

A manual of the anatomy, physiology, & diseases of the eye and its appendages / By S.J. Stratford.

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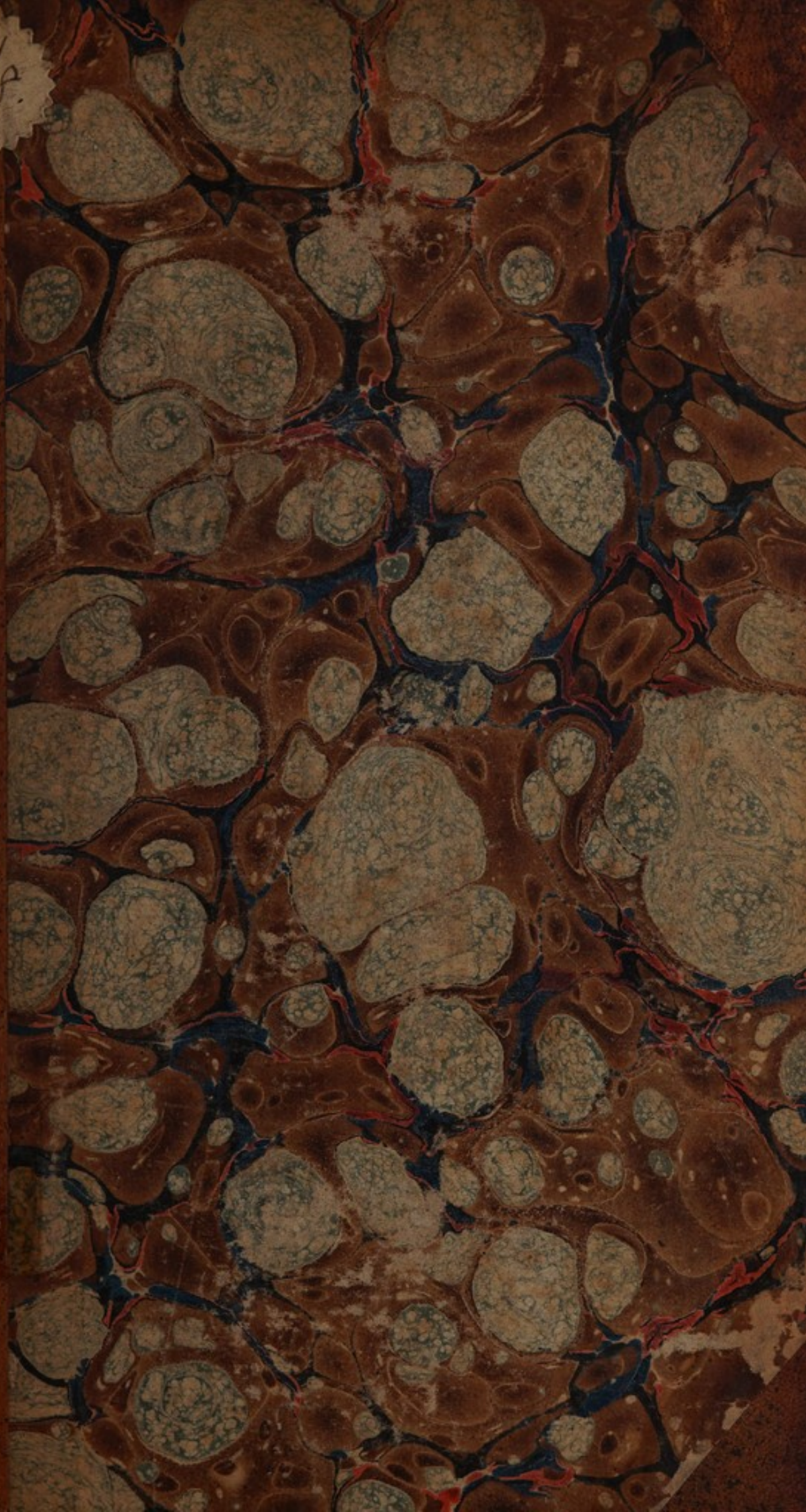
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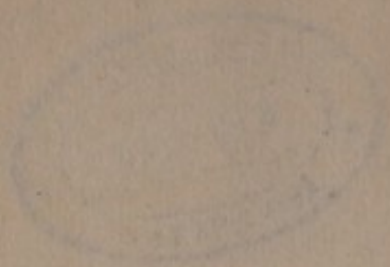
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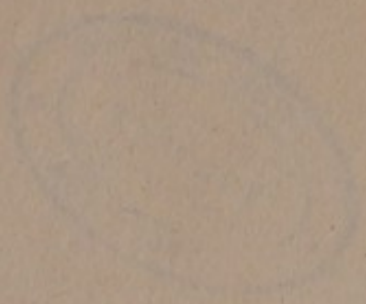
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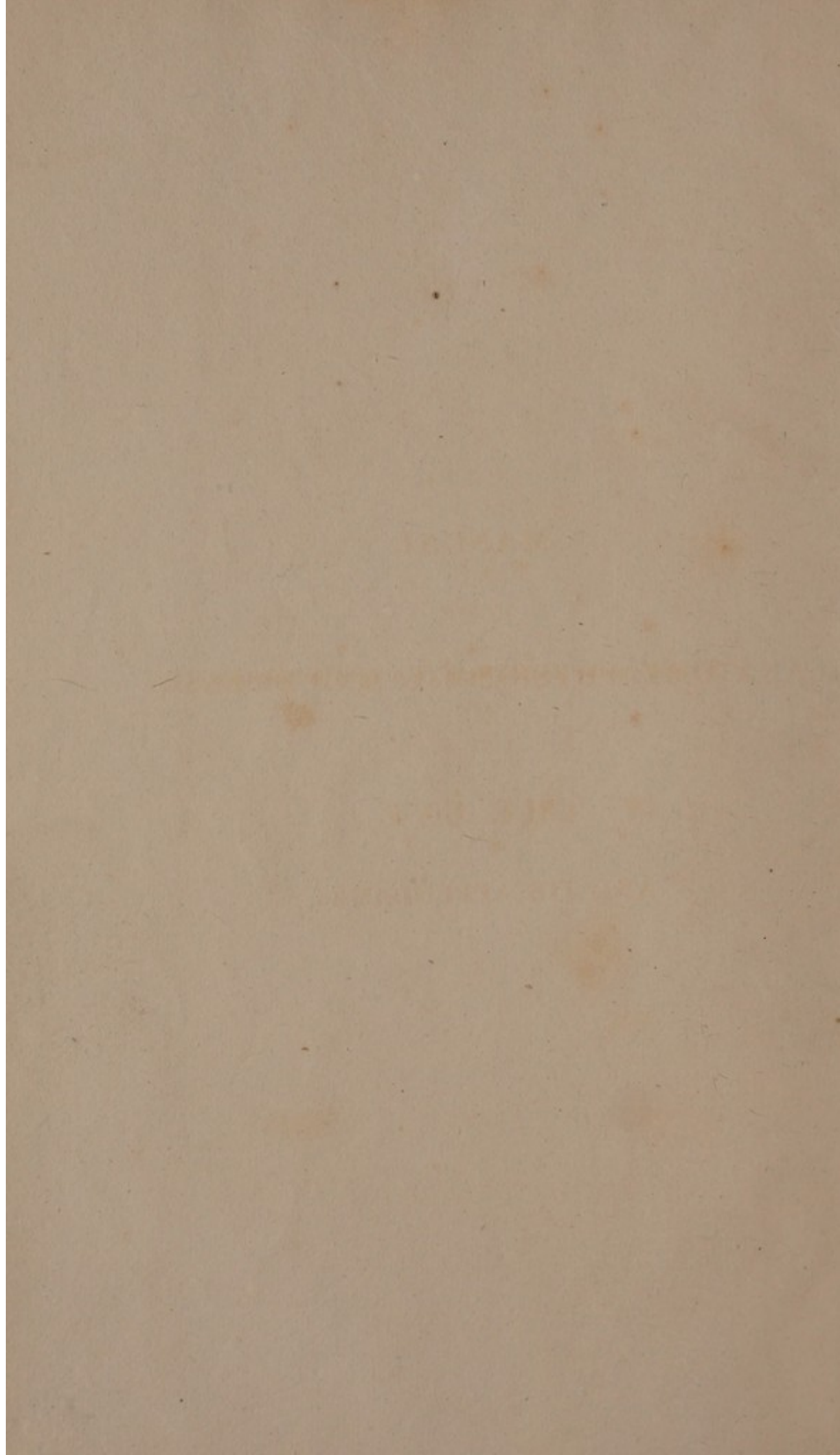
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A
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ANATOMY, PHYSIOLOGY, AND DISEASES
OF
THE EYE
AND ITS APPENDAGES.





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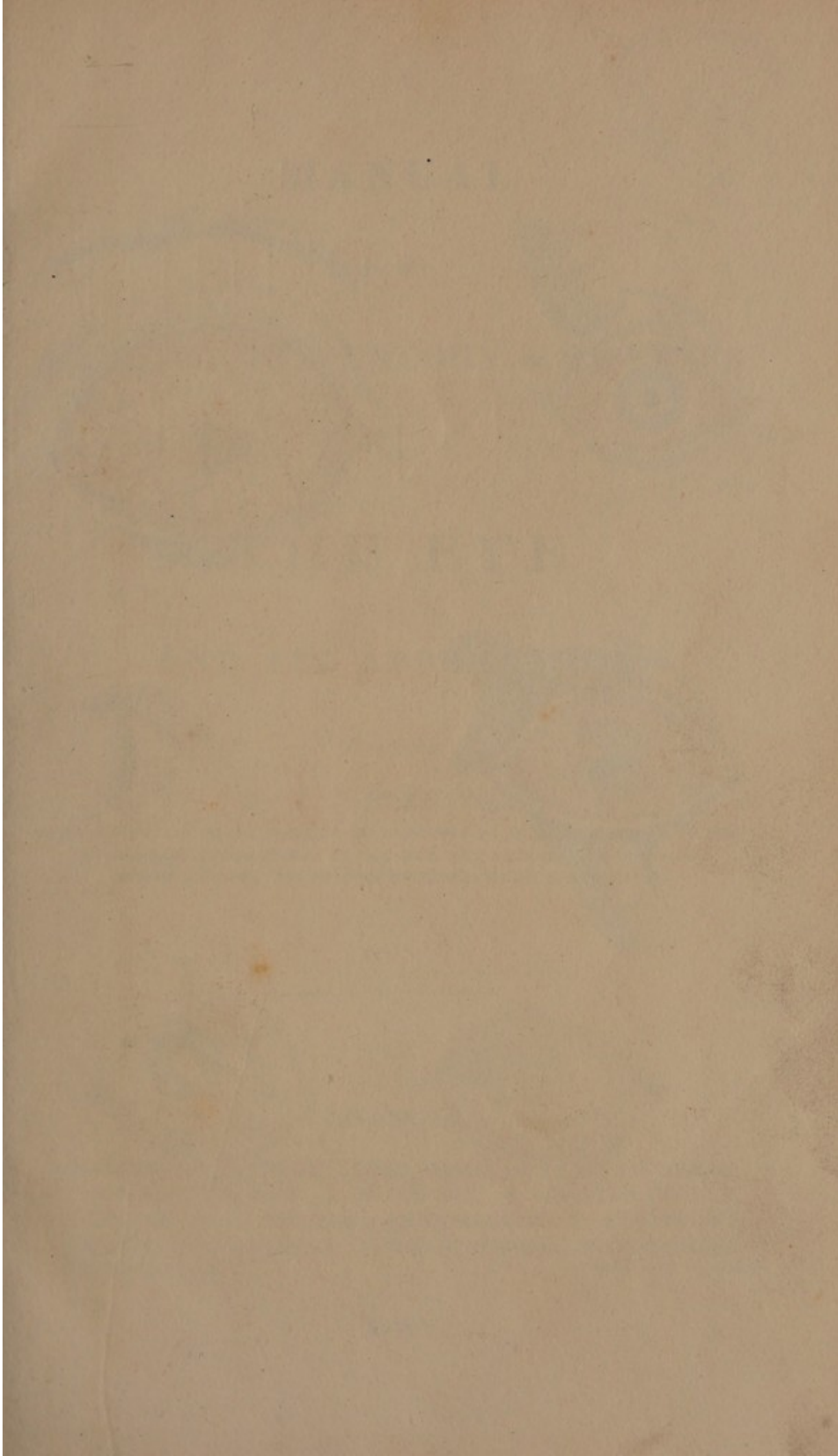
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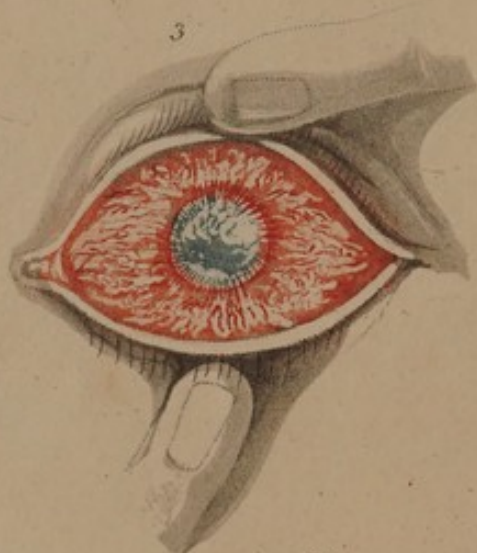
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OF

THE EYE

AND ITS AFFECTIONS.





Drawn by S. J. Stratford.

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MANUAL

OF THE

ANATOMY, PHYSIOLOGY, & DISEASES

OF

THE EYE

AND ITS APPENDAGES.

By S. J. STRATFORD,

MEMBER OF THE ROYAL COLLEGE OF SURGEONS IN LONDON, SURGEON TO THE
DISPENSARY FOR DISEASES OF THE EYE, AND LATE SENIOR ASSISTANT-
SURGEON OF THE 72D, OR DUKE OF ALBANY'S OWN HIGHLANDERS.

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CROSS; T. H. WHEELER; AND H. DEIGHTON, HIGH-STREET,
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WORCESTER.

1858

PREFACE.

TO

SIR JAMES M'GREGOR, BART. M.D. F.R.S.

THE LIBERAL PATRON OF EVERY DEPARTMENT OF
MEDICAL SCIENCE;

ALSO TO

GEORGE JAMES GUTHRIE, ESQ.

SURGEON,

AND

SAMUEL REED, ESQ.

TREASURER,

TO THE

ROYAL WESTMINSTER INFIRMARY FOR DISEASES OF THE EYE,

WITH EVERY ACKNOWLEDGMENT OF

GRATITUDE AND RESPECT,

BY THEIR VERY HUMBLE AND DEVOTED SERVANT,

THE AUTHOR.

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PREFACE.

As the Study of the Diseases of the Eye, which was formerly very much neglected by the regular surgeon, is now, properly considered, a branch with which he should be perfectly conversant, the want of a work that should present, at one view, what is most worthy of our attention on this subject, seemed to be called for: in attempting such, I trust, at the same time that I evince my attention to the duties of my profession, I may be of use to some of its members. In the following pages it has been my intention, to combine a general view of the Anatomy, Physiology, and Diseases of the organ in question; which, I hope, will be found concise and easy of comprehension. As to the Anatomy, a perfect knowledge of it, is an indispensable requisite for one who desires to practise this department of our profession, with pleasure to himself or benefit to his fellow-creatures: from it are deducible all the rules of practice that have been found useful by the test

of experience ; while, without it, the operator would often find himself in difficulties that would perplex and vex him. Attention also to the different Tissues and Humours of the Eye, has enabled the Physiologist the more readily and justly to speculate upon the uses of these several parts, while a better knowledge of the Science of Optics has tended to strengthen and confirm them ; and now that the Physiology of the organ will illumine the mind of the surgeon, it must call upon all to admire the beauty and adaptation of its form. If, in any portion of the following description, I have ventured to speculate upon the forms and uses of a part, I trust that, in seeking the hidden truth, I have done it with candour and sincerity, and shall be found supported by analogy ; in many instances, the only true basis left to right conclusion. From the more precise distinction of the coats and humours of the Eye which we now possess, is deducible a superior facility of distinction in the many and different diseases that affect or implicate this delicate and beautiful organ ; and if I have ventured, in my account of these diseases, somewhat further than has previously been attempted, I sincerely hope that the points I have endeavoured to establish will bear the test of experience, and in the end be found of use to the Practical Surgeon.

The incentives to the study of Ophthalmic Surgery are very considerable; setting aside the mere stimulus of lucre, what can be more curious and interesting, than the restoration to sight, and all its enjoyments, of a person who has not for years participated in its pleasures? and who among the most sordid of our profession, that ever heard the expression of feeling, and delight of a blind restored to sight, and did not experience an interest, and a pleasure far superior to his usual sensations? while the varied delights which vision presents to us are often only valued according to their true estimate, when we happen to be deprived of them. It has often been thought, that the delicacy of the organ must preclude the employment of any powerful means in the cure of its diseases, but the mind enlightened by the perfect knowledge of the part, will readily know to what extent the hand may proceed. This is but a vulgar fear, founded upon the dread of losing so excellent a sense; while, perhaps, it may be the reason that Ophthalmic Surgery was not, in times past, more generally studied; at that period its principles and operations were entirely consigned to men whose knowledge was handed to them from their fathers, and they followed the rules, in the treatment of these diseases, which he alone taught them, without looking to the book of Nature, and

drawing from Anatomy those conclusions which now assist us to distinguish with accuracy, the many affections to which the parts are liable. The power of diagnosis in these complaints, now that this is fixed upon general and correct principles, is speedily comprehended, by the meanest capacity, and easily acquired by the diligent student.

44, FOREGATE STREET,

WORCESTER.

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ANATOMY AND PHYSIOLOGY.

EXPLANATION OF THE PLATES.

PLATE I.

Acute Conjunctival Inflammation.

PLATE II.

Purulent Conjunctival Inflammation, with very considerable chemosis or effusion of lymph or serum under the Conjunctiva.

PLATE III.

Inflammation of the Cornea, showing pink sclerotic vessels under the enlarged and deeper red-coloured vessels of the Conjunctiva.

PLATE IV.

Prolapsus of the Iris, and consequent derangement of the Pupil.

PLATE V.

Paralysis of the Eyelids.

PLATE VI.

Tumours of the Eyelid, combined with capsular cataract and adhesion of the Iris, causing irregularity of the Pupil, a consequence of inflammation.

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ANATOMY AND PHYSIOLOGY

OF

THE EYE

AND ITS APPENDAGES.

THE ORBITS.

IN describing the anatomical structure of the eye, we scarcely know at what point to commence, the whole forming one continuous circle, and having such general dependance, that we find no part unsupported. Custom, however, has fixed upon the bones as a general basis upon which to form our superstructure: but in describing their several processes and foramina, we must not forget their uses and connexions; that they are surrounded by the soft parts, united to them by blood-vessels and nerves, and are liable to be implicated in their diseases. I propose, first, to take a view of the orbits as an individual whole, and then proceed to a more minute description of their several bones, their different processes and foramina. On the first view of the cranium, the orbits attract our particular notice, as two irregularly oval and funnel-shaped cavities, situated on the anterior parts of the skull, separated by the bones and cavities of the nose. They form two pyramids, with the base anteriorly, and the apex directed obliquely backwards, so that if we place a pencil in the centre of both orbits, we shall perceive that they are far from forming parallel lines, that they converge within the skull, but diverge greatly at their nearer extremity: we may also observe, that the nasal side of the orbit is more prominent than the temporal, a conformation which permits a great extent of lateral vision. The pyramid is made up of four triangular surfaces, which are formed by the following bones, placed in juxta-position and united by sutures, viz. the frontal, the sphænoid, the æthmoid, the superior maxillary, the malar, the palatine, and the lachrymal: these entering more or

less into the composition of the orbits, serve in a great degree to defend the complicated texture of the globe from external injury.

THE OS FRONTIS.

The first bone that claims our attention, from the prominence of its situation, is the frontal bone: it has been likened to a clam-shell, from its semi-circular and hollowed shape, and has been divided into frontal, nasal, and orbitary portions. The first points of demonstration are the superciliary ridges, slight transverse eminences, on which the eyebrows rest: we may also observe many small foramina, for the transmission of arteries, veins, and nerves; these are the nutritious vessels, which go to supply the bone, support, and nourish it, so that when deprived of these, the bone exfoliates and dies. Among the foramina, however, two claim a distinct notice, the superciliary holes situated on the lower part of each superciliary ridge: these transmit a chief branch of the fifth pair of nerves to supply the scalp with sensibility, and a branch of the ophthalmic artery, which mounts over the forehead: sometimes we find only a groove in the place of the foramen, sometimes scarcely a corresponding mark. On each side the superciliary ridge is bounded by two angular processes; the two external situated on the temporal sides, and joined by the transverse suture to the malar bones, while the two internal are placed on the nasal, in connexion with the superior maxillary.

