simple.

Half a century ago, paracentesis oculi was recommended and practised by Wardrop in certain inflammatory conditions of the eye. He particularizes cloudiness in the aqueous as a symptom demanding speedy relief by early evacuation of the humours, for the purpose of "diminishing irritation and lessening pain and tension of the organ." Dr. Sperino, in the first instance, made trial of simple paracentesis very much for the same purpose. Most assuredly he does not appear to have employed it on purely physiological grounds; but rather as an important auxiliary to other remedies, and to subdue the inflammatory stage of glaucoma, irido-choroiditis, hypopion, iritis, keratitis, threatened penetrating ulcer of the cornea, &c. I may particularly call attention to the fact that it was in these several forms of disease that section of the ciliary muscle was practised at the Royal Westminster Ophthalmic Hospital in the year 1859, with an amount of success which then attracted much attention. For many years prior to that date, I had practised paracentesis in conical cornea by repeated evacuations of the aqueous; in some cases, repeating the operation from twenty to thirty times. In a few instances, and by the direction of the late Mr. Guthrie, I have tapped the anterior chamber every second day, that is, three and four times a week for a couple of months, but, so far as I believe, at that time, without sensibly diminishing conicity of the cornea. Beer and Rosas employed paracentesis in cases of hydropthalmia with marked benefit. Beer was particularly careful to repeat the operation through the same opening in the cornea, and he employed a probe for the purpose. Pittard tried the operation in a disease formerly known as *aquo-capsulitis*. The instrument he devised

very nearly resembled the knife used by Graëfe in iridectomy, with this difference, that it was double-bladed, one blade sliding over the other; the edge of one blade was not cutting, but acted as a grooved director for the purpose of gradually evacuating the aqueous.

The late Dr. Mackenzie once said, of paracentesis, that "although in certain cases an invaluable remedy, it is rather too nice an operation to come into general use"—a remark that must surprise modern ophthalmic surgeons. The kind of instrument preferred by Mackenzie was a broad iris knife; and the puncture, he says, should be "a tenth of an inch from the juncture of the cornea with the sclerotic, upon any point of the circumference, the more dependent part being chosen if possible. When the knife has been made to penetrate the chamber, it should be partly withdrawn and slightly rotated on its axis, to allow of the aqueous gradually draining away; the instrument is not withdrawn until all the fluid has escaped."

Desmarres prefers a thin conical knife; and, after a first operation, inserts a probe through the same opening, repeating the evacuation two or three times during the day. Dr. Sperino's practice, although bolder, resembles that of Desmarres; and he employs for the paracentesis a small knife with a double-cutting edge, slightly curved on the flat, the concavity being turned upwards after it has penetrated the chamber. The aqueous is gradually drained off, and in all subsequent repetitions of the operation, a probe is inserted through the same opening. The junction of cornea with sclerotic is the point chosen; and the opening in the first instance, for certain reasons, must not be too small. His practice is to repeat the evacuation as soon as the aqueous shall have become secreted. The knife, on entering the chamber, must be kept perfectly parallel to the iris, otherwise this membrane may be injured or prolapsed, as it will be some-

times in the most skilful hands when the aqueous is too suddenly evacuated. Should prolapsus iridis occur, the eye should be exposed to a strong light for a second or two. If this does not cause the iris to be withdrawn, or it cannot be returned by making gentle pressure with a curette, it is better to excise it than leave it exposed to the irritation and pressure of the eyelid. After each operation, cover the eye for a time with a soft pad and bandage, and allow them to remain on until all pain has subsided. This is a precautionary measure in most operations of the eye: in paracentesis, the smarting pain of the operation passes off in a few minutes; however, should much pain follow, it is advisable not to repeat the evacuation so soon as it might otherwise have been thought advisable.

When paracentesis is practised for the relief of other disease than that of cataract, Dr. Sperino agrees with me that it is of the utmost importance that a diminution of the tension—intra-ocular pressure—should be the absolute result attained: nothing short of this can be expected to be of service to the patient. The good acquired may, in some cases, be measured by observing the iris, which, before the operation, is pushed forward, and appears to take a convex form, pressing against the posterior part of the cornea. Dr. Sperino has found it useful to keep the pupil in a semi-state of dilatation, which, in his opinion, renders the eye more tolerant of the evacuations. But, in accordance with the capacity of the eye to bear a repetition of the paracentesis, we recognise the measure of the amount of good to be looked for in most cases. As to the kind of cataract which is likely to be most benefited, he finds it may be resorted to in nearly all forms and states of the cataractous disease; and if, as he asserts, the formation of cataract depends entirely upon a disordered state of the circulation, that is, on a previous inflammatory condition, then a free paracentesis, and