The orbitary plates which form the roof of the orbits, and the floor on which the anterior lobes of the cerebrum rest, are two thin and almost diaphanous lamellæ, which jet out in a horizontal direction from that part of the bone which forms the forehead: between them is an open space, into which the æthmoid bone is received, hence denominated the fissura æthmoidæ. Just at the connexion of the frontal with the æthmoid bone, we always find one and sometimes two foramina, which are distinguished by the terms anterior and posterior orbitary foramina: they are for the transmission of a branch of the fifth pair of nerves into the cranium, and finally into the nose, to supply the upper part of the schneiderian membrane with common sensibility, and for the passage of arteries, branches of the ophthalmic, to bestow on it a considerable vascularity. We should also mark a depression in the orbitary plate of the frontal bone upon its temporal side, for the situation of the lachrymal gland, which is fastened to it by a particular ligament. There is also a minute pit behind and above the internal angular process of the same bone, which gives attachment to the cartilaginous trochlea, in which the tendon of the superior oblique muscle acts.

OS SPHÆNOIDES. The next bone to which our attention should be directed is the sphænoid, common both to the cranium and face: it is situated at the base of the skull, and acting as a wedge, serves, by its peculiar form and position, to bind in and support all the bones of the head. Anatomists, always indulging an inventive fancy, have imagined that this bone bears some resemblance to a bat with extended wings, hence have sometimes called it pterygoid bone; but by general custom, the projections which are considered similar to the feet of that animal are named pterygoid processes: its middle is likened to the body and head, while the temporal and orbital processes are compared to the extended wings. The upper or central surface they have imagined to resemble a Turkish saddle, the spot on which the pituitary gland is lodged being the seat, while to the projections that surround it they have given the name of clinoid processes, from their likeness to the four posts of a bed. The foramina of this bone are very numerous, and transmit most of the nerves which go out from the brain.

The parts of this bone which enter into the composition of the orbit are few, in comparison with the points of demonstration. The great processes, which have been thought to resemble the extended wings of a bat, have three surfaces, one only of which belongs to the orbit. The first is the cerebral, supporting the middle lobes of the brain; the second the temporal, on which the temporal muscle plays; the last is the orbital, a smooth surface placed upon the lateral and temporal side, forming the back part of the outer wall, and connected by the transverse suture to the orbital plate of the temporal bone, and by the sphænoidal to the malar bone. In looking into the orbit we may observe another portion; this is the lesser wing, or wing of Ingrasias: this forms the posterior part of the roof; it affords a passage to the optic nerve, while the principal internal muscles of the eye have their origin from it.

We should next consider the foramina. The first that claims our notice is a round hole in the wing of Ingrasias, just under the anterior clinoid processes, which transmits the optic nerve going to be expanded into the delicate retina; and also the ophthalmic artery, which winding round the nerve, enters the orbit with it: this is the principal vessel that supplies the eye and its appendages. The next is the foramen lacerum superius, which is situated at the back of the orbit: it is a slit formed by the wings of the sphænoid bone; it is widest near to the sella turcica, and grows gradually narrower, until it terminates almost in a line. Through this foramen, the third, the fourth, part of the fifth, and the sixth pair of nerves, pass out of the cranium,

to animate the eye and its appendages, with their various sensibilities. Through this also are the veins returned into the sinus which surrounds the cella turcica.

OS ÆTHMOIDES.

The æthmoid bone, so called because by some it was supposed to resemble a sieve, its horizontal plate being perforated by many foramina, which in the living body transmit the first pair of nerves or olfactory. It is situated in the inferior or middle of the cranium, in that aperture which in the frontal bone we denominated the fissura æthmoidea: it is in shape almost a cube, and seems composed of a multitude of thin, brittle, and semi-transparent lamellæ, which constitute the partitions of many cells that are lined with schneiderian membrane, and afford a very great increase of surface, without an augmentation of volume, so that while its sides form the nasal walls of the orbits, its upper surface supports the anterior lobes of the brain, while its many and intricate cells increase the organ of smelling, and permit the fuller reverberation of the voice.

The orbitary plates of the æthmoid bone are two almost square surfaces, incased between the frontal and inferior maxillary bones, joined to the former by the transverse, and to the latter by the æthmoidal sutures. It is also connected to the palatine and lachrymal bones; which latter have by some been considered a part of them, but being separable by maceration, require to be demonstrated as individual bones. The ossa plana, as these surfaces of the æthmoid bone have been called, serve to form the nasal walls of the orbits, and to shut up and complete the numerous cells of the nose.

While considering the cells and convolutions of this bone, we ought to speak of those lamellæ which have been termed the upper and lower spongy bones. The superior is always a process of the æthmoid, while the inferior are considered as distinct bones, which in the fœtus is sufficiently demonstrable, as their ossification proceeds from a distinct nucleus. These turbinated bones, as they have sometimes been denominated, consist of two convoluted spongy lamellæ, which may be felt with the finger in each nostril. Their convex surface is turned toward's the septum narium, while the concave looks towards the maxillary bones, covering the opening of the lachrymal duct. They are attached to the maxillary bone by a little hook-like process, and when we introduce the probe into the lachrymal duct they may generally be distinctly felt.

THE OSSA MAXILLARIA SUPERIORA.

The superior maxillary bones are the most prominent of the

face, forming its basis. The alveolar process, which contains the teeth, forms the great distinctive mark of our age. With the palate bones, the superior maxillary form the roof of the mouth and the wall of the nose, while its orbitary plate, which jets out in a horizontal direction, supports the eye, and forms part of the floor of the orbit. Between these parts we find a cavity, called the antrum of Highmore, whose diseases often implicate the orbit. The orbitary process is in connexion with the malar, æthmoid, and lachrymal bones: in it may be observed a groove or canal for the passage of a branch of the fifth pair of nerves, hence called the infra-orbitary, which comes out upon the cheek, to supply it with sensibility. We should also notice the nasal process, as it is the point against which the probe strikes when we attempt to pass it along the lateral canal into the nasal duct: it stands erect, giving an attachment to the tendon of the orbicularis muscle, forms part of the nose, and is in connexion with the lachrymal bone.

OSSA MALARUM.

The malar bone is of an irregular square form, placed upon the superior and lateral part of the face: it forms the most prominent part of the cheek, and has connexion with the temporal frontal sphænoidal and superior maxillary bones, and is very smooth and compact in its texture.

The orbitary surface is concave, serves to eke out the floor of orbit, and enters into the composition of the spheno-maxillary fissure; while its outer border, which is almost an acute angle, forms a great proportion of the temporal boundary of the orbit.

OSSA PALATI.

The points of demonstration in the palate bones are many and complicated, from their numerous connexions. They are placed at the very back part of the orbit, between the maxillary and sphænoid bones, so that they lengthen out the palate, complete the nostrils behind, and rise up into the composition of the orbits.

The orbitary plate is a small triangular surface, a kind of knob placed upon the top of an upright process, which, from its presenting two surfaces in the orbit, has sometimes been distinguished into the anterior and posterior orbitary processes. They serve to fill up the nasal wall, but are situated so deeply within the socket, and are so small, that the student has great difficulty to distinguish them in the unseparated cranium.

OSSA UNGUIS.

The os unguis is a thin lamella of bone, without any cancelli: it seems to form part of the orbitary plate of the æthmoid bone:

it shuts up its cells, and should be considered as a continuation of its surface, but being separable from the rest, is by anatomists reckoned a distinct bone. It is about the size, and bears some resemblance to a finger nail, whence its name. It has a groove in it, which conveys the lachrymal duct into the nose. This bone being so very thin and little vascular, is subject to caries, from the peculiarity of its situation. Obstruction and inflammation often occur in the lachrymal passage, and, by proximity of situation, affect this bone; and this again being rendered impervious by disease, a passage will sometimes be required to be forced; and now we should mark well its situation and direction, for if we make our attempts too high, we may injure the upper spongy bone, and if too forward, may be foiled against the hard process of the superior maxillary.

THE APPENDAGES.

THE SUPERCILIA, OR EYEBROWS.

The eyebrow is the first point that should arrest our attention; it is formed of skin covering the occipito frontalis and orbicular muscles, and is but loosely attached by fatty cellular substance to the ridge of the frontal bone. It consists of a thick row of short strong hairs, which stand erect for a short distance, at the nasal extremity of the brow, corresponding to the insertion of the corrugator supercilii. They form an arch, following the curve of the superciliary ridge; they are most numerous in the centre, gradually decreasing in thickness and number, until they terminate almost in a point at the temporal extremity. In people of dark complexion and black hair, we find them very large and bushy, while in others they are of light colour and sometimes almost absent. They are moved by several muscles; the occipito-frontalis raises them upwards, while the orbicularis draws them downwards; and here we may also observe a muscle peculiar to the human species, which arises from the internal angular process of the frontal bone, and is inserted into the brow. The action, when both contract, is to approximate, or, as it is said, to knit the brows. In strumous ophthalmia, and all cases in which there is a morbid irritability of the retina, we find the eyebrows corrugated and depressed, to moderate the quantity of light that is admitted to the field of vision; while, curious to remark, in other examples, where, from a deficiency of nervous power or some mechanical cause preventing the rays of light duly impinging upon the retina, the same occurs, the better to collect the rays into a proper

focus. The supercilia serve in some degree to guard the eyes from external injury, while, from the attachment of their several muscles, they greatly assist in the expression of the sterner passions.

THE PALPEBRÆ OR EYELIDS.

The eyelids are two semi-oval curtains, placed over the general surface of the orbit, to regulate the admission or entirely exclude the light from the eye. The skin, which is particularly delicate and fine, is but slightly attached by very loose cellular tissue to the orbicularis muscle, which with a strong ligament that descends from the orbit, the expanded tendon of the levator, and the tunica conjunctiva these eked out and fashioned by two semi-lunar cartilages, form their chief consistency. So loose is the cellular tissue that connects these parts, and so devoid of fat, that in purulent ophthalmia, or in any erysipelatous diseases of the face, we often find the eyelids monstrously swollen, from the effusion of fluid into their texture. When the lids are closed, they have a uniform and smooth appearance; but, when the superior is elevated, we may observe deep crescent-shaped folds in the skin, particularly marked in old age, immediately under the orbitary arch. Of the two lids, the superior is broader and more movable than the inferior; so that while this scarcely rises, the superior descends a considerable length to close the eye. To perform these several motions, we find two particular muscles, viz. the orbicularis oculi, and the levator palpebræ superioris.

THE ORBICULARIS OCCULI.

This is the sphincter muscle of the eyelids; it arises by a neat round tendon from the nasal process of the superior maxillary bone, from which its fibres diverging spread out towards the external angle when, after being attached to the bone, they intermingle with those that take their course along the lower lid. This attachment has been considered the insertion of two muscles; but I believe it is more generally thought that the fibres take a circular course around the lower eyelid, and are inserted into the tendon from which they took their origin. These fibres, which are nearest to the palpebral margin, are nearly circular, while those which are more distant describe the form of an ellipsis; many also spread out upon the cheek: some are attached to the superior maxillary bone, and others cover the lachrymal sack.

In the dissection of this muscle, we find that the external fibres are stronger and more marked than those which are in connexion with the tarsal cartilages; these, which are much smaller, and almost colourless, were described by Riolan as the *musculiciliares*.

The action of this muscle is to close the lids, and assist in defending the eye from external injury: it is said to cause the flow of tears by compressing the lachrymal gland; of this I have some doubt; for if it was correct, external pressure would excite them. It certainly assists to direct them towards the internal angle of the eye; but their secretion would appear to be the produce of nervous communication. The lesser muscles, too, are called into action, in the short quick motion of winking, which by means of a peculiar apparatus serves in a particular manner to cleanse the ball of extraneous matter, and remove every source of irritation.

THE LEVATOR PALPEBRÆ SUPERIORIS.

This muscle, which arises deep within the orbit, takes its origin from the lesser wing of the sphænoid bone, just above the rectus superior, and near to the margin of the optic foramen: here it begins by a neat round tendon; the muscular fibres gradually expanding, spread out into a flat surface, which gently bending, passes over the ball, and is finally inserted, by a broad, flat, and very thin tendon, into the whole length of the superior tarsal cartilage. Its action is to raise the lid, and draw it inwards, while by some it has been said to protude the eye, and direct its axis horizontally.

THE PALPEBRAL LIGAMENT AND TARSAL CARTILAGES.

Immediately below the muscular tissue is a ligamentous structure, which stretches from the orbital margin, to the outer edge of the tarsal cartilage; near to the orbit, it is thick and strong, but progressively it diminishes in strength and density, until it becomes scarcely more than condensed cellular membrane. In the upper lid it is situated between the orbicularis and levator, but in the lower it is merely covered by the conjunctiva. The tarsal cartilages are the two elliptical cartilaginous borders of the eyelids, which give that firmness, regularity, and graceful curve to the palpebra, which permits them to be closed with such minute exactness. They are connected to the palpebral ligament, which in some degree serves to support them in their proper situation. They are of a fibro-cartilaginous texture, and slightly yellowish colour; are both thicker and broader in the middle than at their extremities, where they are united. We may observe, the superior is larger than the inferior, and that the nasal extremity is rounded, while the temporal is of an angular form. Their thickest part is the external orbitary margin, on which the cilia are placed, while they gradually become thinner as they approach the orbital circumference, until they are nearly lost in continuity with the palpebral ligament. Their outer

surface is convex, and in connexion with the orbicularis muscle, while the inner is concave, marked with lines, which lodged the meibomean follicles, and is covered by the tunica conjunctiva.

THE CILIA OR EYELASHES.

The eyelashes are three or four rows of very stiff hairs, situated on the borders of the tarsal cartilage. We find the layers more numerous upon the superior than the inferior, while they are thicker in the centre than at either extremity. By the aid of a microscope, we may distinguish that each cilium has at its root, a bulb or little monticulus, from which it springs: we should also note the shaft is small at its origin, grows gradually larger, and then again decreases until it finally ends in a very acute point. We find that there is a membrane apparently of the serous kind, for it contains a thin transparent fluid; this lines the cellular membrane, that surrounds the bulb; is reflected over the monticulus, and ascends upon the shaft, seeming to form minute fibrils, which stand out in one direction; so that if we move a hair between the finger and thumb, it always passes one way.

Hair has by some been maintained as an excretion, and to possess neither circulation nor sensibility, although in the natural state of the parts we can perceive no vessels, yet in some diseases to which it is liable, we must infer that it possesses a circulation; for example, in the plica polonica, when cut, it has been known to bleed, which, as the illustrious Bichat has correctly remarked, that this fact, "prove manifestment qu'il y avait des exhallans dans l'état naturel, lesquels agrandés et dilatés; alors, versant un fluide qu'au paravant ils refusarent d'admettre." As to the sensibility of the cilia, they say that the monticulus at the root is copiously supplied with branches of the nerve of feeling, so that the least vibration at the extremity of the hair is directly communicated to the sentient apparatus, and that in this instance, like the feeler of insects, the cilia form a chief guard to the eye.

THE MEIBOMEAN FOLLICLES.

These are chains of little round glands, placed between the membrana conjunctiva and the tarsal cartilages; they are more numerous and distinct in the upper than in the lower lid; and here we can generally count from twenty to thirty; their excretory ducts opening by minute mouths in one or two rows on the tarsal cartilages, just within the margin of the cilia. By the aid of a glass, we can distinctly perceive little glands, each of which have an opening into a common duct, and when highly magnified have been thought to resemble studs of the smallest pears: from analogy, one could conclude, that they had each a little artery, which, ramifying in their substance, secretes a mucus to lubri-

cate the delicate surface of the conjunctiva, and prevent the effects of friction, while it permits a greater freedom of motion. These glands often become diseased, when their secretion frequently occasions irritation and ulceration of the tarsal borders.

THE LACHRYMAL GLAND, AND THE SECRETION OF THE TEARS.

The lachrymal gland is situated in the outer and superior part of the orbit; is convex superiorly, to correspond with the fovea of the frontal bone, in which it is placed, irregularly concave below; it is inclosed in a strong and distinct capsule, and is fastened by a ligament in its proper situation. The lacrymal gland is of that species denominated conglomerate; that is, it consists of many minute portions or little glandules, each of which has a convoluted little artery, that ramifies upon its surface, or dips into its substance, and this, by some internal and undemonstrable apparatus, secretes that fluid we call the tears, which consists principally of serum, with a few salts in solution: this is poured into minute excretory ducts, that uniting proceed almost in a perpendicular direction, under the conjunctiva to the lower part of the upper eyelid, and there open by five or six mouths, which are sufficiently distinct, and have often been injected; these excrete this fluid so necessary in the economy of the visual apparatus. Besides minute arteries convoluted to admit of increased or diminished secretion, there are corresponding veins, that return the superfluous blood back again into the vascular system, and keep up that chain of action so necessary to the formation of the part.

The use of the tears is evidently to wash away any offending particles, which getting between the eyelids and the globe, irritates the delicate and sensible surface of the conjunctiva, which by nervous influence stimulates the gland to increased secretion, to remove the offending cause, while the action of the mind also seems to have a peculiar influence over it. At all times there is a slight secretion from the gland, which is necessary to the healthy condition of the conjunctiva; but during emotion, or other excitement, it is very greatly increased, and now the action of the orbicularis closing the eyelids, must elongate the ducts, and provide for the increased and speedy excretion.

THE PUNCTA LACHRYMALIA, SACCULUS, AND DUCTUS LACHRYMALIS.

When the eyelids are closed, there is between the meibomian borders and the surface of the globe, a groove or sulcus, which increases in breadth as it approaches the inner canthus; the edge of the upper border is clothed with a number of very

minute febrils, which serve to cleanse the cornea as it moves over it, and at the same time to collect the tears into the canal, and eventually to convey them down the lachrymal canal into the nose.

At the nasal extremity of this sulcus are the puncta lacrymalia, situated upon two little conical eminences, terminating the meibomean borders of both tarsi; they are placed in a minute eminence, or little mamillary process, are about the size of pinholes, sufficiently visible upon examination, dipping into the substance of the tarsal cartilage. Their orifices vary in dimension, but are generally open, which is accounted for by the discovery of two minute muscles, that act upon their mouths. In passing the lacrymal probe, we often see them close, so as sometimes to form an obstruction to the introduction of the instrument. This little canal now passes in a perpendicular direction in the substance of the tarsal cartilage, and after forming a minute cul-de-sac, turn at right angles towards the nose, run in a horizontal direction along the borders of the inner canthus, to terminate in the upper and anterior part of the lachrymal sack, sometimes the two horizontal canals meeting form a common passage before they arrive at the point.

The lachrymal sack is of an oblong, oval figure, and of a fibrous texture; it is situated in the concave surface of the lachrymal bone, covered by a tendinous expansion of the orbicularis muscle, and is greatly defended from external injury by the upright process of the superior maxillary bone. Having passed into the bony conduit, the sack suddenly becomes considerably smaller, this formed by a duplicature of the lining membrane, which adhering to the periosteum, marks the division between the sack and the duct. The nasal duct now becoming much contracted, continues its course along the bony parieties, downwards, outward, and gently slanting backwards, until it opens under the concave surface of the spongy bone, in the side and near the floor of the nostril.

The internal surface of the puncta, the canals, the sack, and the lachrymal duct, are lined with a very delicate mucous membrane, said to be continuous with the conjunctiva, and schneiderian membrane of the nose, which is abundantly supplied with mucous follicles; at the entrance of the duct into the bony canal, there is a fold which serves as a mark of distinction; at the extremity there is also a duplicature, which has something of a valve-like form. The tears then being secreted by the lacrymal gland, are poured out upon the surface of the globe, and serve to clear it of extraneous particles; they are then collected by the sulcus, and passing to the nasal extremity, which being the widest part, has been called the lacus lachrymalis, they are then received by absorption into the puncta, passed along the perpendicular and

horizontal canals into the sack, where, by the compression of the surrounding muscles, they are forced into the duct, to be excreted into the nose. While considering the texture of these canals, we should attentively mark the situation and direction of the several passages, that we may be the better able to introduce the lachrymal probe, and adopt the most effectual means to remove the diseases of this part, which are often extremely tedious in their cure.

TUNICA CONJUNCTIVA, VALVULA SEMI-LUNARIS AND
CARUNCULA LACHRYMALIS.

The membrane, which, from its office, is called tunica conjunctiva, would seem most naturally to follow the description of the lids. It is a sero-mucous membrane, and serves to cover and unite the globe with the palpebræ. It is said by some to be continuous with the mucous membrane of the nose and alimentary canal, which they trace up the nasal duct, over the sack, and through the puncta, out upon the surface of the lids. To demonstrate it with facility we should observe its connection to the tarsal margin, where it adheres pretty closely, while it is but loosely connected by a very lax cellular membrane to the inner surface of the lid. We now trace it towards the ball, and observe, that its surface forms a pouch or bag in the angle of connection between these parts, which permits of very great facility of motion ; we then follow it upon the white surface of the sclerotic coat, to which it is more firmly connected, and then over the transparent surface of the cornea, where its union becomes so particularly intimate and firm, as to admit of the demonstration of its continuity, but with the greatest difficulty ; indeed the point has been disputed by M. le docteur Ribes, but many instances of long continued diseased action will fully prove its continuity. Upon the surface of the lids it is of a pale red and vascular appearance, and secretes a considerable quantity of mucus ; upon the sclerotic coat it is perfectly transparent ; in health its vessels carry no red particles, so that it is scarcely distinguishable from the coat beneath it ; in disease, however, it becomes of a deep red colour, its capillaries conveying red blood in profusion. When upon the surface of the cornea, the membrane is supplied with extremely minute serous vessels, which, from the smallness of their calibre, and their very close and intimate connection with the surface of the cornea, are, in their healthy state, quite imperceptible, but in many diseased conditions of the conjunctiva they become sufficiently obvious, and their continuity is very plainly demonstrated. The secretion from this portion of the membrane is said to be of a serous nature, which the minuteness of its vessels would greatly tend to con-

firm. The *valvula semi-lunaris* is a reflection, or fold of the conjunctiva, attached to the inner canthus of the eye; it is of a red colour, crescentic form, and appears very vascular; has the mouths of several mucous ducts opening upon it, and a few hairs projecting from its surface. When the eye is directed to the outer angle, it is expanded, and laid smooth upon the sclerotic coat, but when the eye is returned it becomes folded upon the caruncle. The *valvula semi-lunaris* has been described as the rudiment of the *membrana nictitans* of animals, in them it varies in size, but is generally of a thick substance and crescentic form. In birds it is semi-transparent, and capable of covering the whole eye.

The *caruncula lachrymalis* is that little red body which is seen to occupy the hollow between the horizontal canals at the inner canthus of the eye; it is an assemblage of minute mucous follicles, which, covered by the conjunctiva, secrete that gummy matter which we find accumulate during sleep, at the inner canthus of the eye. This mucus serves to entangle the larger particles of dust that might obstruct the puncta, but which, by the action of the *valvula semi-lunaris*, are removed from the sensible surface of the conjunctiva, and accumulated at the inner angle of the eye.

THE MUSCLES OF THE EYEBALL.

The muscles subservient to the motions of the ball are six in number; five arise deep from the bottom of the orbit, while the sixth, which is very short, proceeds from the orbitary plate of the superior maxillary bone; they likewise differ in their actions. Four of them coming from around the optic foramen, and going straight forward, are called *recti*, while the other two, from their course, are denominated *oblique*.

The *rectus superior* arises from the lesser wing of the *sphænoid* bone, immediately above the optic foramen; it is situated directly under the *levator palpebræ superioris*; is somewhat similar in form, but shorter, passing directly forwards to the anterior part of the globe; when in union with the other three muscles, it forms a tendinous expansion, which is firmly connected to the sclerotic coat, and has sometimes been reckoned one of the coats of the eye, under the name of *tunica albugenia*.

The *rectus inferior* is of the same form as the preceding, it lies upon the floor of the orbit, arising by a tendon that is common to it and the two following muscles; it then passes directly forwards, and assisting to form the common tendon, is inserted exactly opposite to the former muscle.

The *rectus internus*, which is similar to the two former, proceeding from the same origin, and with them immediately em-

bracing the optic nerve, where it enters the orbit, forming for it a kind of sheath ; it then goes forwards, to be inserted into the internal and lateral part of the globe.

Rectus externus coming from the bottom of the orbit, has two origins, one of which is from the sphenoid bone, while the other is from a ligament that crosses the foramen lacerum, and between these pass the sixth pair of nerves. This muscle is similar in form, and is inserted into the outer and lateral part of the tendinous expansion ; from the obliquity of its origin it is the longest, while the internal is the shortest of the four muscles.

These muscles being of one class, have actions similar in character, but varying in effect, according to their insertion ; thus when they act simultaneously, they press the eye back into the orbits, when only one acts, the eye is turned in the direction of its insertion, upwards, downwards, inwards, or outwards. When we place the eye in the intermediate situation, two must combine in simultaneous actions, while the rolling motion is occasioned by the action of the one immediately following, in regular succession, the one that preceded it.

Obliquus superior : we find this muscle coming, in like manner, from the deepest part of the orbit ; it differs, however, as much in kind as in insertion ; it is thin, round, and much longer, taking its origin from above the optic foramen, and that ligament, which, in connection with the dura mater, covers this part of the orbit : it proceeds obliquely inwards and forwards, forms a delicate round tendon, which passes through the trochlea, situated at the inner angle of the eye, and supplied with a synovial capsule : it is then reflected backwards, and is finally inserted by a broad tendon directly under the rectus superior at the upper and posterior part of the globe.

Obliquus inferior : this is situated at the inferior and anterior part of the orbit ; is shorter and flatter than the preceding. It arises from the orbitary process of the superior maxillary bone, a little anterior to the lachrymal canal, from whence it directs itself backwards, and turning round the globe, passes between it and the rectus externus, until it is inserted by a thin tendon into the sclerotic coat, very near to the entrance of the optic nerve into that texture.

The combined and simultaneous action of these two muscles is to draw the eye outwards, and directly forwards, and act as antagonists to the four recti. When the obliquus superior alone acts, it has been said to turn the eye downwards and outwards. This, looking at the direction of the muscle, would appear the most probable mode of its action, did not the manner of its insertion excite some doubts in our mind. The individual action of the obliquus inferior, is said to turn the pupil upwards and in-

wards; but if we reflect that its insertion is quite at the posterior part of the globe, near to the optic nerve, we can easily conceive how it may act with the former muscle as an antagonist to the recti, and draw forward the globe, but cannot so readily perceive how it accomplishes the individual action. Indeed, I can find no position of the eye in which either of the latter muscles are absolutely required; for the four recti are amply sufficient to turn the eye in every direction: if so, why should we multiply our difficulties by supposing that they have?

THE ARTERIES AND VEINS OF THE EYE AND ITS APPENDAGES.

The ophthalmic is the principal artery of the eye and its appendages. It is a branch of the internal carotid, of no considerable size, but important from the number and variety of the parts which it supplies. Soon after it is given off, it passes into a canal of the dura mater, upon a level with the optic nerve, passing directly under it, and going with it through the optic foramen upon its temporal side, and then taking a spiral turn, completely surrounds it, supplying the eye-ball itself with many minute twigs, giving branches to the apparatus and neighbouring parts, while it forms frequent anastomosis with the arteries of the face.

The lachrymal artery is that vessel which supplies the lachrymal gland, and furnishes the secretion of the tears. It comes off from the ophthalmic about two or three lines distance, after it has entered the orbit, it goes along its outer surface, passing between the bony parieties of the orbit and the rectus externus muscle, giving many minute twigs to the parts along which it takes its course until it reaches the gland, where it is subdivided into an innumerable quantity of minute branches which go to supply each little glandule with pabulum to fulfil its office. Just before it enters the gland, it sends some small twigs forwards to the fat and periostum of the orbits, while others run to supply the eyelids. Sometimes we find this artery coming from the anterior meningeal, when it does not enter the orbit with the nerve, but comes through the foramen lacernum.

The central artery of the retina is next in enumeration of the branches of the ophthalmic, and is by some said to be the continued trunk; it is indeed the most important, from its course and distribution, of any of this system of vessels. It goes winding round the nerve, entering into its substance, and running between its febrils, piercing with them the cribriform plate of the sclerotic coat, is distributed as a beautiful network to supply the nervous matter of the retina. A branch has been described as going through the very centre of the globe, to be distributed

to the numerous cells of the vitrious humour. It is then said to branch out upon the posterior surface of the capsule of the lens, where it inosculates with the ciliary arteries. According to Mr. Bell, these vessels may be seen while the *membrana pupillaris* is still unbroken. In the adult, however, they are not so obvious, and must carry but a serous fluid; for if the red globules still passed through them, they would form an impediment to the progress of some of the rays of light, which should pass on to the retina. Cloquet also distinctly affirms the fact of their existence. He says, "*Un de ces rameaux penetre dans le corps vetri, lui fournit quelques ramifications d'une tenuité excessive, et semble parvenir a la partie posterieure de la capsule du cristallin.*" This has been denied by some, but I think it possible to conceive its existence, even was it invisible in every case, for the cellular tissue that forms the partitions of the vitrious humour, to say nothing now about the fluid they contain, require a circulating apparatus as well as every other part of the body.

The super-orbital artery, so denominated because it passes with the nerve through the super-orbitary foramen in the frontal bone, coming off from the ophthalmic, it passes from behind, forwards along the roof of the orbit, to which it sends minute twigs, lying superior to the *levator palpebræ superioris*, which it also supplies. It now makes a sudden turn over the superior margin of the orbit, and divides into two branches, one internal and most considerable, mounts upon the forehead between the bone and the orbicularis muscle, and it almost directly divides itself into a great number of twigs, which diverging, go to supply the occipito frontalis muscle, forming inosculations with the branches of the transverse artery of the face, and the anterior temporal; the latter much smaller, more superficial and shorter in its course, goes in a similar direction, but forms a communication with twigs which proceed from the lachrymal artery.

Posterior or short ciliary arteries, are minute branches which come from very various sources; principally, however, from the ophthalmic. Some few occasionally proceed from æthmoidal and the muscular branches; they are in number between thirty and forty, very slender, placed in the soft adipous matter that surrounds the optic nerve; and here they inosculate, forming many very slender communications. Arrived at the posterior part of the globe, they individually penetrate the sclerotic coat around the entrance of the optic nerve, some stopping to supply these textures, but the far greater number going forwards to distribute themselves upon the choroid; here they are subdivided into a multitude of minute branches, forming a complete network of vessels; some few go onwards, passing the ciliary ligament, to unite in forming the great arterial circle of the iris; but most of them appear

to proceed to the ciliary processes. Here, indeed, so great is their number, that it has been said that you may count twenty or thirty to each; these have very frequent communication, and although at the termination of these inosculation they cease to carry red blood, I feel convinced that many serous vessels now go forwards to supply the lens and its capsule.

The long ciliary arteries are generally two in number; and are known by the names of external and internal: they are larger than the preceding, and enter the sclerotic coat at a greater distance from the optic nerve; one on the nasal, the other on the frontal side. Having supplied this tunic with minute twigs, they pass horizontally forwards between it and the choroid, and penetrating the ciliary ligament, they divide into two branches, running almost at acute angles, and now sending minute branches to inosculate with the short ciliary arteries, they go forward, and are principally distributed to the iris, and form its several arterial circles.

The muscular arteries are those branches which go to supply the muscles of the ball; they are the least regular of any in this system of vessels, but are generally in two distinct branches, which, according to their course, are called superior or inferior. The superior generally comes from the ophthalmic; it soon gains the inferior surface of the rectus superior: here it divides into several branches, some of which penetrate its fleshy fibres; others go to the supply of the levator of the lids, and the superior oblique muscle of the eye. Where this artery is deficient, branches proceed from the lachrymal, the super-orbital, and ciliary arteries, to supply its place.

The inferior, which is larger, and more constant than the superior, also comes from the ophthalmic, and passing downwards between the optic nerve and rectus inferior, gives twigs to that muscle, to the rectus externus and internus, the obliquus inferior, the lachrymal sack, and periosteum of the orbit. The most important points, however, in the distribution of these arteries, are the minute twigs, which are denominated the anterior ciliary arteries. These are the terminations of the muscular branches, which having supplied the four recti muscles, take a course along their expanded tendons, sending branches to the conjunctiva, enter the eye at two or three lines distance from the circumference of the cornea, giving twigs to supply that part of the sclerotic coat, and many minute serous branches to the substance of the cornea, while their main trunks go forward to inosculate with the other ciliary arteries within the eye-ball.

The æthmoidal arteries are generally two small branches, which passing from the ophthalmic, enter into the nose by those foramina described as the anterior and posterior orbital: the one

that passes through the posterior is very small; it goes along towards the internal wall of the orbit, between the obliquus superior and rectus internus muscles; when arrived at the bone, penetrates into the æthmoidal cells, and is minutely distributed upon their delicate mucous membrane; a branch then enters the cranium, and is lost upon the dura mater. This, however, is often wanting; and the parts to which it is distributed are generally supplied by the anterior, which is larger and more regular in its course. It accompanies the nasal branch of the first division of the fifth pair of nerves into the nose, sending minute branches to the æthmoidal cells and pituitary membrane; it enters the cranium, gives twigs to the membrane of the frontal sinus; it then supplies the dura mater, and is finally lost upon its falx.

The palpebral branches are generally two in number, often, however, coming off in one single trunk. The superior sends twigs to the orbicularis muscle, the lachrymal sack, the caruncle, and tunica conjunctiva, then passing along the superior tarsal cartilage, forms an inosculation with the branches of the lachrymal. The inferior takes its course downwards, by the side of the cartilaginous pulley of the superior oblique muscle, passing behind the round tendon of the orbicularis, to which it also distributes its twigs, while some go to the caruncle and conjunctiva; it then passes along the border of the inferior tarsal cartilage, sending minute twigs to the meibomean glands and the skin of the eyelids.

The nasal and frontal branches are two twigs, which, passing out of the orbit, are considered as the terminations of the ophthalmic artery. The nasal, which is very small, goes out above the tendon of orbicularis, forming a connexion with the extremity of the facial, distributes its minute branches to the lachrymal sack and neighbouring muscles. The frontal also, at the inner angle of the eyes, mounts upon the forehead, between the bone and orbicularis muscle; it then separates into several minute branches, which becoming cutaneous, spread out in every direction.

We find that the external apparatus also receives branches from the external carotid artery. Thus we see the external maxillary, which turns over the lower jaw, and gives many branches to the face, is finally lost in its connexions with the frontal, but before it reaches the angle of the eye, it gives many twigs to the orbicularis muscle and skin of the eyelids. The anterior temporal artery is also exhausted upon the brow, and superior lid, while many of its twigs are discoverable at the external angle of the eye. We should also observe, that there are twigs which proceed from the transverse artery of the face, and some, also, from that branch which accompanies the infra

orbital nerve. These are distributed to the lower lid, and thus complete this very perfect circle of arterial inosculation.

THE VEINS OF THE EYE AND ITS APPENDAGES.

The veins which correspond to the ophthalmic artery, are formed by trunks which arise from minute radicles, that correspond with the branches of that artery; so that to describe their individual course, we should only have to repeat the description of the branches from which the radicles that form them proceed; and here we might remark, how difficult it is to understand the connexion of these several vessels: it is believed that there is, in many instances, a direct communication or inosculation between the artery, and vein, which sometimes carries red blood, sometimes but a serous fluid; in other instances, that the artery terminates its course by minute capillary vessels, which having performed their due office, for the nourishment of the body, the debris is returned by similar capillary veins or absorbent vessels, that sooner or later pour their contents into, and serve to form the radicles of the vein, which gradually increasing in number, are collected into larger trunks. These are the lachrymal, the central vein of the retina, the super-orbital, the ciliary, the muscular, æthmoidal, palpebral, frontal, and nasal, which being united into the ophthalmic vein, pass out of the orbit, through the internal part of the foramen lacerum, and empties itself into the cavernous sinus.

The veins of the external apparatus also pass into two principal trunks; thus, those which arise from the brow and upper lid, go to assist in the formation of the deep temporal; while those of the lower lid, and outer angle of the eye, form the commencement of the great transverse vein of the face, and these have a frequent and large communication, not only with the minute radicles of the external parts, but with those branches which go into the orbit to assist in forming the ophthalmic vein.

NERVES OF THE EYE AND ITS APPENDAGES.

The nerves that go to supply the eye and its appendages, are so many in number, and so seemingly various in function, that it has long been difficult to describe their actions, or conceive their individual uses; but since the great discoveries in the nervous system, by Mr. C. Bell, I think it will not be presumption to attempt at some explanation. Indeed, however, the difficulty of the subject is still sufficiently obvious, and will afford ample scope for the investigation of many ingenious minds: but was part only of the gloom, that has so long overshadowed the subject removed, we should be infinitely indebted to that excellent physiologist.

The brain has, by anatomists, been divided into cerebrum, cerebellum, and medulla oblongata, which last is just the commencement of the spinal marrow. Now, as has been admirably demonstrated by Mr. C. Bell, each of these parts give origin to nerves that possess different functions. Thus the crura of the cerebrum, which, collecting from the central part of each hemisphere, take their course down under the pons varolii, giving off nerves as they pass, until they finally become the anterior columns of the spinal marrow, and here they are separated into nerves, which are distributed to every muscle of the body, conveying to them the power of voluntary motion. The crura of the cerebellum, taking their origin from the cineritious matter of each lobe, go to form the pons varolii, are continued down along the spinal column, regularly giving off its nerves, each of which has a ganglion upon it; they then unite in the same theca (for the convenience of distribution) with those that proceed from the anterior column; these are destined to supply the surface of the whole body with that sensation, we denominate feeling. Besides these, we find in the medulla oblongata certain bodies which contain a portion of cineritious matter: these are placed between, and descend, for a certain distance, with the two great columns of the spinal marrow. These are called the corpora olivaria, from their shape, and are distinctly proved to give off nerves which have a separate and individual function, that of supplying and connecting the parts influenced in the action of respiration: to say the least, they are nerves over which the will has no control.

Some of the nerves from each of these distinct and different parts proceed to the eye, or the apparatus subservient to vision; to stimulate the different muscles to their several offices; or to supply this delicate, and sensible organ, with the sensation so necessary to its preservation.

The nerves which go to each apparatus, to perfect the different organs of the senses, also proceed from the brain, where they arise, as it were, from distinct beds of cineritious matter. Thus the first, or olfactory, proceed from three roots in the anterior lobes of the brain; while the second, or optic, comes principally from the nates and testes, and thalami nervorum opti-
corum.

OPTIC NERVES.

The optic nerves are the largest of those which arise from the brain, excepting the fifth pair. They give off no branches, from their origine to their final termination on that delicate, and sensible membrane, the retina; they proceed from the thalami nervorum opti-
corum, which are two white bodies of an irregular oval shape, covered by the plexus choroides, and situated on the

lateral ventricles. If we make a section of them, we find that they are composed of striæ of medullary and cineritious matter, similar to the corpora striata. They unite under the fornix or vault of three pillows, by means of the commissura mollis. We may also observe, that besides the thalami, the nates and testes, or tubercula quadrigemina, appear to furnish part of their origine. The commencement of the nerves then proceed downwards, turn round the crura cerebri, and, adhering to the tuber cenerius, are here known by the name of tractus opticus. We then find them gradually approach each other, and unite just before the corpora albicantia and infundibulum. It has been thought by some that the optic nerves here decussate; but several circumstances would lead us to believe, that only a union takes place, and the fibrilla again diverge, and pass onwards through the optic foramen, to the posterior part of the globe.

The optic nerves, in their passage from the brain to their entrance into the orbit, are only covered by the tunica arachnoides, and pia mater; but in addition to these, when arrived at the optic foramen, they have an envelope, formed by the dura mater, which we find in the orbit, as the theca of the nerve, and is said by some, to be finally expanded into the sclerotic coat of the eye.

MOTORES OCCULORUM.

These nerves arise from the crura cerebri; that column which I have said gives out the nerves of voluntary motion. We may see them coming from the internal margins of these bodies; besides which, some of their fibres may be traced from the medullary matter that is between the crura; united, these pass forwards, anterior to the pons varolii. We find them soft and flat; they afterwards become smaller, more round, and are now considerably less in size than the optic. These nerves then diverging from each other, go forwards, and penetrate the dura mater, under the anterior points of the tentorium, by the side of the cavernous sinus; they then proceed forwards, passing to the foramen lacerum, and are separated from the carotid artery but by a very thin layer of cellular tissue. In this part of their course we find them laying superior to the third pair, and the ophthalmic division of the fifth, but under the anterior clenoid process, they are covered in their turn by those two nerves. The third pair of nerves, a little anterior to their passage into the orbit, are divided into a superior and inferior branch, which enter by the foramen lacerum in its widest part, going between the two origins of the rectus externus, with the nasal branch of the ophthalmic, to which they are united by cellular tissue. When within the orbit, the superior branch goes upwards, and

inwards, above the optic nerve and nasal division of the fifth pair, and soon reaching the inferior surface of the rectus superior, to which a branch is distributed, in very minute filaments, a lesser division often traverses this muscle, and is sent to the levator palpebræ superioris; but before its final separation in this muscle, it is connected with a twig of the fifth pair, which goes downwards upon the conjunctiva of the upper eyelid, to endow a certain portion with sensibility. The inferior branch, which is the largest of the two, passes between the optic nerve and rectus inferior muscle, and after a short course is subdivided into three divisions. The first, and largest, passes obliquely inwards to the origine of the rectus internus muscle, and is lost among its fibres. The second, which is shorter than the preceding, ramifies in the rectus inferior; while the third, very long and slender, passes between the rectus inferior and externus, going almost at right angles, to the obliquus inferior, and entering near its tendon, is distributed to its fibres, animating them with the commands of the will. Just at its separation from the other branches, this division sends a twig upwards, which goes to form a union with the posterior parts of the ophthalmic ganglion, in whose composition it seems to serve some very important purpose.

THE TROCHLEARIS.

We find that authors have long been at variance with respect to the origin of the fourth pair of nerves. Some say that they come by several distinct filaments from the crura cerebelli, near the border of the Valvula Vieussenii, or that medullary lamina, that forms the root of the fourth ventricle: others, that it proceeds from the region of the nates and testes; but I think that I have traced them from the crura cerebri. This nerve, which is the smallest of those that proceed from the brain, passes out betwixt the cerebrum and cerebellum, by the side of the Pons Varolii, passing above the arachnoid membrane, enters a canal formed in the dura mater, along which we trace it, by the side of the cavernous sinus, separated from its blood but by a fine layer of cellular tissue, then going above the motores oculorum, it enters into the orbit with the first division of the fifth pair, by the foramen lacerum. Then taking their course in the orbit, with the frontal branch of the fifth pair, from which they receive a minute twig, that entering their sheath, passes with them, above the rectus superior, and levator of the upper lid, then proceeding downwards, and inwards, and while the fourth pair are minutely distributed to the obliquus superior, this branch of the fifth passes onwards to the conjunctiva, at the inner canthus of the eye. The curious fact of the distribution of this

nerve to the superior oblique, has long attracted the attention of anatomists, who have often been at a loss to conceive its use. Should it be proved, as I think it will, to proceed from the crura cerebri, the known function of that portion of the brain will explain, that it goes to animate this muscle to the commands of the will, and is therefore a nerve of voluntary motion.