often repeated, may be expected to assist therapeutical means. The ophthalmoscope reveals the earliest indications of opacity; and it is, undoubtedly, at this period that paracentesis and medical remedies may be most advantageously employed. With Sperino, I believe that an opaque lens may recover its transparency, provided its histological elements have not been entirely destroyed or seriously impaired by the violence of the attack. He has observed that the amount of disorganization in the crystalline body marks, in all cases, the limit and extent of the number of tappings required to restore it to transparency; and, from the very first evacuation, a check is given to the further progress of the disease; that is, if the cataractous condition is uncomplicated with disease of the choroid or retina. It may be gathered, from what I have stated, that diminished sensibility of vision with advancing age often rests on a double basis: first, on the integrity and transparency of the media; and next, on the nervous sensibility which regulates the vascular supply. The first gives rise to less accurately defined images on the perceptive layer of the retina; and the second renders perception and conduction unreliable and imperfect in every case, varying only in degree. Traumatic cataracts are not usually comprised under the head of curable, but only when accident has produced a slight amount of opacity, and has not disturbed the attachment of the lens, nor seriously interfered with its vascular supply and nourishment. I have known cataract to be produced by a very slight blow on the eye, and without rupture of the capsule; also, as the result of a shock, as in a slight railway collision, when opacity of lens ensues. In such cases, the violent concussion, or it may be the fright, has caused some disturbance of nutrition. We must not regard such cases as hopeless, but, without delay, make trial of paracentesis, and well-directed medical remedies. I must say that, in my experience of traumatic injuries of

the eye, they are too often altogether abandoned; while judicious and proper treatment, early resorted to, will very frequently prevent loss of sight.

As an evidence of the value of paracentesis oculi in every stage of cataract, even the most advanced, Sperino relates the case of Mme. Guidilia, aged eighty-one, whose sight had for some time been nearly lost from double cataract. Paracentesis was performed, at intervals of from twenty-four to forty-eight hours, no less than thirty-two times. After the first tapping, the sight began to improve, and in two months opacity had so far disappeared that she was able to read large type, and even thread her needle. Dr. Sperino, having obtained so much unexpected good in this instance tried paracentesis in a number of other cases; and in five out of six, an improved state of vision resulted. The commencement of the improvement takes place, first, on the side the puncture is made, and the clearing up of the opacity gradually extends. It is of some importance that a proper examination be made of the extent and range of the patient's vision, both before and several times after the operation, at stated periods: the perception of objects, whether easily and quickly recognised, and at what distances the dots or letters on the test card can be read: the shadows of objects should be noted, their intensity, and whether central or lateral vision be lost, and at what distances; for, it is almost needless to observe, that, in proportion as the crystalline clears, so will the patient's sight improve, and enable him to mark small objects, and at stated distances.

Repeated punctures, through the same opening if possible, and the number and frequency of the evacuations, must always, more or less, depend upon a renewal of the aqueous. It may be the work of an hour, or of two hours, or of as many days; but, as Dr. Sperino assures us, no unhappy result has followed paracentesis oculi in his hands, we may

proceed to repeat the operation with a boldness which may well excite the astonishment of those who have not witnessed division of the ciliary structures. There cannot be a doubt of the value of the latter for the relief of tension, and for the purpose of unloading the gorged and turged vessels of the ciliary zone, and, at the same time, evacuating the distended aqueous chamber: by diminishing pressure, the choroidal circulation is restored, inflammatory action arrested, and disorganization of the nervous tissues averted.

The subject, however, is so thoroughly interesting, as one of surgical and scientific enquiry, that it well deserves to occupy the serious attention of all those whose professional engagements and scientific pursuits may afford the motive and opportunity. I shall be content if I have succeeded in arousing attention to the subject, thrown one ray of light on the pathology of cataract, or shown those interested and engaged in the practice of ophthalmic medicine, that cataract is not quite out of the pale of the therapeutic resources of our art.