THE FIFTH PAIR.

This pair of nerves are similar in their origine to the spinal, insomuch that they receive filaments both from the cerebrum and cerebellum. We may trace one, and the largest division, from the crura cerebelli, where it is about to form the Pons Varolii: this consists of seventy or a hundred fibres of nervous matter, surrounded by its proper layer of cellular tissue. The other comes from the crura cerebri, near the external border of the tuber annulare, and is formed by five or six filaments, which are larger, softer, and more white than the former. The two distinct and separate origines are connected by cellular membrane: they, however, have a little groove between them, in which a minute branch of an artery not unfrequently runs. Then advancing to the extremity of the superior border of the temporal bone, it enters into a canal formed by the dura mater, and having passed a distance of five lines, we find it form a ganglion of a greyish colour and semi-lunar shape; this is situated in the cavernous sinus, and receives twigs from the sympathetic or great connecting nerve of the body. The ganglion is only formed upon the division coming from the crura cerebelli; the other fasciculus passes under it, and goes to the inferior maxillary division of this nerve.

This is the largest nerve that arises from the brain; while in the cavernous sinus, it separates into three divisions; one passing into the orbit, through the foramen lacernum, the second going out by the foramen rotundum, to supply the upper jaw and face with sensibility; while the third, proceeding through the foramen ovale, and having been joined by that portion which proceeds from the crura cerebri, it goes to animate the larger muscles of the jaws, and to supply the tongue and lower part of the face with sensibility.

The first division, or the ophthalmic, is that which we find passing into the orbit: it is the only one of the fifth pair that we have to notice, when considering the nerves of the eye; it is the smallest and most superior of the three. In its passage outward, towards the orbit, we find it inferior to the motor nerve, but presently it becomes superior, and internal to it, and now it divides into three branches, which having arrived at the foramen lacernum, enters the orbit distinct from each other.

The first of these subdivisions is the lacrymal: it is the smallest in size, and passes forwards in a canal formed by the dura mater, to which it strongly adheres; then entering the orbit, it goes along its external wall, between the bone and rectus externus, to be distributed to the lachrymal gland, and superior eyelid. When arrived at the gland, it is divided into three or four twigs, the principal of which are minutely distributed to its proper tissue; some pass onwards through it, to supply the conjunctiva, while others, having arrived at the gland, turn inwards, and give a profusion of minute fibres to the upper lid. Besides these, a small twig passes forwards, and downwards, through a canal in the malar bone, and comes out by a small foramen, to be distributed to the skin of the cheek.

The frontal nerve is the second, while it is the largest of the branches of the ophthalmic: it passes into the orbit, between the periosteum, and posterior extremity of the rectus superior. Going forward, we find it above the levator palpebræ superioris, here it subdivides into two twigs; one the internal, sometimes called the super-trochlearis, directs itself inwards towards the pulley of the obliquus superior. Here it sends off several twigs, which pass within and without the upper eyelid; while some also lose themselves in the integuments covering the corrugator supercilii and occipito-frontalis: a branch penetrates the frontal sinus, and is distributed to the membrane which lines it. The main branch however, going between the pulley and the bone, escapes from the orbit, and is principally spread out upon the subcutaneous tissue of the forehead. The proper frontal branch, however, goes through the super-orbitary foramen: here it gives off a twig to the upper lid; it is then subdivided into many and minute fibres, some of which pass among the muscles, while others are more superficial, and are distributed to the cuticle of the forehead, and by some have been seen to ramify in the bulbs of the hair.

The last, or nasal division, penetrates into the orbit between the origines of the rectus externus muscle: it then passes obliquely inwards and forwards between the optic nerve and rectus superior, to gain the internal wall of the orbit, and under the obliquus superior separates into two twigs. The first, or internal, accompanied by one of the æthmoidal arteries, enters by the foramen orbitale anterius, to be distributed to the mucus membrane lining the cells of the nose. The second, or external, passes along the wall of the orbit, below the pulley of the obliquus superior, dividing into several fibres; the upper of which pass to the eyelids; the lower to the caruncula lachrymalis, and lachrymal sack, and come out upon the face, to supply the skin of the nose.

We should here consider the ophthalmic ganglion, which is of a square form, somewhat elongated, and situated upon the outside of the optic nerve. Directly after the nasal branch of the fifth pair enters the orbit, it sends a twig forward that has previously been joined by one from the superior cervical ganglion of the sympathetic, to enter into its composition, while it receives a large twig from the motor oculi. This body, in all probability, is a kind of plexus, in which the different fibres being collected, are here again separated, and so concatenated as to fulfil the several actions and uses that they are designed to perform. From it the ciliary nerves, particularly delicate and fine, proceed in two fasciculi, running forward in the fat of the orbit, ten or twelve in number, to the back part of the sclerotic coat, and piercing this texture obliquely in connexion with the ciliary arteries. They then run forwards between the sclerotic and choroïd coats, to supply the iris with its peculiar sensibilities.

Having thus reviewed the distribution of that division of the fifth pair which enters the orbit, we should now consider its use. I have said that the fifth pair is similar to the spinal nerves, in so much that they arise by two separate and distinct origines, one of which however, we find considerably larger than the other. This comes from the cerebellum, and is therefore a nerve of sensation. The ophthalmic division is formed entirely of this, as we could easily have ascertained by refering to its distribution, had not its origine obviously assured us of the fact. These then are the nerves, which going to supply the apparatus of the eye, endow its membranes with the acute sensibility so necessary to their preservation, while they are also distributed to the skin covering and surrounding them.

THE SIXTH PAIR.

These nerves arise from the crura cerebri, immediately below the tuber annulari; their fibres, proceeding from the side of the corpora pyramidale, mount upwards in two fasciculi, which soon unite, and then proceeding forwards to the posterior clinoid process, pierce the dura mater, entering the cavernous sinus, surrounded by the tunica arachnoides, and is separated from its blood but by a fold of the lining membrane. It is in connexion with the carotid artery, adhering to it by a layer of cellular tissue: here we find it of a redish colour, and a little increased in volume. While passing the foramen caroticum, it receives several twigs from the superior cervical ganglion of the sympathetic, which, mounting with the artery, have often been described as the commencement of that great nervous chain, which so universally pervades the whole trunk. The sixth pair of nerves then passing through the foramen lacerum by a distinct

opening, above the ophthalmic vein, enters the orbit between the two origins of the rectus externus muscle, where we find it has a connexion with the motor oculi; then going directly forwards, is almost immediately distributed to the fleshy fibres of that muscle. This nerve, which comes from the crura cerebri, and is finally lost in the rectus externus muscle, goes to endow it with the power of voluntary motion. It has, however, long been a matter of speculation, why this muscle in particular should be supplied with a distinct nerve, and why that nerve is connected in so marked a manner with the sympathetic.

THE SEVENTH PAIR.

The seventh pair of nerves consist of two very different and distinct parts, which have been distinguished by the names of *portio dura* and *portio mollis*; the former of which goes forward to the face, while the latter, being the nerve of hearing, is beautifully distributed upon the internal apparatus within the petrous portion of the temporal bone.

The *portio dura* has been said to take its origin entirely from the crura cerebelli; but, I think, that if it be attentively examined, it will be observed, that most of its filaments proceed from the corpora olivaria, while some may even be traced to the corpora restiformia, or the continuation of the crura cerebri; these united rise by the side of the Pons Varolii, and form a soft white cord that runs in a gutter or fossa, marked in the auditory portion of this nerve. They enter together the internal auditory foramen, but it very soon separates from the *portio mollis*; here the *portio dura* sends off some minute twigs, which pass to supply the muscles of the internal ear; it then passes along the aqueductus fallopii through the temporal bone, and here likewise it sends off a branch, which has been called the *corda tympani*, which goes to join the gustatory. The *portio dura* then escapes upon the side of the face, by the stylo-mastoid foramen at the root of the styloid process; it is here covered by the parotid gland, into which it plunges, and is then subdivided into many branches, some of which go to the eye, others to the nose and mouth; to be distributed to their several muscles. It is necessary only to consider those branches, which are distributed to the appendages of the eye; these arise in the very substance of the parotid gland, and passing forwards and upwards upon the face, are finally lost in the substance of the orbicularis oculi and muscles of the brow.

The seventh pair have, by Mr. C. Bell, been denominated nerves of respiration, that is, the parts to which they are distributed are synchronously called into action with the apparatus necessary to that function; besides this power, they are evi-

dently nerves of voluntary motion, which must be obvious upon the slightest attention: and if it be correct, as I mentioned, that they take their origin both from the *cura cerebri* and *corpora olivaria*, we can easily comprehend the compound function, and at once understand why they animate the muscles of the face agreeably to the mandates of the will, and can also influence them in combination with the respiratory system. Those twigs however, which pass to the orbicularis and muscles of the apparatus, endow them with the power of voluntary motion. Mr. C. Bell has, however, laboured with great ingenuity to prove that even here there is a very evident connexion with the respiratory system. I will not directly deny the fact, but must confess, that the necessity of such a provision is not so obvious here, as among the muscles of the nose and mouth.

It might be as well, if before we leave this interesting subject, we took a slight review of the functions of the several nerves which supply this beautiful apparatus. The optic we have shown passes to the eye, to be expanded into the retina, and to become the immediate communicant of that impression we denominate sight. The motor oculi is distributed to five of the principal muscles of the ball, endowing them with the power of voluntary motion; the fourth goes to the obliquus superior, to supply it with a similar function; the fifth, which is a nerve of sensation, is distributed to the surface of the apparatus; while the sixth goes to the rectus externus, and the seventh to the muscles of the lids, to animate them with the commands of the will. Thus the whole evinces a most beautiful combination and uniformity of intention.

We should now also notice, that the orbit is filled with a quantity of delicate adipous matter, almost fluid in the living body, contained in a very lax cellular tissue, which forms an equable support to its many important contents, while, at the same time, it permits a very great freedom and latitude of motion, so that the different muscles act without impediment.

THE EYE BALL.

General Considerations.—Before we commence a minute description of the several parts of this organ, it would be better that we had some general view of their whole, which would lead us, by degrees, to a more minute acquaintance of the individual parts, and teach us, that although separate in description, they form one complete and beautiful apparatus. The globe, or ball of the eye, as it is vulgarly denominated, is a spherical body, made up of a variety of membranes, which give support to the more fluid parts, or serve some particular use in its economy. It is supplied with humours of different consistency, that refract the rays of light, and pro-

vide that they fall with due exactness upon the sensible part of the organ. The external surface we find made up of a very strong and tough membrane, to support and hold in connexion all the internal parts, the greater proportion of which is opaque, but we may observe a transparent surface upon the anterior part, this, which is a larger segment of a smaller circle than the posterior, was once supposed to be a continuation of the same membrane, but is now demonstrated as a distinct and separate part, which, by its toughness, assists to support the eye, while its perfect transparency freely permits the rays of light to pass into the organ. Next in connexion we find the choroid coat, which supplies the dark pigment, to absorb the rays of light after they have produced their effect upon the expanded nerve. A very delicate membrane lies immediately within this, and is called the retina, the nervous part of the apparatus. Next in situation follow the different humours that refract and adjust the focus of the rays of light, which, however, are duly moderated, by the sensible and beautiful membrane, which freely floats in the anterior chamber of the eye—the iris, which acts as a curtain, to proportion the quantity of the rays of light to the intensity of their power. Of those humours, which assist to form the globe, the first is the aqueous, situated in the anterior chamber, perfectly fluid, to permit the due action of the iris; secondly, the crystalline lens, a body of denser consistency, made up of concentric lamellæ, serving to the proper adjustment of the rays of light; and, lastly, the vitreous humour, forming the greater expansion of the globe. In addition to the several parts, we have vessels, carrying blood, which varies, however, in its quality, according to the part supplied; thus some arteries carry red blood, while others, as in the transparent membranes, carry but a serous fluid, perfectly pellucid, which runs through these tubes, to nourish and support them; and to combine all the parts in one perfect whole, are the nerves which influence the different functions of this beautiful little organ.

INTRODUCTORY VIEW OF THE SCIENCE OF OPTICS.

To be able perfectly to comprehend the physiology of vision, and the uses of the organ we are about to consider, it is necessary we should take a general view of the science of optics, not dipping deep into it, for that would require volumes, but only to place before the reader some of its laws which bear upon the subject, for without a knowledge of them, he might be amazed at the beauty, form, and composition of the tissues, but could not understand the purposes they were intended to fulfil. Light is matter thrown out from the sun, or reflected from luminous bodies, which, entering the eye, strikes upon the sensible retina, and gives to us the sensation of light, or produces vision. The

sun is, perhaps, the great source of light, but some ignited, and even numerous phosphorescent bodies, emit it; in these instances it would but appear to be disengaged by chemical action from substances that held it in a latent form. A ray is the smallest stream of light that could propagate itself through a minute hole; and, in the study of optics, is represented by a mathematical line.

I have said that the rays of light are represented by mathematical lines: these proceed in every direction from an ignited body. Thus, if we place a candle in the centre of a room, it is soon filled, more or less, intensely with the rays that proceed from it, these diverging as they go out, the flame soon forms the apex of a cone, larger or smaller, according to the length of its rays.

Light is so extremely subtile in its nature, that we are little able to put its laws and properties to the test of positive demonstration, which some material substances allow of. In some instances, however, we may perceive an analogy to the grosser forms of matter. Thus, from passing from a rarer medium into a denser, the ray of light, if it strikes in a perpendicular direction, proceeds onwards in its course, without experiencing any alteration, but if it impinge at an angle, it is refracted, that is, the ray seems bent in its passage from the one medium into another, or it would appear to meet with such a degree of obstruction, as to turn it from the course it held, and to incline it to the perpendicular; but should the substance be opaque, and not admit of its passage, it is reflected according to the angle of its incidence. An easy little experiment will clearly demonstrate the refraction of the rays of light: thus, if we place a substance (a shilling, for example), at the bottom of a bason, and retire to such a distance, that the edge of the bason just prevents the rays being reflected from the coin to the eye, we should then fill the bason with water, and it will become directly and plainly visible, proving that the light experiences a refraction on entering the water, and being still reflected at its due angle, is submitted to another change in its course to the eye. A diagram may also serve to render this more intelligible.



Thus, if the ray 1 proceeds without any impediment, and strikes upon the coin at 4, it is reflected back in a perpendicular

direction; but if that at 2, impinging at an angle, enters the water at 3, its course is changed, so that instead of pursuing the dotted line, it strikes at 4, and is reflected to 5, its proper angle; but again, on entering the air, it assumes the angle of its original direction, 2. I should also mention, the denser the medium, the more marked is the refraction: thus water produces a greater effect than air; glass than water; while the diamond is more powerful than glass: and this also should be remarked, that the more inflammable the nature of the body, the greater is the refraction.

Light has long been known to philosophers as a compound body, that is made up of many and different coloured rays, which is clearly and fully proved by its refraction through a glass prism. Thus, if we admit a ray of light through a small aperture of a window-shutter into a dark room, and hold a prism in the stream, we shall find that the rays will be separated, and divided into different colours, so as to become distinctly and individually visible; and we may by these means, as it were, dissect the ray, as an anatomist does the body with his scalpel. The image formed by the different rays thus separated, constitutes the solar spectrum; it consists of seven primitive rays or colours, viz. red, orange, yellow, green, blue, indigo, and violet: each of these rays vary in the degree of their refrangibility in the above order, the red being the least and the violet the most refrangible. They also differ in the space they occupy in the spectrum; so that if we divide this into 300 parts, we shall find that the red occupies 45, the orange 27, the yellow 48, the green 60, the indigo 40, and the violet 80. Having shown light to be a compound, by the dissection or division of its several rays, so by synthesis, or the combination of these several rays, we can add another proof that will assist to convince us of this important and curious fact. If we paint all the primitive colours upon a piece of paste-board, giving each its due proportion in the spectrum, then pass a bit of string through its centre, and make it whirl round with very great velocity, instead of each primitive colour, we shall have one general light surface, formed by the conjunction of these several rays.

These experiments clearly prove that the compound rays of light are those only which produce the sensation of vision. To produce colour in any thing, therefore, it is necessary that the object should absorb all the rays of light, excepting those which produce the tints, these being reflected from the body, and impinging upon the retina, enable us to distinguish the various hues that afford us such pleasure and delight. All colours are made up of these primitive rays, varying the proportion of each, so that they form that infinite and pleasing variety that surrounds us on every side.

THE SCLEROTIC COAT.

This, which is the external coat of the eyeball, serves to support the more internal and delicate parts by its form and strength, and gives that globular appearance to the eye which we admire; without it, these parts would collapse by the slightest pressure, and be unable to perform their several functions with the minuteness and perfection they now evince. It is of the nature of those membranes anatomists have designated by the name of fibrous, similar to the dura mater and periosteum in formation: it is a hard, firm, and whitish membrane, consisting of fibres firmly attached and interwoven, not separable by maceration, in the adult state, but said to be divisable into two layers in the foetal eye; at this period it certainly is not so strong, so that perhaps its fibres permit of forcible division. The sclerotic coat forms little less than four-fifths of the posterior covering of the globe; it is thickest at the posterior part, but considerably thinner anteriorly, where it is covered by the expanded tendons of the recti muscles, which have often been enumerated as a coat under the name of tunica albuginea; it has little vascularity in the healthy state, its vessels circulating but a serous fluid; when, however, in a state of inflammation, they become enlarged, and carry red blood, so as to give this structure a pink colour. On its posterior surface the sclerotic coat is sometimes pierced by a round opening, which gives passage to the optic nerve; but generally in its place we find a multitude of minute foramina, which serve to admit the separate fibres of this nerve; one or two, however, are remarkable among them for their size: these permit the artery to enter, and the central vein of the retina to escape into the orbit: it is called the cribriform plate, from these numerous perforations. Besides this, we may also observe many minute oblique foramina, through which the ciliary vessels and nerves pass. Anteriorly we find a circular opening, six lines in breadth; this, in the unseparated condition, is filled up by the cornea implanted in a groove of the sclerotic coat, the outer margin of which passing forwards upon the circumference of the cornea, is connected to it with very great strength and firmness; to use a familiar simile, it bears some analogy to the manner the glass is fixed into the watchcase.

The membrane which encloses the optic nerve, and forms its sheath, is described by some as the commencement of the sclerotic coat; this has also been said to be continued from the dura mater; it certainly bears a very great and striking resemblance to it, both in the quality of its tissue and the nature of the office it performs.

The external surface of the sclerotic coat is covered by a cellular tissue, that connects it to the surrounding parts within the

orbit, while we find its internal clothed by the choroid coat, which is in immediate connexion with it.

THE CORNEA

Is that transparent membrane placed upon the anterior surface of the sclerotic coat, and so firmly connected to it that they were formerly considered one and the same, and were described under the names of opaque and lucid cornea; but a more attentive examination demonstrating their texture and conformation, has fully proved the fallacy of this position. The cornea is formed of strong, transparent, and fibrous lamina, which are superadded upon each other; these are generally six in number, and are connected by a cellular tissue, which forms many little cells between each layer; these cells contain a transparent fluid, secreted by very minute and colourless exhalent vessels: such is the admirable contrivance that renders this firm and dense structure permeable to the rays of light. Without this peculiar apparatus every fibre that crossed the pupil would of necessity reflect a portion of the light, and thus intercept and confuse the view of every object presented to the eye. We find that many minute and strong substances, which reflect the rays of light when in air, and are hereby obvious to the sight, when wetted or immersed in water, become invisible; so I imagine the aqueous secretion penetrates each layer of the cornea, distending and separating each fibre of its substance; and these fibres being immersed in or lubricated by this pellucid fluid, freely permits the passage of the rays of light, which without this beautiful provision would be reflected off from the cornea. Thus, after death, when evaporation of this fluid has taken place, and we can by pressure bring the fibrous layers nearer to each other, a white appearance presents itself; that is, the light is reflected from the two closely approximated layers of the cornea. I apprehend the same thing would take place in the living eye, were it possible to remove the fluid. The human cornea is a pretty regular sphere, convex anteriorly, concave within, serving, with the sclerotic coat, to support the more fluid parts; without, we find it covered with a layer of conjunctiva, which is firmly connected to it by cellular tissue, and so intimately participates in the same contrivance to secure its transparency, that it is with difficulty we can demonstrate their separate existence. Upon its outer surface this also secretes a fluid, that assists to render it pellucid. Upon its internal surface is a layer, which has been called the membrane of the aqueous humour; that this layer exists, is perfectly demonstrable, but that the membrane is reflected over the iris and capsule of the lens, is a fact that analogy only can confirm. The aqueous humour being a serous fluid, this is called

its capsule, and is likened to the other serous membranes of the body. Disease sometimes leads us to imagine that it is present, for in inflammation of the iris, I have distinctly perceived this lamina of the cornea simultaneously affected; and may not this partly account for the muddy appearance the anterior chamber generally exhibits in this affection?

The vessels that nourish the cornea proceed from the anterior ciliary arteries; these are the extreme branches that supply the muscles of the ball, which going forwards, pierce the sclerotic coat to form inosculation with the vessels within the eye. In this passage through the sclerotic coat they give off many minute branches, which in health carry but a serous fluid, and thus transparent are perfectly invisible; it is but in disease, when their calibre is increased, and they suffer the red globules, or rather a larger quantity and denser quality of coagulable lymph, to pass along them, that they become in any way demonstrable; thus in inflammation of this tunic we find a beautiful circle of little pink-coloured vessels forming an areola around the cornea, and penetrating into its very substance, while its whole surface takes on a muddy appearance, which I apprehend is now accounted for by the supposition that a denser fluid now permeates these serous branches.

In infancy the cornea is thicker in its substance, and more lax in its texture, than in adult age. It now also contains a greater secretion of interstitial fluid, which necessarily increases in some degree the convexity of its surface, which is perhaps a provision for the greater refraction of the rays of light in the infant eye, a circumstance which in the adult is sufficiently provided for by the general increase of size.

THE CHOROID COAT.

This membrane is next in connexion to the sclerotic coat, covering its internal surface; it is beautifully soft and easily torn, while from its great vascularity it has been considered the centre of circulation within the eye. Some who have imagined that the tunics of the eye were a continuation of the membranes of the brain, have (while they considered the sclerotic to proceed from the dura mater) thought this derived from the pia mater. In its use it may seem in some degree to correspond, but by administering to other and very important functions, it obviously claims a marked distinction. This tunic was described by Ruysch as consisting of two membranes; one the outer, carrying and supporting the vessels; the other (which has been called, in honour of him, tunica Ruyschiana) is of a flocculent appearance, and secretes the dark pigment which we find on its inner surface. This distinction is scarcely perceptible in the human

eye, but in that of some animals it is much more obvious: its existence has been altogether denied by some anatomists; I think, however, the distinction is warrantable, from the evident difference of their office.

The outer lamina of this membrane, then, is the proper chorioid. It consists of a multitude of minute vessels, connected together by cellular tissue, and these would appear to carry the red blood which is subservient to the secretion of the black pigment. This is of a brown colour, and after death stains the neighbouring surface of the sclerotic coat. On its inner surface are the branches of the posterior or short ciliary arteries, which form a net-work of great vascularity, and which in a fortunate injection appears of a universal scarlet colour; they are very intimately connected to the veins which are without, and may likewise sometimes be shown by a successful injection from the superior cava: these are beautifully convoluted, and exhibit great exactness in the arrangement of their branches. Thus each capillary vein enters into a larger trunk, after making a very graceful turn, so that they have been compared to a tree with weeping branches, or to the fine curve of the waters of a jet-d'eau, while from it they have also received the name of *venæ vorticosæ*; and these being collected into three or four larger trunks, pass through the sclerotic coat into the orbit.

The *Tunica Ruyschiana*, also sometimes called *tapetum*, is the internal lamina, which under the microscope presents a fleecy appearance; this proceeds from the projection of an immense number of very minute villi, that secrete the paint we find covering its inner surface. Anatomists have not, from the minuteness of the structure, been able to discover any glandular apparatus; but from analogy, I am almost brought to consider that such must really exist; when washed of the pigment, its surface is of a brown colour; in very young subjects it is particularly red. This is also the case in the eye of the albino; but here I doubt that the *tunica ruyschiana* ever existed, and consider that an original deficiency of the formation of this part, is the cause of the absence of the pigment.

The *pigmentum nigrum*, which is secreted by the *Tunica Ruyschiana*, lies upon it, and immediately behind the *Tunica Jacobi*. In animals we find it of a black colour, but in the human eye it has a brownish tint, and is therefore not inaptly (by the German anatomists) denominated *Pigmentum Fuscum*; its colour, however, varies in density in different individuals, while in some it is entirely wanting. It appears to be about the consistency of mucus, not merely placed upon the surface which secretes it, for upon examination we find that the next membrane is free from any tinge—but it must be covered by a very deli-

cate cellular tissue; so delicate and fine that it is washed away with the pigment, by means of a little water and a camel's hair brush.

This is the matter that occasions the jet black appearance we see, when looking into the pupil. In the albino and some animals it is absent, when the internal eye seems red, from the blood vessels of the choroid reflecting the rays of light. We also find that it varies in quantity at different times; thus in old age, or the commencement of some diseases, it is partially absorbed, when the bottom of the eye becomes more visible, and we are apt to mistake it for an opacity in some of the transparent media. Its use is evidently to stifle the rays of light that have produced their due effect upon the sensible retina, as I have explained, that in the phenomena of colours, all the rays of light are absorbed, excepting those that produce the tints: now in black none are reflected, a circumstance which directly proves the use of this pigment. The rays of light which enter the pupil, and strike upon the expanded nerve, having produced their intended effect, are directly absorbed; but was this colouring matter deficient, or in any degree absent, they would be reflected, and in all probability would produce a proportioned degree of confusion in the perception of objects.

The outer surface of the choroid is united to the sclerotic coat by a fine and lax cellular tissue; it is also particularly connected at many points by the ciliary arteries and veins. The optic nerve, which passes through the sclerotic coat, also forms a band of very intimate connexion; and here the choroid coat forms around the cribriform plate a little monticulus, over which the fibres of the nerve diverging, are expanded into the retina. At the upper margin it also receives a firm attachment to the ciliary ligament, or general point of union of most of the internal membranes. Between the choroid and sclerotic coats we may also discover the long ciliary arteries, their corresponding veins, and can easily distinguish the ciliary nerves which accompany them, by their whiteness and size, for these run in parallel lines, at about equal distances forwards, to form the annulus gangliformis.

LIGAMENTUM CILIARE.

The ciliary ligament is a kind of greyish ring, seated at about the distance of a line and a half from the external circumference of the cornea; it is thick, particularly at its upper margin; is from two to three lines in breadth, and appears of a pulpy texture. Here we find is the general connexion of almost all the internal tunics, which are united to it by the firm sclerotic coat; at the lower margin is the choroid, upon its superior edge

is placed the Iris, and between the two the ciliary processes adhere to it.

The ciliary nerves passing up between the sclerotic and choroid coats, are said, when they arrive at this point, to form a plexus or general union of nervous twigs, which has been named by Sœmmering the annulus gangliformis, which afterwards sends out minute and delicate fibres, to regulate the action of the Iris. That such a ganglion really exists, I am led to doubt, from observing upon the division of these ciliary nerves, that the pupil becomes permanently and largely dilated at the point supplied by the wounded nerve, a fact which, although it may throw some doubt upon the case, does not entirely disprove the idea. The student should be particular to mark this spot, for it is necessary to avoid it in our different operations behind the pupil; for should we happen to wound this general bond of connexion, we might do immense damage, setting aside the fear of wounding this centre of nervous influence. He should also observe the exact spot at which the long ciliary arteries pierce the ligament, for although a wound of them would not be very dangerous, it is as well we avoid them.

THE CILIARY PROCESSES.

This is a beautiful little circle placed posterior to the iris; it is considered by some to be a continuation of the choroid coat, which they represent as plaited at the angle of its inflection, to allow of its accommodation to this part of the globe. It certainly bears a great resemblance to it, in texture and vascularity; but as it is easily separated from it, and is evidently placed here for a particular and useful purpose, I think it better to consider them distinct. If we divide the eye longitudinally, and remove the crystalline and vitreous humours, we shall see the smaller extremity of these processes which were in apposition with the capsule of the lens, floating loosely, while we may also observe the firm attachment of their external margin to the ciliary ligament. We likewise find that these folds of membrane are radiated like the disk of a flower, having a lesser light-coloured circle included within a larger and darker one, presenting an appearance that has not inaptly been termed the corona ciliaris. In the uninjected state they are loose and flaccid; but when their vessels are filled, we find them of a scarlet colour. Their vessels proceed principally from the ciliary arteries, which having supplied the choroid coat, now advance in great profusion to the ciliary processes, endowing them with a like vascularity, while the veins are also connected to the *venæ vorticosæ*. Upon the inner surface these processes have a layer of colouring matter, similar in character to the pigment of the choroid, and

iris; this is secreted by an appropriate apparatus, from the innumerable quantity of minute vessels which I have mentioned. In number these processes vary from sixty to eighty, are about the length of a line and a half, alternately longer and shorter, assuming the appearance of a triangle, with the base in connexion with the ciliary ring, and the apex pointing towards the lens. Now if we inspect the corresponding portion of the vitrious humour, we shall see the mark of their adhesions, and may observe some slight depressions of the membrane to which they were attached; these correspond in depth to the elevation of the folds, and are stained by the same fuliginous paint, so that they are often mistaken by the student for the processes themselves. The use of this plaited membrane is another instance of the beauty and perfection of the organ; for supplied by the black pigment, and assisted by the frequent folds, it entirely prevents the admission of the rays of light around the circumference of the lens, which if allowed to pass, would in all probability, from not receiving its due degree of refraction, confuse and render vision indistinct.

M. le docteur Ribes has advanced a theory, that these processes secrete the aqueous and vitrious humours: that the aqueous humour is formed by them would appear probable; but that the vitrious is, I consider, from the nature of its conformation, to be far from correct.

THE IRIS.

The iris, so named from the variety of its colour, forms one of the most striking traits in the human countenance: it gives a brilliancy to the eye, a sprightliness and animation to the features, which are peculiarly interesting. It is that coloured membrane which is hung in the anterior chamber of the eye, and acts as a curtain to regulate the quantity of light to be admitted to the retina; it is of a circular form, having a greater and lesser margin; the greater is firmly connected to the ciliary ligament, while the lesser forms the pupil, which is the circular hole in the centre of the membrane: this we find is nearer on the nasal than on the temporal side, to the ciliary ligament. The iris floats freely in the aqueous humour, dividing it into anterior and posterior chambers. The anterior chamber of the aqueous humour is the largest, being about a line and half in depth, while the posterior is but the fourth of one, at most. By some anatomists the iris has been considered a continuation of the choroid coat; but the disposition of its vessels, combined with its difference of function, obliges us to consider it a separate and distinct membrane.

The iris is said to be composed of muscular fibres, a vascular

net-work of vessels, and an apparatus which secretes the pigment, called uvea. Over these, and reflected upon its surfaces, is described the membrane of the aqueous humour; this, after a very attentive examination, I have not been able to discover; but reasoning from analogy, I am led to believe it exists.

With respect to the muscular fibres, authors have long been at variance concerning their existence. That the iris, however, possesses them, seems very probable; but we have not been able to prove it satisfactorily to demonstration. From the nature of its actions, however, I am led to conclude that they exist, and that this texture of the iris is not formed as the German anatomists would have us believe, by little cavernous bodies, which it was supposed are filled with blood in the contracted state of the pupil, and, like the cavernous body of the urethra, were comparatively empty in the relaxed, when the pupil was dilated. Pretty as this theory of the conformation of the iris may sound, we cannot bring it to the proof by demonstration, and so must depend upon analogy in our decision of the muscularity or non-muscularity of this membrane. I would conclude that it was muscular from the quickness of its movements, and its exact correspondence with the other sphincter muscles; thus in fainting and compression of the brain, we find it dilated. Another proof which I think will tend greatly to convince us of the fact, and is decidedly at variance with the German hypothesis, is, that in inflammation, this membrane becomes permanently dilated, and the pupil of course contracted, as the generality of other muscles do, from the interstitial deposition of coagulated lymph; while in the cavernous body of the penis we find effusion of lymph seal up the mouths of its cells, and prevent the passage of blood into them, whence the penis is afterwards always in a relaxed state, and not to be excited by libidinous ideas. Indeed, M. Maunoir affirms, that he has seen the muscular fibres by the aid of a glass, and that they are arranged in two directions, radiated and circular. The radiated he describes as proceeding from the ciliary margin towards the pupil, and by their contraction to dilate it; while the circular are internal, surrounding the pupil, and form a sphincter muscle, which contracts the diameter, or entirely closes it. This is a fact which I confess I have not been able to discover, but must at the same time consider its existence very probable.

In the iris we also find a provision similar to that in the choroid coat, for the secretion of a pigment which is here called the uvea, as in that texture we find an intricate plexus of blood vessels, affording pabulum to the minute villi that pour out this paint.

The villi which secrete the uvea, as it is called from its re-

semblance to the colour of the grape, I apprehend to be a glandular structure, profusely supplied with very minute arterial branches; in an injected state it is particularly red. The uvea, which is placed upon the posterior surface of the iris, shines through this semi-transparent membrane, and gives that variety of colour that is observable in the eyes of different creatures. Its tints would appear to vary with the colour of the hair, or complexion of the individual. In very dark people we find it of a brown colour: in the eyes of individuals that possess a fair skin it assumes a light blue; while in others, such as the albino, it is entirely absent, when we find the iris of a red colour. This pigment I have described as similar to the choroid secretion, save that it seems more firmly to adhere to the posterior surface of the iris: this is accounted for, however, I apprehend, by the following circumstance, viz. that it has a layer of the membrane of the aqueous humour reflected over it: this would, indeed, appear more than probable, for unless something covered it from the action of the aqueous humour, it would be washed off by the motions of the iris, and float in the anterior chamber. The use of this pigment is to secure the thorough opacity of the iris, so as to prevent the light from passing through any part of this membrane, for unless it possessed it, it would not be so effectual a guard to the retina.

The arteries which supply the iris with blood are the branches of the ophthalmic, called long ciliary arteries; these passing forward between the sclerotic and choroid coats, pierce the ciliary ligament, when they divide into two twigs, which pass almost at right angles, and having arrived at the outer margin of the iris, inosculate with the minute twigs of the short ciliary arteries, and form a very obvious vascular circle at the great circumference of this membrane. From this point a multitude of minute vessels proceed: when the pupil is contracted they run in straight lines, but when it is dilated they are convoluted, passing in the radius of a circle, until they arrive about midway between the ciliary and pupillary extremities: here they form a second anastomosis, and again give out a number of very minute twigs, which run in a like manner to the margin of the pupil. The returning veins intermingle with the arterial branches, and pass either into the *venæ vorticosæ*, or into the trunks that accompany the long ciliary arteries.

The iris is very beautifully supplied with nerves, which proceed from the lenticular ganglion, supposed to be its centre of nervous sensibility. I have shown how this ganglion is formed, by a branch of the third pair, or motor nerve, a twig from the fifth, or nerve of sensibility, united to the fibres coming from the superior cervical ganglion of the sympathetic. From this

point the ciliary nerves pass forward to the eye, pierce the sclerotic coat, running between it and the choroid, until they arrive at the ciliary ligament: here they are divided into many minute fibres, which go to regulate the motions of the iris. According to the nerves which it receives, we should expect this membrane to be under three influences. In the first place, it is governed by the sensibility of the retina, which excites the motor nerve that is minutely distributed to the muscular apparatus; secondly, this being a nerve of voluntary motion, must bring it under the command of the will; and thirdly, it has a twig from the nerve of feeling, or fifth pair; this, I imagine, as in other parts of the body, receives an impression, which differs, however, in so much that the iris not being an external part of the body, is not under precisely the same kind of influence, that of common sensation: but we know that the sensibility communicated by the same nerve often differs in degree, so that in this instance I suppose the nerve of sensibility to be minutely distributed on the anterior surface of the iris, there to be influenced by the rays of light, whilst although not felt on the external surface of the body, may to this delicate membrane be perfectly perceptible. The connexion of the motions of the iris with the sensibility of the retina, is one of its most prominent and useful qualities, for when rays of light, that act with great intensity, strike upon this membrane, they would injure the nerve, by the violence of their impression, unless the iris contracted, and as a curtain, interposed to diminish the quantity, or altogether to exclude their passage into the eye. But when, from the paucity or little strength of these rays, it is necessary a larger volume should be admitted, we find the pupil dilated, to permit an increased number to impinge upon the retina, and so to render visible, objects that reflect but few or very distant rays. That the motions of the iris are under the command of the will, we should be led to expect, from the nerves that supply them. In Mr. Travers's work is the case of Dr. M. P. Roget, detailed by himself, directly proving the fact, and very ingeniously accounted for by that acute philosopher. I believe that all men possess a power over this membrane, but very few put it in exercise. That the iris possesses a sensibility peculiar to itself, is proved by the circumstance, that in amaurosis, where its motor nerve could receive no excitement from the retina, we often find this membrane acting as freely as when under its immediate control. It is possible in some cases the will may direct its movements; but if we examine the case with attention, we shall be able to perceive that the contraction and dilatation of the pupil alternates with the admission or exclusion of the rays of light from the iris.

MEMBRANA PUPILLARIS.

This is a thin and delicate membrane, which closes up the pupil in the eye of the foetus. It was first noticed by Wachendorf, in 1738; but its discovery is also claimed by Haller, Albinus, and Dr. Wm. Hunter, who observed it about the same period. In the dissection of the foetal eye, we may discover the little red vessels of this delicate membrane shooting across the pupil, and inosculating with those that proceed from the opposite side: they are generally visible after a minute injection until about the seventh month, when the consistency and vascularity of this diaphenous web appears gradually to decrease, until the hour of birth, when, upon the admission of the first rays of light that impinge upon the retina, the iris is excited into action, and finally ruptures its delicate fibres. That it is a membrane is proved beyond all doubt, for unless supported by cellular tissue, the vessels which are sufficiently obvious could not exist, for indeed they must possess vasa vasorum to nourish their coats, and connect them with the general system. I have before mentioned the membrane of the aqueous humour, which is said to be reflected over the anterior chamber of the eye: if this really exists in the foetus, it must be double, that is clothing both chambers of the aqueous humour, which this membrane must now serve to divide. Indeed I think it probable that the minute vessels may pass between their layers, and may with them form the membrane in question.

I find that the membrana pupillaris is described by M. Jules Cloquet as a reflection of the membrane of the aqueous humour. He says, "*La membrane pupillaris est evidenment formée de deux feuillets diaphanes et adossés l'un à l'autre. Le posterieur appartient à la chambre correspondante de l'œil, et naît du pourtour de la pupille; l'antérieur dépend de la membrane de l'humeur aqueuse qui tapisse la face posterieure de la cornée transparente et toute la chamber antérieure de l'œil.*"

Having considered the motions of the iris, we know that in the absence of its proper stimulus—light, the pupil is fully dilated, and so it would be in the unborn infant, unless this membrane held it in a medium state of dilatation, until its organization be completed, and it has arrived at such perfection, that upon the first call of the iris to its office, its last remaining fibres, now so few and delicate, are ruptured by the first motions of the membrane.

THE RETINA

Is the beautifully expanded extremity of the optic nerve, the seat of every luminous impression, and the most internal of those membranes denominated the coats of the eye. I have described

how the optic nerves arise in the brain, from the nates and testes, and thalami nervorum opticorum; how they proceed forwards, having a connexion, and then diverging, pass through the foramen lacerum, and finally arrive at the posterior part of the eyeball; how, after they enter the orbit, they are enveloped in membranes similar to those surrounding the brain itself, and said to be continued from them; how one is united with the sclerotic coat, while the others may be traced into the ball, along with the nervous fibres.

The optic nerve, just at its entrance into the globe, is very much compressed, as though we had tied a string tightly around it. This appears to arise from the fibres of the nerve being now closely connected and firmly supported, to ensure them a secure passage through the hard sclerotic coat. The fibres now pass through the cribriform plate, each fibre going through a separate foramen; and if, in our examination, we remove the retina, and squeeze the nerve, we can distinctly prove this fact; for the nervous matter will protrude through minute pores: here also we find the fibres collected into a little amonticulus, or minute papillæ, surrounded by a fold of the choroid coat, over which they spread out, and are finally expanded into the retina.

The retina, so called from the net-like appearance produced by its blood vessels, is said to consist of three separate coats, or layers. The middle, and most essential, is the nervous matter, delicately expanded between the other two. This, in the living subject, is perfectly transparent; but in dissection after death, we find it of a light grey tint, extremely soft and pulpy, consisting of minute corpuscles united by the cellular tissue. This matter lines the inner surface of the choroid coat, but is not directly connected with it. It passes forwards to within a short distance of the corona ciliaris, and terminating abruptly, we may observe a transparent portion between them. It seems partly deficient at the point where the nerve enters the globe; that is, the fibres at the monticulus do not receive sensation so acutely as the expanded matter of the nerve.