When coagulation of the globulin or albumen of the lens has proceeded beyond a specified point, then all hope of restoration by therapeutical means must be abandoned. I would not have you think that I wish to deny a fact so patent, that there will always be a large number of cases of cataract, recognized by the surgeon as *hard*, which will prove to be too far advanced to be amenable to medical means, and, consequently, resort must be had to extraction of the lens. Nevertheless, what I have endeavoured to place in an impartial manner before you, will, I am convinced, be the means of directing more attention to the importance of sifting, as it were, or rather selecting the fittest cases for the operator's knife. It is, in my opinion, owing to a want of care in selecting proper cases for extraction that failure often ensues. Then there is, also, the resort to certain vaunted

modifications, as they are termed, which frequently end in mutilations of eyes, rather than restoration of sight, and which has much tended to divert attention from the well-known operation for the removal of cataract, so long and so successfully performed by the late Mr. Guthrie, at the Royal Westminster Ophthalmic Hospital. My colleagues and myself at that Institution still give the preference it so well merits to the *flap operation* of that master of eye surgery; and the unvarying results may well challenge comparison with those obtained by any other mode of operating in any Eye Institution in the world.

It is almost needless to repeat Mr. Guthrie's directions for extraction: yet, for the benefit of those who have not had an opportunity of seeing the operation, it may be well to do so: premising that extraction will only be resorted to in cases of hard cataract, which may be easily distinguished from all others by practitioners of experience.

"The surgeon who proposes to perform the operation for cataract by extraction, should have been accustomed to operations on the eye. He should have performed every other several times over, before he approaches this, the *ne plus ultra* of perfection in such operations; and his hand should be so steady that the point of the knife, when duly poised between the fore-finger and thumb, and slightly resting on the second finger, shall not be seen to move in the slightest degree for twice the time necessary for the performance of the operation: and no man should attempt it, unless his fingers and nerves are of a conformation to admit of this being done. Practice in operating often gives a confidence which overcomes this evil, when it depends on nervousness alone; which is the reason for the direction given that it should be the last operation on the eye the inexperienced surgeon should attempt. If the defect or tremor is a physical inconvenience, the surgeon who is the sufferer should not operate by extraction.

The operation by extraction should always be done by making the incision upwards, and any deviation from this should be considered as an exception to the rule, caused by the great inconvenience which would attend its performance upwards, from the protruberance of the orbit, the sunken state of the eye-ball, or from that fear which will sometimes so pervade persons that they cannot be induced to turn the eye downwards, so as even to allow the pupil to be seen, much more to expose the upper part of the cornea. In such cases the division of the cornea must be effected downwards, or downwards and upwards, which, if it can be done, prevents the edge of the flap of the cornea from being raised by the edge of the lower eye-lid, an accident which will not, however occur so often as is supposed, if the incision should have been happily made. The real evil of the incision downwards is, that the edge of the flap will be raised more certainly when the incision has not been well made; and that when any accident occurs, of whatever nature, to prevent the adhesion of the incised parts by the first intention or the adhesive process, there will inevitably be a cicatrix of a greater or less extent, into and behind which the pupil may and usually will be drawn, so as to prevent vision. If such accidents should occur when the incision is made upwards, the lower part of the cornea is clear, and the iris behind it is sound, in which an artificial pupil may be made with the greatest advantage; a pupil below being of much more advantage than a considerably larger one above. The irritation and distress arising from exactly the same accident upwards, is nearly as nothing when compared with what takes place when it occurs downwards.

The position of the patient is of importance. Some operators prefer the recumbent. I always place the patient in a high-backed chair, with the head well supported, and capable of being turned a little backwards; but whatever

may be the position preferred, it is advisable to adopt it always if it can possibly be done. There is something in the habit of doing a thing; and a slight change from the usual mode of operating may lead to an untoward event that might perhaps have been avoided. The surgeon should always operate with the hand he is in the habit of using commonly. A man may learn to operate well with both hands; but, unless he is naturally ambidexter, he learns it at the expense of many an unfortunate person, who pays with his sight for the acquirement of a very unnecessary dexterity, which is by much too dearly purchased, and at by far too high a price to avoid a simple change of position. To prevent this dreadful evil, the surgeon should stand behind the patient when operating on the right eye, and before him when operating on the left.

The patient should be placed opposite a single clear steady light, without sunshine, and a northern light is the best, although it is not of much consequence what light it is, provided it is unaccompanied by the beams of the sun. He should be seated in an arm chair, the back of which should be low enough to support the head when gently inclined backwards. A night-cap fitted exactly to the head, so that it cannot move, should now be put on: the fore part should be turned up if it comes too low down on the forehead, and the middle of a light thin spongy kind of linen bandage, two inches and a half wide, and just long enough to cross over the eyes and to pin on the sides of the head, should be sewed to the centre of it behind, ready for use.

For the operation on the right eye, the surgeon should place himself behind the patient, and he will usually find it necessary to stand on a stool, in order to raise himself to such a height that he may readily lean over, and have his hands at perfect ease; and in that position and distance from his own head or chest, which is most convenient to him.