The outer layer of this tunic would appear similar to the tunica arachnoides, both in consistency and office. Like it, we find it delicately thin and transparent; surrounding the outer surface of the nervous matter, separating it from the pigment of the choroid coat, with which this layer is in immediate apposition, and this too, instead of stopping at the corona ciliaris, as the nervous matter, passes forwards under the ciliary processes, and is then marked by their eminences, and stained with their paint, until it arrives at the capsule of the lens, over which it is reflected. Just before it arrives at the capsule, we find that it forms with the external tunic of the vitrious humour, the canal

of Petit. This membrane was first described by the justly celebrated anatomist, Dr. Jacobs, of Dublin, who demonstrated its existence but a few years back. It is best discovered in an eye that has been kept a short time, when we may generally elevate it from the nervous matter, by means of a camel's hair brush and a little water. The inner layer of this membrane is denominated the *tunica vasculosa retinæ*: it is similar to the *pia mater* in the nature of its office, and like it, we find it composed of a delicate cellular membrane, supporting and connecting a tissue of blood vessels, which supply the nervous matter. This tissue is supplied with blood, by that branch of the ophthalmic artery called from its course the *arteria centralis retina*. It is a twig that passes forwards by the side of the optic nerve, pierces its investing membrane a little posterior to the globe, runs between the nervous fibres until with them it enters the eye, and is finally expanded into this delicate net-work of vessels. If we make a section of the nerve, near to the eye-ball, we see its open mouth forming a hole, which by the ancients was called the *Porus Opticus*, and considered to fulfil some very important office in the physiology of vision. The artery having passed through the cribriform plate, we find it distributed with very great minuteness upon the inner surface of the nervous matter: many of the vessels carry red blood, and are visible to the naked eye; but the far greater number convey a serous fluid, for the nourishment of this delicate apparatus. Some of these vessels go forwards, to inosculate near the ciliary processes, with the termination of the short ciliary arteries, and here having received a considerable augmentation, many of its serous branches go forwards to supply the lens and its capsule. These in health are perfectly transparent; but during disease I have distinctly seen them extending themselves upon the capsule of the lens. The veins which return the blood correspond with the arteries, being collected from their minute terminations into larger trunks, pass backwards through the cribriform plate into the orbit. It is them we so distinctly see, in our examination of this membrane after death, they being generally filled with blood, while the arterial branches are quite empty. We should now look well to the delicate vascularity of this layer, and its connexion with the nervous matter; for unless we give this point due consideration, we shall not be able rightly to comprehend the diseases to which the retina is liable.

We find, on our examination of the eye-ball, that the optic nerve does not enter in the axis of vision, but pierces the sclerotic coat at an angle upon the nasal side, which we find is exactly opposite to a spot deficient of sensibility to the impression of the rays of light; but about two lines to the outside of this,

we find, upon the internal surface of the retina, a little yellow spot, seen only in the recent eye, exactly in the axis of vision, and surrounded with several folds of the membrane, and in its centre we observe an appearance which has been described as an irregular foramen, more marked in childhood than in age. This is called the foramen of *Scemmering*, he having described it in the year 1791. Having made an injection of the recent eye, we may observe this yellow spot surrounded by the arteria, and vena centralis retinae, as a delicate vascular corona. This is supposed to be the most sensible spot on the surface of this membrane, and to receive with most perfection the impression of surrounding objects.

THE HUMOURS OF THE EYE.

The humours of the eye are those transparent media, which, filling up the interior of the ball, give the due support to its several coats, while they also serve many very necessary purposes in the physiology of vision. The first is the aqueous, situated in the anterior part of the globe, perfectly fluid, to permit the free actions of the iris. The second is the crystalline, which is particularly instrumental in the refraction of the rays of light, and is placed immediately behind the aqueous humour. While the third is the vitreous, occupying the posterior part of the globe, formed of an aqueous fluid, separated by many *sapientæ* into little cells, which give it a sufficient degree of resistance to support the expanded coats of the eye.

THE AQUEOUS HUMOUR.

The aqueous humour is that transparent fluid that fills up the anterior chamber of the eye, formed by the posterior surface of the cornea on the one hand, by the anterior capsule of the lens and ciliary processes on the other. It is a clear, transparent fluid, slightly viscous, about the specific gravity of 1009. It has little smell, or taste; is slightly coagulable by boiling; and is inferred by chemists to consist of a large proportion of water, small quantities of albumen and gelatine, combined with some neutral salts. Its averaged quantity in the adult weighs about five grains, while in the eye of the foetus, we find it slightly bloody in appearance, and estimated at a grain and a half. The iris, which hangs perpendicularly in this fluid, moves with great freedom, and in a healthy state of the eye, not the least vacillation or tremor is perceived, as a consequence of its action; and thus situated, it is said to divide this space into the anterior and posterior chambers of the aqueous humour. The dimensions of the chambers were first demonstrated by *M. Petit*, who, freezing the eye, fully proved their disproportion. He

found the piece of ice occupying the anterior chamber considerably larger than that situated in the posterior, which was a thin pellicle of about one-fourth its size.

The chamber of the aqueous humour is by some said to have a serous membrane reflected over its surfaces. This has been disputed by many very excellent anatomists; but analogy will, I think, lead us to conclude that it certainly exists. Now we find every cavity of the human body containing a serous fluid, to have its proper capsule, without which it might be extravasated into the surrounding cellular tissue; moreover, wherever motion is permitted in any of these cavities, such a membrane seems indispensable, so that, although anatomical demonstration will do but little to decide this point, I apprehend the above circumstances will permit us to conclude, that the membrane of the aqueous humour, which must be exquisitely delicate and fine, is reflected over all the surfaces with which that fluid is in apposition.

The source of the aqueous humour has long been a subject of discussion. Some say that it is the ciliary processes which give it out: others, that it is the thinner particles of the vitrious humour, which transude through its membranes, and so fill the anterior chamber of the eye; while a third affirms, that it proceeds from the transparent membrane of the aqueous humour. I would consider it most probable, that it was secreted by this membrane, only however, those portions of it which cover some part supplied with considerable vascularity. The ciliary processes are undoubtedly one of the most vascular surfaces in connexion with the anterior chamber of the eye, and this fluid must, from its very quick secretion, require some points endowed with very considerable vascularity; for if we puncture the cornea, and permit it to escape, we find it regenerated in four-and-twenty hours: these then are perhaps one of the sources of this secretion, while a fact stated by Mr. C. Bell, seems to militate against their being considered the only source; for he directly affirms, that he has found a fluid, in the anterior chamber of the aqueous humour, in the foetus. Here the *membrana pupillaris* forms a direct partition between the two cavities. Being coeval with the formation of the eye, it ought entirely to exclude the aqueous humour from the anterior chamber, if it is secreted by that portion only which covers the ciliary processes. We find, however, that the iris is a very vascular tissue; and if the membrane which covers it be but endowed with the necessary apparatus, this is fully competent in every point of view to its secretion.

THE LENS AND ITS CASPULE.

The crystalline lens is that transparent body placed upon the anterior surface of the vitrious humour, embedded, as it were,

in its substance ; it is surrounded by a beautifully pellucid capsule, which serves to retain it in its proper position. The lens is formed by very thin concentric lamina, superadded upon each other, and surrounding a harder nucleus ; the more external of these layers are soft, and easily removed : but the nearer we approach the centre, they appear to become more condensed and firm in their texture ; so, that as a necessary consequence of its formation, we find it considerably thicker in the centre than at the circumference : we should also observe, that the lens is doubly convex, and that in its posterior surface this is more marked than in its anterior. The composition of the lens, chemically examined, seems to differ but little from the other membranes. We find, however, that it is of greater specific gravity, about 1100, and that it has a considerably larger proportion of albumen and gelatine in its composition, as we should naturally infer from the greater density of its substance. It is firmly coagulated by boiling, and the action of acids. A fact curious in the formation of the lens is that, by the action of heat, it is separated into three equal divisions ; this is a separation of its fibrous texture, and no proof of its muscularity, as Dr. Young was ingeniously led to consider. The lens is contained in its proper capsule, which is firmly connected to the surrounding texture. This capsule is described by some anatomists as formed by a splitting of the external membrane of the vitrious humour ; but this is a lamina so very thin and transparent, that I apprehend it would not be strong enough to confine the lens in its situation, but would be ruptured by every motion of the globe ; moreover, if we compare the relative density of the two layers, we shall find the capsule considerably thicker than this membrane before it approaches the lens, which must at once convince us of the fallacy of this conclusion. I would consider the capsule of the lens as a distinct transparent membrane, forming a sack without an opening, and firmly connected and surrounded by the adjoining textures ; indeed, so firm is the structure, that it was considered by Haller to resemble the cornea : it is strengthened on the fore part by a reflection of the Tunica Jacobi, which having surrounded the proper matters of the nerve, is continued forwards, and connected to the ciliary processes ; on its anterior surface we find a mark corresponding to each, it is also here firmly united to the other membrane of the vitrious humour, at a short distance anterior to the capsule : these layers separate, the anterior proceeds forwards, and is reflected over the capsule, to which it is very intimately connected, serving to maintain it in its proper situation, while the Tunica Hyaloidea is situated immediately behind it, and performs a similar office ; between the strong adhesions of these two layers, and their reflection upon the capsule of the

lens, we find a cavity denominated the canal of Petit, or, by the French, the canal godronné : this is regularly crossed by little transparent fibres, passing from the union of these layers to the capsule of the lens, and may possibly be the transparent vessels that go to supply the lens itself. This cavity is easily demonstrated by puncturing its outer lamina, and then inflating it with the blow pipe ; the air passes easily around it, and elevates the membrane, at equal distances, into a kind of crown around the circumference of the lens. Within the capsule we find a minute quantity of fluid, which surrounds the lens, and has been called the liquor Morgagni, and is, perhaps, to permit some motion to the lens. I have already described, that I think it probable a very minute serous membrane is reflected upon the anterior surface of the capsule, so I would conclude, and for the same reasons, that its internal surface partakes of a similar character.

It has been said that the lens is not supplied with blood vessels, that it is only a deposition from the liquor Morgagni, by which it is surrounded ; that this is not the case I am convinced, and I am sure I shall be supported by every rational and thinking mind ; for as the lens is formed, by an infinite wisdom, for a particular and useful purpose, so must it be supplied with vessels which nourish and connect it with the general system, supporting it in that combination of actions which is a proof of its vitality. In the healthy eye we find it perfectly transparent, but when separated from its connexions, it soon becomes opaque, and is eventually absorbed : this will stand as a proof that it possesses life, and will go a great way to convince us that it has vessels passing from the capsule to the circumference. These, when ruptured, leave the lens as a foreign body, similar to what anatomists would have us to believe was its natural condition. The vessels which supply the capsule I have often seen circulating on its surface in the living eye during disease ; in their natural state, however, they are perfectly invisible, being minute serous twigs from the arteria centralis retinae, the branches of which having supplied the retina, and arrived at the ciliary processes, inosculating freely with the short ciliary arteries, as serous vessels go forward through the canal of Petit, giving off minute twigs as they pass along, which are distributed to the capsule of the lens ; the main trunks, I imagine (for I confess anatomical demonstration does not throw the least light upon the subject), pass forwards, at regular intervals, through the liquor Morgagni to supply the lens itself. The twigs also of the central artery, which are distributed to the vitreous humour, are reflected upon the posterior surface of the capsule, forming minute inosculations with the former vessels. I would also conclude, that these arterial branches had veins corresponding to them, which returned the superfluous quantity of the fluid transmitted by

the artery, while they also absorbed the débris of animal matter to be thrown out at the system.

The crystalline lens would appear to be similar in use, but more perfect in formation, than the opticians' lens; like it, we suppose, it is placed behind the aperture or pupil, to refract or concentrate the rays of light, so that they shall impinge with due precision upon the sensible apparatus in this delicate organ; when the lens is absent we find the sense confused, but are, in some degree, able to remedy the defect by the use of glasses.

THE VITRIOUS HUMOUR.

The vitrious humour is that beautifully transparent body which is situated in the posterior chamber of the eye, is surrounded by its several coats, and gives a degree of support to its globular form, that renders this one of the most interesting and delicate organs in the body; it occupies three-fourths of the globe, is of a spherical figure, excepting on its anterior surface, where we may observe a depression, marking the situation of the lens: it is soft and jelly-like, consisting of a fluid, in many very minute cells, surrounded by a delicate transparent membrane, called the tunica hyaloidea. It lies in connexion with the vascular coat of the retina, is united to it but at one point posteriorly, where a branch of the artery passes into its substance, while we find it firmly connected anteriorly to the tunica Jacobi and the capsule of the lens. According to chemistry, it varies little from the aqueous humour, excepting that it contains a larger proportion of the albumen and gelatine, its specific gravity is about 1016.

The cellular texture of the vitrious humour was first pointed out by M. Demours, who, having frozen the eye, and cut into its substance, observed a great number of shining points, which he removed with great difficulty by the assistance of a needle, and found them to consist of wedge-shaped flakes of ice, firmly connected and supported by an excessively thin and transparent membrane. The vitrious humour thus demonstrated to be a body made up of an immense number of cells, containing an aqueous fluid, which, like the cornea, continually lubricates the sepimenta that surrounds it. This confirmation gives a degree of firmness and consistency that serves to support the surrounding texture, without, in any degree, obstructing the passage of the light to the bottom of the eye. The sepimenta which contain the fluid, I think, I have observed to run with great regularity in two different directions, which appear to cross each other, and to be particularly collected at the posterior capsule of the lens, which is firmly united to them. The source of the fluid contained in these cells is by some said to be secreted by the ciliary processes, and to pass backwards, to

distend each little partition; but that this is not the fact, I apprehend its conformation will go a great way to prove; for in our examination of this body we find it retains its form, even after we have separated it from its surrounding connexions; and suddenly to empty it of its fluid, it is necessary to puncture each little cell: it may be said, that if we make an opening into this body, the fluid will gradually, after a time, exude: this, however, is no proof of the continuity of the cells, for the weight of the fluid may rupture the delicate lamina of each, and thus gradually empty the texture; was it a secretion from the ciliary processes, filtered into each of them, it would, in all probability, run out as soon as we had removed those bodies.

In our description of the arteria centralis retinae we described a branch to pass into the substance of the vitrious humour, forming its only union at the posterior part; this is visible in the eye of the foetus, and conveys red blood. but in the adult it ceases to contain the red globules, and admits but a serous fluid to pass along its course. This twig goes forwards on the outside of the axis of the eye, as I conceive to be minutely subdivided into invisible twigs, some of which must be sent to each little cell, and ramifying upon its walls, must give out the secretion which serves to distend them. Even the existence of this artery has been doubted, but allowing that the fluid is formed by the ciliary processes, we must have some minute transparent arteries and veins, which enter into the vitrious humour, to nourish its septimenta, and connect it with the general system.

The use of the vitrious humour is to distend and support the surrounding tunics, and to keep them at a proper distance, so that the rays of light being duly refracted, may be able to converge and strike upon the sensible part of the retina, while its cellular conformation may be intended to prevent any vibratory motion in a fluid so nearly connected to the immediate seat of every lucid impression.

OF VISION AND ITS SEAT.

From the previous description of the structure of the eye we become sensible that vision is a simple sense, in so much that we can distinguish light from darkness; but for the just perception of external objects, a concatenation of events is necessary, that shall regulate the due refraction and convergence of the rays, so that they fall with precision and effect upon the sensible part of the apparatus. To excite sensation, which is the accurate representation of surrounding objects, upon the retina, formed by the reflection of the rays of light from external bodies, these communicate an impression that is conveyed by the optic nerve to the brain, the centre of perception. But the brain

having received the sensation communicated by the external organ, cannot, until the eye is educated by the sense of feeling, comprehend the external impression. This, in our present state, we are not conscious of, having, by slow and imperceptible degrees, obtained a knowledge of the phenomena, presented by surrounding objects, a recollection of whose form and colours coming to our assistance, help us to understand the impression communicated to the brain.

The retina, as I have explained, is, in all probability, the sentient portion of the eye, but this apparently simple and obvious fact has been doubted by some philosophers, who have looked upon the choroid coat (because the picture of external objects was seen upon it), as the seat of this sense; that their conclusion was incorrect, is now universally allowed, and the nervous matter of the retina believed to receive the impression, and communicate it to the sensorium.

The retina of both eyes is competent to receive different impressions of surrounding bodies at the same time, and communicate them to the brain; but for perfect vision, it appears necessary, that the impression communicated to the retina of one eye should exactly correspond with that in the opposite; both these conveying but one and the same sensation: so that if the axis of the eyes do not agree, and the rays of light impinge at different points on each nerve, then we find double vision is produced, which creates confusion in the perception of objects.

We are sensible of a difference, in the adaptation of the eye, to near and distant vision: the change which takes place to fit it to these two different states, has long been a subject of dispute, and has given rise to many and very ingenious theories; but the most rational and convincing is that, I think, advanced by Sir Everard Home, who, assisted by Mr. Ramsden, has made it a matter of demonstration, which, if perfectly correct, must set this point at rest. They contrived to adapt to the living eye a microscope, which magnified 30 times, in the field of which was placed a thin wire, exactly in a line with the anterior surface of the cornea, when adjusted to distant vision; and they observed, upon an attempt to view a near object, that the cornea projected considerably; the space through which it moved was measured by magnifying the divisions on the scale, and comparing them, and it was found to be about the 830th part of an inch, a space distinctly seen in a glass of the power they employed. To produce this change, he supposed that the recti muscles drew back the eye, and compressed the sclerotic coat, so as to lengthen the cornea, and produce a greater refraction of the rays of light when we view a near, than a distant object.

DISEASES OF THE EYE

AND ITS APPENDAGES.

GENERAL CONSIDERATIONS.

As is obvious, from previous demonstration, the eye is composed of many and very different textures ; among them anatomists have instanced examples of the three great divisions of membranes, the mucus, the fibrous, and the serous ; besides which, we find parts differing from any similar structure of the animal frame ; such as the transparent media, the choroid coat, the iris, and the ciliary processes, which, as I have explained, are of peculiar formation, admirably subservient to their different and important purposes. Most of this variety of conformation is visible to our eye, and is liable to diseases peculiar to each of these several textures ; so that when we come to consider the different and individual affections, we may at first be astonished by their number and variety, but if we recollect, that the generality evince symptoms of one great class—inflammation, we shall find the confusion considerably removed, and the comprehension of its effects upon the different structures may be rendered obvious to the meanest capacity.

Previous, then, to observing the various effects of inflammation upon the individual parts, I think, we should now stop to consider some of its principal phenomena, and endeavour to understand its nature.

The symptoms of inflammation have, from the most distant period that is handed down to us, been marked as consisting in redness, swelling, heat, and pain ; these symptoms vary in degree, according to the nature of the exciting cause, or conformation of the affected texture. As this disease is believed to have its seat in the capillary vessels of the part, we should be duly acquainted with the nature of the office they perform ; and then, I think, we may be able to form a clearer idea of the changes which occur in these several textures. Thus, in every part, we have an artery, endowed with muscularity, carrying out the blood, which, at different periods of our existence, contains all

the component parts of our frame. The composition, also, of this fluid, which is the acting ingredient, should be as well understood as our present knowledge will admit. Blood, according to common observation, is composed of two individual parts, which naturally separate when left at rest ; these have been distinguished by the names of crassamentum or cake, a concrete red mass, and the serum, a thin yellowish-green fluid. The component ingredients of these several parts vary, in proportion, in different states of the body, during health, and when labouring under the effect of disease. The crassamentum generally forms more than one-half of the blood ; it is composed of red globules, connected together by means of coagulable lymph : these red globules, according to chemists, consist of a fibrous gluten and a portion of the oxid of iron : the gluten gives them consistency and form, while it holds the iron, which is the colouring matter, in combination. The serum is a fluid composed principally of water, holding in solution a portion of coagulable lymph and several different salts. The blood thus formed, is, as I have mentioned, distributed over the body by the arteries ; having arrived at their extremities, part passes by inosculation into the veins, and is again returned by them to the heart, while a portion, varying in density in the different structures, is sent to deposit in every part of the animal economy the essential principles of its texture ; while we also find minute capillary veins and delicate and transparent absorbent vessels going to remove the débris, or matter that has performed its due function, and is now, as it were, foreign to the system, and in process of time to be thrown off by the several excretory processes which are going on in various parts of the body. These several parts are also supplied with nerves, which connect them into a general whole, supplying them with various degrees of sensibility, while all these individual parts are joined together by a cellular tissue, which uniting them, forms the general bond of connexion.

These observations naturally lead us to consider the immediate cause of the general symptoms, and, I trust, will the better enable us to comprehend them. The redness of an inflamed part arises from the dilatation of its vessels ; so that branches previously conveying but a serous fluid, now carry the red globules, for the exciting cause, calling into increased action the muscularity of the artery, propels this fluid in greater quantity, and with additional power, into the capillary vessels ; this increased momentum (in the most simple case) gives rise to the effusion of serum into the surrounding cellular texture, which, in some cases, occasions the swelling and distension of the part. The pain is referable, I apprehend, to this distension, which irritates

the nervous fibres, now rendered acutely sensible by this increased action of the neighbouring vessels, while those belonging to its immediate nervous texture must have a due correspondence, and a proportioned action, which will cause an increase of its sensibility, while the heat would appear to proceed from a very slight augmentation of caloric, rendered more obvious to the patients' feelings by the morbid condition of the sensitive apparatus. These symptoms vary considerably in degree in the several kinds of inflammation, as well as in the different textures it may attack. Some of these symptoms we often find scarcely perceptible, or altogether absent, while in other cases they are the most marked appearances.

If we also take a transient view of the general effects of inflammation, we may be the better able to comprehend them in the different, and individual structures of the eye. I have said that the increased action of the artery excites an effusion of serum into the cellular texture, perhaps by the rupture of its most minute capillary extremities. If this excitement goes on, a denser fluid, coagulable lymph, is poured out, which in some instances blocks up the circulation, and by compressing the vessels, may cause sloughing or mortification, which is the death of a part; this, when a healthy action is restored, is separated by the absorbents of the surrounding structure, while we find a secretion of pus, differing, however, often in the quantity and quality of its component parts, assisting to remove this, now the offending cause, and helping to restore the part to its natural function. We should likewise observe, that these several symptoms sometimes excite a state called fever, which is but a symptom, proving that the constitution sympathizes with the local malady.

These are the general symptoms and various consequences, which, modified by a variety of exciting causes, or difference of structure, will present themselves to us in considering the different diseases of the eye. Many of them, and their effects, we shall often find particularly prominent, while the existence of some will seldom be perceptible.

DISEASES OF THE MEMBRANA CONJUNCTIVA.

INFLAMMATION.

The conjunctiva, as I have described, is the mucous membrane covering the inside of the palpebræ, and reflected over the globe, bearing a resemblance to the lining membrane of the alimentary canal; this is very subject to inflammation, which varies,

however, considerably, both in its degree and extent; while we find these are again considerably influenced by the virulence of its exciting cause, or the peculiarity of constitution in the affected person; though modified by these circumstances, it still retains characters that serve to distinguish it from the diseases of the other textures. As such, I think it will be preferable to take a general view of the various symptoms and consequences which it presents, and then we shall be the better able to understand its varieties.

Inflammation of this membrane commences with an increased redness of its vessels, which now enlarging, carry red blood in greater quantity; these are of a scarlet colour on the sclerotic conjunctiva, and pass in radii from the circumference towards the cornea, and are obviously moveable above the sclerotic coat. If we now invert the palpebræ, we shall find them there partaking of a similar deep red appearance. The patient now complains of a sensation, similar to that produced by sand or dust between the lids; this in all probability is produced by the deficient secretion of tears and mucus, which having ceased to lubricate these surfaces, the enlarged vessels cause a degree of irritation upon every motion of the lids. As this irritation increases, a sense of itching follows, which however, soon amounts to acute pain, particularly increased upon the motion of the lids. The surface of the conjunctiva has now a glassy appearance which is in consequence of the increased flow of tears, which in the commencement of the complaint was much diminished in quantity, if not entirely suppressed; these now occasion a sense of heat and scalding particularly annoying. There is sometimes an intolerance of light, but this is not unfrequently absent. As the disease advances, we find the redness increase, the conjunctiva of the palpebræ and sclerotic coat are a perfectly scarlet surface, while the vessels of the corneal conjunctiva also begin to be distended, and the patient sees objects as through a mist; or if he looks at a candle by night, it is seen but dimly, and appears as if surrounded by a luminous halo. At this period we may also observe a slight elevation of the conjunctiva from the surrounding parts, in consequence of the effusion of a thin serum into its cellular texture; this becomes particularly marked in that of the palpebræ, whose lax texture permits a great extent of effusion, so that they swell out, and now appear perfectly smooth and red, while they are sometimes so distended that the patient cannot uncover the ball; indeed it sometimes even occurs to a very great amount in the sclerotic conjunctiva, which is so distended with this fluid that the cornea is more or less obscured, appearing sunk in the globe. A great degree of symptomatic fever is now generally present, accompanied by pain in

the head, and sickness at the stomach. An increased flow of mucus, which in the first stage of the disease was entirely absent, now takes place; at first it is thin, fluid, and small in quantity, but as the disease proceeds, it increases, becoming more viscid, and of a yellow or grey colour; speedily, however, this assumes all the characters of pus, and not unfrequently is very copious in quantity: it is furnished by the minute vessels which supply the conjunctiva; the neighbouring parts, such as the meibomean glands, and lachrymal apparatus, become affected; a portion of the secretion is perhaps poured out by this glandular apparatus, while the dryness of the nostrils, which is often present, is the consequence of the obstructed passage of the tears. The vessels now assume a bluish-red tint; coagulable lymph is deposited in the cellular tissue, and, when particularly obvious, upon the sclerotic portion, the distended tissue, covered with the enlarged vessels, assumes a fleshy appearance, and is marked as an unfavourable symptom: so far it is, that it indicates an intense degree of inflammatory action; at the same time it generally occurs in the cellular texture of the palpebræ, when they assume a bluish-red appearance, and feel much harder than when serum only is effused into their texture. The corneal conjunctiva by this time has become opaque, and sometimes red vessels may be seen upon its surface. The secretion of tears is now generally profuse, while the palpebræ are often glued together by hardened mucus, so that they are prevented escaping; but when the lids are separated, they rush over the cheek, combined with much purulent secretion. When the inflammatory action has arrived at this height, it very soon spreads to the other textures of the globe, implicating the neighbouring parts, and now it may excite symptoms not necessarily the effect of conjunctival inflammation, such as a dull, obtuse pain in the eye-ball and forehead, the pink, or rose colour, of the sclerotic coat perfect opacity of the cornea, symptoms indicative of sclerotic and corneal inflammation: it may spread deeper, implicating the iris and other internal parts, or may proceed to ulceration of the cornea, protrusion of the iris, sometimes the escape of the different humours, and it may even amount to suppuration of the eye-ball itself, with consequent collapse of its texture, and total blindness. These are the most marked symptoms of conjunctival inflammation; they are, however, greatly modified by a variety of constitutional and local causes, which constitute the specific differences in this affection, noticed by authors.

SIMPLE CONJUNCTIVAL INFLAMMATION.

This, which is the most simple variety, is generally produced by cold, or any slight irritation or injury of this membrane; soon

after the application of its exciting cause, we find the vessels of the sclerotic portion of the conjunctiva assume a red colour, and this generally in irregular patches, some fasciculi of vessels being more filled than others, giving somewhat of a mottled appearance to the membrane. At first there is a sense of itching, speedily amounting to acute pain, which is attended with an increased lachrymation, that to the patient's feelings gives a sense of scalding, while the eye appears suffused and glassy; the inflammation extends over the palpebral conjunctiva, down the lachrymal canals, producing an irritation that often occasions sneezing, and an increased discharge of mucus from these parts. The light is sometimes painful to the eye, but this is by no means universally the case. These symptoms may continue to increase for thirty-four hours, when we may sometimes observe a slight effusion of serum, and an increased secretion of mucus, sometimes taking on a muco-purulent character, especially if the palpebral conjunctiva has been the principal seat of the affection. Now, also, besides the redness arising from vascular congestion, especially if the inflammatory action has been severe or acute in its progress, we may observe bluish or dark red patches in the conjunctiva; these are spots of ecchymosis, caused by the rupture of some minute vessel, and the extravasation of a small quantity of blood into the cellular tissue, under the conjunctiva, which often seems greatly to assist in the resolution of the inflammatory action. This variety of conjunctival inflammation is seldom attended by any very considerable symptomatic fever: sometimes we find the symptoms of gastric irritation to occur, but these rarely proceed to a great extent, the inflammation gradually, in a few days, beginning to subside: it generally assumes somewhat of a chronic form, especially if the palpebræ have suffered much: this, however, in a healthy subject, is quickly removed. As the disease subsides, we may observe that its vessels take on a bluish tint, perhaps dependant upon the enlarged veins, which are now most prominent. We likewise find that the pain subsides, the tears lessen in quantity, and give a feeling of cold; the serum or blood is soon absorbed, and this disease generally leaves the eye without any unpleasant result, save an increased irritability of the membrane, rendering it liable to a return upon the application of the slightest cause.

This variety of conjunctival inflammation has often obtained the name of catarrhal ophthalmia. That it frequently proceeds from the injurious influence of cold or moisture upon the surface of the body, is undoubted: indeed, this would seem to be its most frequent cause, but as it may arise under other circumstances, I do not consider that it ought to receive so exclusive an appellation. It is the *blepharo conjunctivitis catarrhalis*, or

the ophthalmo-conjunctivitis catarrhalis of continental authors. In support of the term catarrhal ophthalmia, some have said that it is to be distinguished by the mucus discharge from common inflammation of these parts. This increased mucous discharge, however, I apprehend, is always a characteristic of inflammation in a mucous membrane, in whatsoever part of the body it may be seated, and consequently must be a fallacious mark for distinction. There is also described a variety of this disease, under the head of *Catarrhal Inflammation of the Eyelids*. It is but a slight degree of the same disease, confined to the palpebral conjunctiva; almost exclusively affecting this part, it would seem to cause a slight modification in the symptoms which deserve to be considered. This disease generally commences with a smarting, or burning pain, and a sense of dryness of the margins of the lids: these become red and swelled; sometimes the diseased action would seem almost confined to the angles of the tarsi, but commonly it becomes general, when considerable uneasiness is experienced upon motion, often giving the sensation as though a foreign body was between the lids and globe. A mucous discharge soon takes place from the inflamed membrane, accompanied with pain or a sense of itching. The meibomean glands are always more or less implicated in the inflammatory action; so that the secretion of that mild unctuous mucus is suspended, which is one cause of the increase of pain and irritation. By degrees the secretion returns, and soon it is increased in quantity, and vitiated in quality, so that during the night, the more fluid parts being absorbed, the lids are glued together, and are with difficulty opened in the morning, while an incrustation is also observed upon their margins, which is apt to occasion minute ulcerations, if not speedily removed. The same increased secretion is apt to spread over the surface of the cornea; and as extraneous matter smeared upon glass affects its polish and transparency, so this stops the course of some of the rays of light through the pupil, and causes an impairment of vision, which often alarms the patient, who fears he is about to lose his sight. Consequent upon this condition of the surface of the cornea, he moves the lids with frequency, which increases the irritation; while in an evening, especially if the patient is engaged in any minute work, or in a hot room, an exacerbation frequently occurs; a cloud seems spread over the different objects presented to his view; and he generally observes a halo or ring around the flame of a candle. The acute inflammatory action seldom increases to any considerable height. It remains stationary for a short time, or soon becomes chronic; in which condition, if not properly treated, it may remain for a considerable length of time.

As I have before said, the difference of this variety of conjunctival inflammation varies but in its situation. It is produced by similar causes, among which the most marked, is that of cold, confined smoky apartments, aided and increased by neglect of personal cleanliness, the indulgence in spirituous liquors, and inattention to the state of the bowels: hence it is common among nurses, washerwomen, and others of the lower classes of society.

I may here also notice a variety of conjunctival inflammation, which is an occasional attendant upon the measles and scarlet fever. It is never very severe in its nature, or injurious in its consequences: indeed, it sometimes amounts but to vascular congestion: but as acute inflammatory action may sometimes arise, attended with pain, redness, and all the other symptoms of conjunctival inflammation, we should watch the progress, and as soon as necessary, apply those remedies which are required in the actual disease.

The treatment of acute conjunctival inflammation is equally simple with the character of the disease, often subsiding upon the application of the mildest remedies, such as a warm fomentation, and a dose of some purgative. As, however, it might extend to greater heights, we should always adopt other remedies in the outset, and endeavour quickly to subdue the disease. We must be mindful at the same time to pay due regard to the power and constitution of our patient: should it be a strong plethoric person, we shall generally find bleeding from the arm to be advantageous, while, in every grade of this complaint, we shall find it benefited by cupping on the temples, or the application of leeches. These are to be repeated according as the symptoms appear to yield. We may apply cold in the first instance, by wetting rags with a diluted solution of the acetate of ammonia, which should be changed every five minutes, for when it becomes dry it will excite irritation. Cold generally agrees well with this kind of inflammation, but where it increases the pain, we should use a warm fomentation, always being regulated by the patient's feelings. We should administer several brisk cathartics, keep the eye at perfect rest, without however, covering it up closely, but merely when the lotion is not applied, keep a small green shade to obstruct the direct rays of light. The patient should be enjoined to keep to spare diet, and the use of all stimulants must be forbidden. Should there be much fever, a saline draught may often be exhibited with advantage; it will be found very agreeable to the patient's feelings. Perseverance in these means quickly remove the acute stage of this disease; and should any chronic symptoms remain, the judicious application of gentle stimulants,

such as the solution or *vinum opii* and the *ung: hyd: nit:* will speedily perfect the cure.

The treatment of that variety of conjunctival inflammation which especially affects the lids, does not materially differ from the preceding. The same principles should direct us. Bleeding by leeches, or cupping on the temples, according to circumstances, may be required in the acute stage, and assisted by the application of blisters behind the ear, with administration of purgative and alterative medicines. As soon as the disease has assumed a chronic form, the use of stimulants are called for. Among these, the unguentum hydrargyri nitrati will be found particularly serviceable.

PURULENT CONJUNCTIVAL INFLAMMATION.

The next variety of conjunctival inflammation which I shall notice, is that denominated the purulent ophthalmia. It differs, however, considerably in degree from the preceding, deriving its name from the purulent discharge which quickly appears, and is a proof of its intensity. The inflammatory action is stated generally to commence in the membrane where it lines the palpebræ, and is very acute in its symptoms and rapid in its course, soon implicating the other textures of the eye, so that it is not unfrequently detrimental or wholly destructive of vision.

It is worthy of remark, that this very important disease appears to have escaped the notice of the profession, until the contest between England and France for the possession of Egypt forced it, in a peculiar manner, upon the attention of the medical officers of the army, to whom we are greatly indebted for some of the first and very best descriptions of this complaint. From their accounts we learn, that it raged with peculiar and destructive violence, both in the English and French armies engaged in that campaign.

In the present day it occurs most frequently in new-born children, while no age or sex is exempt from its attack. In infants we find it commencing about the fourth day after birth; but it may happen at a more distant period. Its first symptoms, such as a slight swelling and external redness, are seldom noticed by the attendant; or, if observed, are not considered of sufficient importance to require medical advice, so that they not unfrequently permit it to commit great ravages before they apply for assistance. If we see the child on the first commencement, we may observe the disease begins with an increased redness of the palpebral conjunctiva, and a slight secretion of mucus, which glues the eyelids together. There generally appears an intolerance of light, the infant keeping the eyelids closed, to prevent its admission to the globe. It is now often fretful and uneasy, rubbing the eyes with its hands, while, if it be an adult,

he will complain of acute pain, and have other symptoms of acute inflammation. As the symptoms increase, the conjunctiva covering the globe becomes affected; an effusion of serum now takes place, so that the lids are greatly swelled; while it likewise raises the membrane covering the sclerotic coat producing *chemosis*, which causes the cornea to appear sunk in the eye. We now find that the secretion of mucus becomes profuse, while it very speedily assumes a puriform character, and with the increased secretion of tears, often bursts forth when the lids are opened, and, running down the cheeks, produce considerable irritation. In this stage, especially with children, we find it difficult to open the lids, so as to inspect the ball: the intolerance of light, and the irritation of the disease, generally occasions the orbicularis to contract with such power, which, when combined with the swelling of the lids, often produces an eversion which still impedes our view. While, if this shall, (from carelessness) be permitted to remain, it may be attended with serious consequences; and we may be unable to restore it to its natural situation; in our attempts to return it, we should take hold of the cilia, gently pull them outwards, and then downwards, at the same time, making some compression upon the protruded surface of the conjunctiva. As the disease proceeds, the redness of this membrane becomes universal, its surface appears yellow when inspected with a lens, so that it has not inaptly been compared to the lining membrane of the foetal stomach. The lids are now distended to the utmost, the effusion of coagulable lymph takes place under the conjunctiva, and now the fleshy appearance may be observed. The cornea has by this time become implicated, and is more or less opaque; while we can observe the pink-coloured vessels of the sclerotic coat, and the patient experiences a feeling of distension within the ball, and sometimes even pain in the forehead and temple, which are particularly marked towards evening. The symptoms having extended to this height, may, upon the judicious application of proper means, now gradually subside, leaving more or less opacity of the cornea, which will be proportioned to the amount of the inflammatory action. Should the disease however, continue to increase, corneal ulceration and sloughing to a greater or less extent takes place, the aqueous humour escapes, and the iris is protruded through the opening; perhaps even the crystalline and vitreous humours may be discharged, when the eyeball collapsing, the organ is totally destroyed. As soon as the activity of the disease appears to have expended its force, the redness generally subsides, the swelling is removed, and the lymph, or serum absorbed, while the secretion, slowly decreasing in quantity, altogether disappears in a few weeks. It should be remarked, however, that besides the above severe

consequences, it now and then leaves a degree of chronic inflammation rather difficult to remove.

The causes of this complaint are very numerous, being produced by almost every exciting cause of active inflammation. Among these, however, actual contagion, by contact, would appear to occupy the most prominent position: so in the newborn infant it generally arises from the morbid secretions of the mother's vagina; these entering the eye during parturition, would seem to produce their effect upon this tender organ, in exact proportion to the acrimony of the discharge. Some have attempted to contradict this fact, and have supposed it to result from the delicate eye of the infant being exposed anew to the surrounding air and light: this I apprehend is altogether a mistake, or we should find every child partaking more or less of an effect which must be common to all. At the same time, however, that I believe in actual contagion, I can easily imagine that it may sometimes, with infants, be the produce (though very rarely) of cold, or other exciting causes. It sometimes, even in the adult, proceeds from the inadvertent application of gonorrhœal matter to the eye, when it has been said to produce on this membrane an affection that strikingly resembles, in all its stages, the inflammation of the mucous membrane of the urethra; this, from a similarity of tissue, would appear very probable; but that it can be produced by metastasis of gonorrhœal matter to the eye, is, I think, now totally disbelieved. It may also proceed from cold, when it generally appears in persons of a bad state of health, and is frequent among the poor, who being often badly fed and worse clothed, are directly exposed to a greater variety of exciting causes. This disease would appear sometimes to reign epidemic, affecting a great number of persons at the same time. This, perhaps, is not so much from any actual contagion present in the atmosphere, as from the accumulated causes of active inflammation having effect at the same period; so it is with diarrhœa and dysentery, similar affections of other mucous membranes.

In the treatment of this inflammation it is necessary to give due consideration to the constitution and strength of our patient; for if he be an adult of strong and confirmed health, a very active plan must be had recourse to; but should it be a person of delicate health, or broken constitution, we must have a care that we do not attack him too vigorously. In the first stages of this complaint, we should have recourse to blood-letting, and this should be regulated by the circumstances of the case; if there is much redness and swelling of the part, which has come on rapidly, and is attended with considerable pain and great fever in a person of vigorous habit, we should

immediately bleed ad deliquium, act quickly upon the bowels, and recommend a cold application to the eye. After the bleeding, I have seen the eye become comparatively white, the pain decrease, and the swelling materially subside. It, however, will generally require from forty to sixty ounces of blood to make any effectual impression on the complaint; and should the acute symptoms return after the first bleeding, we ought to repeat the operation to a greater or less extent, according to the activity of the symptoms; at the same time we may employ local bleeding, as cupping or leeches. We may now also have recourse to nauseating doses of tartarized antimony, which will often materially lessen the strength of the pulse and the activity of the disease, while at the same time we entirely forbid the employment of animal food. Having by these means diminished the inflammatory action, we shall generally find that the discharge is increased in quantity, and less acrid in quality, so that we may now begin the use of some gentle astringent: for this purpose I prefer a weak solution of alum, at first in the proportion of ten grains to the six ounces of rose water: this should be used frequently, being thrown with a syringe between the palpebræ: it must also be gradually increased in strength, and as we proceed it will be found materially to lessen the discharge, and must act by constricting the relaxed mouths of the secretory apparatus. Should this, however, at any future period appear to lose its effect, we may change it for a solution of the nitrate of silver, or other mild stimulant. The employment of the nitrate of silver has been highly extolled by some practitioners, who have used a very strong solution (ten grains to the ounce), upon the very first appearance of the disease, and they state, with the most decided advantage. This, however, looking at the evident nature of the complaint, I should hesitate to employ in the very commencement, while I can bear testimony to its good effects after the inflammatory action has been somewhat reduced, and the discharge has become profuse. Should the patient be of a weak and irritable habit, and the disease, notwithstanding these means, go on to ulceration and sloughing of the cornea, and if the edges of the wound appear ragged and unhealthy, and the patient feel weak, we should have recourse to the salts of cinchona bark, which will generally put a stop to the ulcerative process, when assisted by the astringent lotion; and now a more generous diet may be allowed, provided we are certain that all the acute symptoms have subsided, and that those which remain are solely dependant upon a want of tone, either local or general. Should the complaint evince itself in the new-born infant (which is now by far the most common case), and should we see it in the very commencement, on

the first or second day, we should apply a leech to each eyelid, gently purge it with rhubarb and magnesia, and use a cold application externally; even should it have lasted several days, and the cornea have become quite opaque, it will be the safest plan to adopt the same means. After the active inflammation has somewhat abated, and the discharge has become considerable in quantity, and of thick consistency, we should employ the weak alum lotion, which should be injected between the lids every half hour, frequently cleaning away the discharge, which often adheres strongly to the inflamed membrane. Should sloughing occur, we must here also use the extract of bark dissolved in milk, or employ the sulphate of quinine, which I consider preferable. Under this treatment we shall generally find the symptoms gradually disappear; they will, however, sometimes suddenly appear to return, the discharge will decrease or become thin, or altogether disappear, the eye again look of a more scarlet-red colour; we should here consider if the astringent solution be not too strong, and is producing the irritation in question; we should let the eye remain quiet for a few days, give a gentle purge, and discontinue the lotion for a short time, until these symptoms are removed, when we may again have recourse to it, with proper caution and due effect.

These are the general principles which we should adopt in the treatment of this disease, whatsoever be the exciting cause. These certainly may differ in virulence and strength, but the effect will be similar, save that it varies somewhat in activity and the degree of inflammatory action.