The patient's head being a little inclined backwards, and duly, although gently and comfortably, supported by the cushion or back of the chair, the surgeon, leaning over from behind, brings the first two fingers of the left hand over the forehead gently down on the eyelid, and raises it up slowly and tenderly, so as to fix it ultimately against the upper edge of the orbit; and to be able to retain it there so perfectly with the end of the fore-finger only, that the patient cannot lower it or close the eyelid by any effort he can make. He should also be able to do this, and to make a little pressure on the eyeball, in order to fix it at the moment the incision is begun. As soon as the index finger is in this position, the second finger leaves the upper, and lowers the under lid, pressing it towards the edge of the orbit below. The eye is thus completely exposed, and may be almost fixed between the two fingers. To do all this well, requires a certain degree of practice, but which is very easily acquired. It must be done very gently, very tenderly, and without giving pain, or almost uneasiness. The error usually committed is in using too much force with the extremity of the fore finger, which gives pain and makes the patient swerve; and it is an error of such great importance, that the surgeon must practise this part of the operation until he feels that he does it as a matter of art, not of force.

The left eye may be fixed in a similar manner; or the surgeon, standing before the patient, raises the upper lid with the side of the fore finger of the left hand, and depresses the under lid with the thumb, the hand being over the nose. The pressure of the fore finger tends to fix the eye at the same time, and to render it as immovable as possible; and this mode of proceeding I generally adopt in preference for the left eye.

The eye being thus opened, and the eyelids retained asunder, the eye loses all the extreme sensibility with which it is

endowed for its security and preservation in its ordinary state. Public opinion, which, on medical subjects, is generally erroneous, although for the most part founded on professional authority, is in no instance more injurious than in relation to the eye. It pronounces it to be an organ of a very delicate nature, exquisitely sensitive, requiring the greatest delicacy of touch, and the utmost necessity of management; which opinion some oculists formerly found it convenient to support, and which the public may still continue to believe without any great disadvantage; but students in surgery must be taught otherwise. They must learn that the eye is not so very delicate; that it will suffer more comparative violence with less injury, than any other organ of importance in the whole body; that so far from being exquisitely sensitive, it is, when exposed in a healthy state, nearly the reverse, only becoming permanently so on the occurrence of inflammation; and that the ablest and most successful operators are not apparently, although they are in reality, the most tender in their proceedings. The opinion of the exquisite sensibility of the eye has arisen from the pain which is felt on the admission of a small piece of dirt, or a fly between the eye-lids; but this occurs from a wise and preservative provision of nature, on account of the insensibility of the eyeball itself. Let the eyelid be raised, and the same piece of dust applied to the surface of the eye, no pain and scarcely a sensation will be produced; remove the piece of dirt, turn out the lid, and whilst it is retained everted, place the piece of dirt upon it, no greater sensation will be induced than is felt when it is applied to the eyeball. The inference is, that both surfaces, when touched separately, are nearly insensible to the species of irritation. But let the same piece of dirt be put between the eyelid and the eyeball, and the sensation produced is exquisitely painful. To give rise to this sensation, it is necessary that the two surfaces should come in contact, and that

the foreign body be grasped between them. If this were not the case, an irreparable injury would often occur to the transparent part of the eye before it would be observed; and if the raising of the lid and the separation of the surfaces did not nearly annul sensation, an operation could not be performed for cataract: for who could bear, without chloroform, the sensation which must arise from pushing a needle into the eye, if it were analogous to that arising from a fly, or a dry solid substance between the lids? The experiment may be tried in a very simple and conclusive manner by any one on himself, by merely keeping the lids apart by an effort of the will, when the end of the finger may be placed boldly on the eyeball without any inconvenience. Inflammation, by enlarging the vessels, gives rise to pain in the same way; and the sensation is, at first, as if some extraneous matter were interposed between the lids. The sensibility presumed to exist in the organ naturally led to the conclusion that the operations required to be performed upon it must be difficult of accomplishment; and the science of optics, in showing the beautiful arrangement of its structure, and the complexity of its functions, induced a belief that the slightest alteration in its composition must be fatal to its mechanism: but this is not found to be the case. Few persons can, however, duly estimate the liberties that may be taken with the eye, until they have seen several operations performed; when the false ideas they have imbibed will be completely removed, and *new feelings will arise in admiration of the benignity of the Creator; who, in rendering the eyeball nearly insensible, enables it in its quiescent state to undergo those operations which are frequently necessary for the recovery of sight.*"

FINIS.

J. MALLETT, PRINTER, 59, WARDOUR STREET, SOHO.