IRRITABLE CONJUNCTIVAL INFLAMMATION

Is the term by which I would designate that disease which has been called strumous ophthalmia. Scrofula is so vague a denomination, and is so difficultly defined, that I think it would be preferable to have a more precise and definite term for this affection, than to confound it with all the various symptoms of the above-mentioned disease. This complaint generally occurs in childhood, rarely attacking adult age: we find it most frequently among the poor, of relaxed and irritable habits, who have a white pasty complexion, with tense and swollen abdomen, and not unfrequently enlarged lymphatic glands. This species of inflammation generally commences with a little increased redness, particularly obvious on the palpebral conjunctiva: there is sometimes pain in the first onset; this, however, generally soon disappears; there is profuse lachrymation, the tears are hot and acrid, irritating the skin of the cheek as they pass over it, not unfrequently producing excoriation. There is a very great intolerance of light, so that the eyelids are con-

tinually shut, and the head buried in the attendant's lap, to screen the eye from the ordinary light of day. This irritability of the retina is the diagnostic symptom; it is quite disproportioned to the amount of inflammatory action, and would appear to depend more on the system of the patient than the immediate disease. I imagine that a slight determination of blood must take place, in consequence of the conjunctival inflammation, to the eye generally, and in this the retina must participate, so as to cause the painful sensibility to the otherwise natural stimulus of light, and this must be kept up, and increased by the irritable state of the constitution. In the little patient troubled with this complaint we find it very difficult to inspect the globe; for as soon as the attempt is made, the eyelids are firmly closed, so that neither the kindest language, nor the severest punishment, will induce it to open them. It is therefore become necessary to effect it by force, and to do so we carefully separate the lids, pressing the whole of them upwards and downwards against the orbit; for if we merely act upon the skin the palpebræ become everted, and again cover the ball. When this complaint has lasted some time, the cornea may become affected, the inflammatory action spreading to that tunic; a consequent opacity is the result, but this rarely arrives at any great extent. We now and then find it connected with cuticular disease, which would seem to extend to this membrane, while it slightly implicates the meibomean follicles; these pour out a vitiated secretion, which excites ulceration of the tarsal margins, and may eventually produce eversion of the lid. Further, also, the inflammatory action may sometimes implicate the roots of the cilia, producing suppuration within their texture, and a consequent discharge of these hairs. Rarely in this variety of disease, may we perceive the red vessels running in distinct fasciculi, forming a little plexus, either on the corneal or sclerotic conjunctiva; these sometimes form a pustule, containing a little straw-coloured matter, which breaking, discharges its contents, and leaves a small ulcer of greater or less dimension and depth, according to the size and extent of the fasciculus of inflamed vessels.

Notwithstanding our best-directed remedies, this complaint often continues for months, a relapse occurring almost as soon as we have made any impression on the symptoms; but troublesome and distressing as they certainly are, I think, that they very seldom produce any consequences detrimental or destructive of vision.

This complaint would appear to arise from cold, dirt, or other slight irritation, that can occasion conjunctival inflammation, which is aggravated and reacted on by a highly irritable and unhealthy constitution.

In the treatment of this disease severe blood-letting is never necessary; but should we see the patient in the early stage, when the acute symptoms are obvious, cupping, or leeches, according to the age and habit, should be had recourse to, and these should be repeated whenever a relapse in the activity of the symptoms take place; these means may be assisted by the application of repeated blisters behind the ears, while, if the disease be of long standing, an issue in the temple will often be found of very considerable benefit. Warm fomentations are generally found most useful, and a poultice over the whole eye often affords relief. Gentle purging is always of advantage, and should invariably be had recourse to, while the exhibition of the *hyd: cum cret:* in alterative doses, should be employed. We should pay very particular attention to the diet, which should be light, and easy of digestion; we should enjoin plenty of air and exercise, which may very often be assisted by change of occupation and the immediate place of residence; indeed, strict attention to the general health is absolutely necessary during every stage of this complaint. If this be duly considered and persevered in, and proper remedies adopted, we shall generally find a speedy improvement, and very often effectually remove the disease.

After the acute inflammatory symptoms have been subdued, we shall often find considerable benefit to arise from the application of mild stimulants, such as the solution or wine of opium; if there happen to be a morbid and increased discharge, from the meibomean follicles, or an excoriated condition of the lid, the application of the *ung: hyd: nitra:* will be found of great use; in the meantime, however, we should be careful to keep the excoriated portion covered with some simple ointment. These means, duly attended to, according to the actual condition of the part, discontinuing their employment when any inflammatory action supervenes, and again resuming their use as soon as it remits, will generally remove every consequence of this complaint, and, with due attention to the general health, the local affection will seldom return.

PUSTULAR CONJUNCTIVAL INFLAMMATION.

The conjunctiva, like other mucous membranes, is liable to the formation of pustules, which may be connected with a similar affection of the skin: such, for example, as accompany the eruption of small-pox, or it may appear distinct, arising spontaneously without any concomitant cuticular disease; pustules may occur both on the sclerotic and corneal conjunctiva, where we may occasionally observe two or more to arise at the same time. Their commencement is marked by an acute pain, often occurring suddenly, an increased secretion of tears, which give the eye a

glassy appearance, while we often find the margin of the cornea assume a blueish tint ; there is sometimes an intolerance of light ; but these symptoms, more or less, subside as the disease proceeds. In the very onset of the affection, we can distinctly observe a minute fasciculus of red vessels passing from the circumference to form a little plexus, where, in a short time, a small quantity of thin serous fluid, which slightly elevates the membrane, makes its appearance : this is quickly followed by a deposition of coagulable lymph, when a little cone-like elevation begins to put on the character of a pustule, and having duly matured, contains a straw-coloured purulent fluid : this, in the course of a day or two breaking, discharges its contents, and leaves a small ulcer, which quickly granulates, and heals, if the patient be in good health. This complaint seldom, however, arrives at any great extent over the cornea, without, more or less, implicating its texture, when, in addition to the dark and superficial conjunctival vessels, we may observe a number of minute pink-coloured lines deep in the sclerotic coat ; these go to the posterior part of the pustule, where it is in connexion with the layers of the cornea ; in this instance we can also observe a whitish halo surrounding its base, especially if it is distinctly connected with the surface of that tunic : these mark the increased dimension of the serous vessels going to supply the pustule ; or to deposit lymph, to heal the breach which has been made by the discharge of pus. When the pustule breaks, an ulcerative action sometimes spreads through all the layers of the cornea, and we may observe the protrusion of a thin transparent pellicle, said to be the membrane of the aqueous humour ; this, when ruptured, allows that fluid to escape, and the iris falling forwards, is very frequently prolapsed through the opening : the iris now fills up the space, the aqueous humour is quickly secreted ; but the iris adhering to the cornea, causes an irregularity of the pupil, more or less detrimental to vision. The point of union between the sclerotic coat and cornea would appear the most disposed to the formation of these pustules ; here I have seen several occur at the same period, that required considerable pains to prevent suppuration, which, from their number, I think, would have formed a very serious complaint.

The cause of this disease would appear to be a circumscribed irritation of some part of this membrane, perhaps the application of a direct virus, for in schools and large families we often find it run through the whole house, or it is symptomatic of some constitutional affection, which, I apprehend, is by far its most frequent source, and perhaps bears some analogy to the pustular eruptions that frequently occur upon the mucous membrane of the mouth and fauces.

In the treatment of this disease we must, in general, be guided by principles similar to those recommended in the preceding varieties of conjunctival diseases. If, however, we happen to see the affection in its commencement, when the minute plexus is but just formed, we may, sometimes, by a direct stimulus to the part, such as touching it with the *argentum nitratum*, and, at the same time, exhibiting a dose of some smart purgative, often arrest its formation in the very onset. This practice is particularly recommended where it is a consequence of the small-pox: these cases should be vigilantly watched, so that on its first occurrence we may quickly apply the remedy, which, if successful, may prevent the opacity of the cornea; so frequent an attendant, and so terrible a consequence of this complaint. If, in the variety that arises spontaneously, these means fail, or the disease should have advanced to a greater extent before we see it, it will be necessary to apply two or more leeches to the eye; these should be placed immediately upon the lid, which is very vascular, and will bleed freely: they should be repeated according to circumstances, and will serve to moderate, if they cannot prevent the formation of matter. We should also purge smartly, and use a warm fomentation to the eye, and should the pustule be large, and especially should it implicate the cornea, we ought to discharge the fluid through an early opening; by these means it generally subsides, and the ulcer speedily heals, but should any chronic irritation remain, mild stimulants and gentle purgative medicines will soon subdue it. Should the ulceration of the pustule penetrate the layers of the cornea, the aqueous humour escape, and a consequent protrusion of the iris occur, it will be necessary to touch the little point with the nitrate of silver; this will for a time relieve the pain and irritation: these symptoms will, however, return when the eschar falls off; it should be again repeated until the pain has subsided, and the ulcer appears disposed to heal. These means, combined with the administration of alterative medicine, and attention to the health of the patient, will generally prevent a return of the complaint.

ERYSIPELATUS CONJUNCTIVAL INFLAMMATION

Is a variety of disease that occurs seldom but in adults of a bad habit and debilitated constitution; it is very seldom acute in its symptoms, and soon becomes chronic, while it often is, if insufficiently or improperly treated, a source of great misery to the patient, particularly from the protracted nature of its duration. The first and most obvious symptom that directly strikes our attention is an external red appearance of the palpebræ, which hang loose and flaccid, and we may observe many folds, which

sometimes contain a minute quantity of serous fluid. The conjunctiva lining the lids are generally of a dark red colour; there is considerable pain and intolerance of light at the commencement, but these speedily subside. We often find an increased secretion of tears, which are hot and irritating; there is a glassy appearance of the cornea, the margin of which assumes a bluish tint. The increased action of the conjunctival vessels would appear to be principally confined to those lining the palpebræ, while, if we evert the lids, we shall find that minute points of coagulable lymph are deposited in this membrane; these often become hard, and are sometimes almost cartilaginous; they give the patient a continual sensation, as though many portions of gravel were between the lids, which is often a source of great annoyance. We also, at this stage, generally find the patient with a foul tongue, a loss of appetite, and other symptoms of a deranged stomach and bowels. We find these acute symptoms, however, soon subside, and leave a chronic state of inflammation often very difficult to remove; should we see the patient in this stage, we shall find that the pain has subsided, the tears ceased to feel hot, but that a constant irritation is kept up by the granulations, on the surface of the conjunctiva lining the globe, in which often large and distinct vessels may be seen running towards the cornea; these divide into minute varicose branches that carry red blood into the corneal conjunctiva, passing in a rectilineal direction towards the centre of this membrane, which is now of a dusky appearance, and generally thickened, so as to reflect some of the rays of light, but not sufficiently opaque to exclude all from entering the eye; it is sufficiently diaphanous to allow the patient to see external objects, while it has been admirably described by Dr. Vetch as of a green colour, not unlike the fracture of a common flint; it is most evidently superadded upon the surface of the cornea, and forms one of the most striking proofs of the continuity of the conjunctiva over that tunic. One of the most prominent and troublesome features of this complaint is its liability to relapse, for no sooner do we lessen the inflammatory action, and reduce the eye to a comparatively quiet state, than from the slightest irregularity and exposure to cold, it directly returns as bad as before, and obliges us to retrace our steps.

The causes of this complaint would appear to be any of those which can excite conjunctival inflammation, happening in an irritable and disordered constitution; so that we not unfrequently find this complaint a sequel of all the foregoing varieties, especially among the poorer classes of society.

In our treatment we should give due consideration to the state of the health; this is a circumstance of the greatest importance,

for unless we improve that, all our remedies will fail of producing the wished for benefit. In the inflammatory stage, where the eye is painful, and the tears feel hot, we should apply three or four leeches to the lids, act briskly upon the bowels, and bathe the eye with warm fomentations ; we should apply blisters behind the ears, which it is generally of great benefit to keep open. These means will speedily remove the acute symptoms, and must be more or less repeated upon every relapse. Here I have found scarifying the palpebral conjunctiva of the greatest service. To perform this adroitly, we should evert the lids, and forcibly draw tight the skin, especially on the lower margin of the orbit ; this will form a kind of ligature upon the veins, and will occasion them to bleed very freely when opened : we should keep up the flow of blood by a stream of warm water from a syringe. This operation empties the enlarged veins, while the knife, dividing their varicose trunks, enables them to resume their healthy dimensions.

The treatment of the latter symptoms of this complaint should embrace that of chronic conjunctival inflammation generally ; for, indeed, it frequently presents all the symptoms, and assumes all the forms that chronic conjunctival inflammation can evince ; so that in describing this disease, I embrace the symptoms, and specify the remedies proper for the treatment of that complaint, which, if employed according to the principles laid down, will seldom fail of success. The indications that here present themselves are, to remove the cause, and excite the relaxed circulation of the vessels ; for chronic inflammation would appear to differ from the acute, only in so much, that in the latter we have an excited action, while in the former we find a state of collapse, consequent upon the preceding activity. In this disease we find the sulphate of copper, used with due discretion, an admirable means of fulfilling both these indications : it excites the absorption of the granulations, while it stimulates the part to an increased and healthy action. Should this, however, be inadmissible, we have the solution of opium, a mild and gentle stimulant, which seems to allay irritation, while it has a due effect upon the vascular system. Should these fail, or after a time appear to loose their effect, a solution of the nitrate of silver, the liq: plumbi: subacet, or the vinum opii, will often be found of service. Here, however, I should give the practitioner a caution not to trust to the administration of these means by the patients themselves, but to see them carefully employed himself, for I feel convinced that the duration of this complaint might be greatly abridged by strict attention to the rules laid down. The most effectual means to employ these stimulants is, to evert the lids, and lay the drop upon the conjunctival surface ; by

these means we insure its application to every portion of the diseased part, and can be sure to cause the intended effect of our remedies. These will generally be sufficient for every useful purpose. Were I to mention every medicine that has been recommended by different practitioners to fulfil these indications, it would require pages: each has been extolled as super-excellent, but has in a very short time given place to a more favoured remedy; for they will be found beneficial only when varied agreeable to principle and the immediate symptoms of the case, and if applied with due caution and consideration, will often speedily remove every tedious and irritating symptom of this disease.

PTERYGIUM.

The pterygium is a preternatural formation of the conjunctiva. It is of a pyramidal shape, always commencing in the circumference of the globe, with a broad base, which gradually becoming narrower as it extends forward, and not unfrequently implicating the corneal portion of this membrane, where we find the apex terminating in its very centre, and never passing beyond it. This triangular body most frequently appears at the inner canthus of the eye, sometimes at the outer, but we very rarely observe it extending from the superior or inferior hemisphere: more than one seldom occurs at the same time; but it is recorded that four have appeared together, proceeding from each of the above points, and uniting in the very centre of the corneal conjunctiva.

There are three varieties of this complaint described by authors. The first is a thin web-like membrane, the most simple in its texture, and most commonly met with; it is of a dull whitish or greyish colour, semi-transparent, and perfectly distinct from the sclerotic coat, upon which it freely moves: we may observe in it several red vessels taking their course towards the cornea. The second is considerably thicker, and necessarily raised from the surrounding portion of the conjunctiva: it is much redder, being filled with minute blood vessels; it is more opaque, and has a shining appearance. It also takes its course towards the centre of the cornea, but is much more defined and distinct in its margins, while it assumes the appearance of a complete pyramid. The third is the cancerous, happily a very rare variety. It is of a much darker red colour than the preceding, is filled with varicose vessels, which freely bleed on the slightest touch; it has the same triangular shape, but its edges are knobbed and irregular, while it commonly adheres firmly to the sclerotic coat beneath it. It is always attended with pain, and that of a lancinating nature, which shoots through

the eyeball, and has been said to be a symptom, marking the presence of a cancerous disease.

The causes of this singular affection are very obscure. It has by some been said to be the consequence of chronic inflammation. This I apprehend to be a great mistake; for, of numbers whom I have seen with that affliction, I never observed any that bore the slightest resemblance to the pterygium in structure or formation. The cause of the pyramidal shape which it assumes, has by Scarpa been supposed to depend upon the increasing closeness of union which we observe to take place between the conjunctiva and sclerotic coats. In the circumference we find it lax and moveable; but as it approaches the margin of the cornea, it adheres with increasing firmness, until it becomes intimately united to the surface of that tunic. This theory is plausible and ingenious; but I think there still remains room for speculation in the causes of this complaint.

It is recommended by some, frequently to divide and scarify the vessels running in the substance of this membrane, under the idea that it depends upon chronic inflammation. By these means we certainly sometimes succeed in curing the disease. I consider it, however, far preferable to remove it entirely with the knife, which, from the slender connexion the two first varieties possess to the sclerotic coat, is accomplished with great facility. The excision of the sclerotic portion of the pterygium is to be accomplished in the following manner: the patient, seated upon a low chair, should rest his head against the breast of an assistant, who should elevate the upper lid, and fix the ball with the fore and middle finger of one hand, while he depresses the lower lid with the other. The patient now turning the eye in a direction contrary to the point from which the pterygium proceeds, the surgeon should take hold of the membrane with the forceps, and raising it from the sclerotic coat, thrust a spear-pointed knife under it, about two lines distant from the margin of the cornea, having due caution not to touch that which lies immediately upon that texture; then cutting outwards, he should divide the membrane near the reflection of the conjunctiva, and then remove it altogether with the scissors. As soon as the bleeding ceases, we should lightly cover the eye, and apply cold, while we vigilantly watch the appearance, and guard against any excess of inflammation: on the second or third day we shall observe a whitish surface covered with a substance resembling mucus; while, in a few more, we shall find that the wound is gradually contracting, and will speedily be healed. If any symptoms of acute inflammatory action come on, we must adopt the means specified in a preceding chapter, on the treatment of acute conjunctival inflammation.

In the treatment of the last variety, excision may sometimes be attempted; but if it has existed a long time, we shall generally find it necessary to remove the whole ball.

TUMOURS OF THE CONJUNCTIVA.

Tumours of various kinds sometimes form in the substance of this membrane. They assume an adipose, fleshy, or cartilaginous appearance; while some are composed of a vascular tissue of enlarged and varicose veins. These seldom take on a malignant character, but not unfrequently are a source of great inconvenience and deformity. The treatment that should be adopted is the complete removal of all that are movable upon, and can be detached from the sclerotic coat, without injury to that tunic, which can generally be accomplished with facility by the forceps and common scalpel.

ELONGATION OF THE VALVULA SEMI-LUNARIS.

The valvula semi-lunaris, that membranous fold situated at the inner canthus of the eye, sometimes becomes enlarged in size. This takes place apparently in consequence of chronic inflammation, when we find it of a red colour, and filled with enlarged and varicose vessels. I have seen it half cover the cornea, when the eye was directed towards the nose. The treatment must be agreeable to the principles recommended for the cure of chronic inflammation of the conjunctiva generally.

DISEASES OF THE CARUNCULA LACHRYMALIS.

The caruncle is the little red body placed immediately behind the semi-lunar fold at the inner angle of the eye. This, from its proximity to the conjunctiva, is generally implicated by any disease that may commence in that texture. The most frequent affection to which the caruncula lachrymalis is liable, is inflammation: this frequently takes place as a consequence of external injury; but may proceed from other causes, when we find that it swells out, becomes painful, and assumes a dark red colour, the tears feel hot, and run over the cheek, instead of passing by the puncta lachrymalia down into the nose. The puncta lachrymalia, if not positively implicated in the inflammatory action, are generally removed from their natural position so as to prevent the due performance of their office. By the adaptation of proper remedies it may speedily subside; but should it go on for four or five days, suppuration will generally take place, preceded by a throbbing pain, and soon we may observe a prominent yellowish spot indicating the formation and presence of matter. In the early stages of this complaint, we should apply four or five leeches to the inner angle of the eye, and these should be repeated

according to the effect they may produce. These, if assisted by other antiphlogistic remedies, such as the application of cold and the use of evacuants, will generally succeed in dispersing the inflammatory action; but should matter form, we must open the little abscess with the point of a lancet, and evacuate its contents. We find that the pain is now commonly relieved, and the swelling speedily subsides: in spite, however, of all our endeavours, we sometimes find a chronic enlargement remaining, which assumes a fleshy character, and is covered with minute wart-like excrescences, which often occasion a permanent stilling of the tears and constant irritation at the corner of the eye.

Instead, however, of the fringed form which I have above described, it will now and then assume a mulberry appearance; will be covered by varicose veins, and may in process of time put on a malignant action, attended with great pain and considerable bleeding upon the slightest touch. This is much more common in the warmer latitudes than in our temperate climate: it is particularly noticed by Scarpa, who recommends early and complete excision, as the best and most effectual remedy.

DISEASES OF THE MEIBOMEAN FOLLICLES.

Inflammation of these minute glands seldom takes place as a primary affection; but they are very frequently implicated in the diseases of the conjunctiva, when we find, at the very first onset of the inflammatory excitement, that their secretion is entirely suspended. Soon, however, it is greatly increased, and as it approaches a chronic state, a vitiated and acrimonious discharge takes place, which, during sleep, often firmly agglutinates the lids together, and may require considerable force to separate them in the morning. This secretion also passes over the edges of the tarsi, and by its irritation excites the formation of minute pustules; these bursting discharge an ichorous fluid, the thinner particles of which evaporating, leave a number of incrustations, that conceal an ulceration beneath them. As this process goes on, the margins of the lids become completely excoriated, and when the ulceration heals, a contraction of the cutis takes place, that frequently produces ectropium.

The treatment of this disease consists in removing the chronic inflammation of the ducts, whose vitiated secretion keeps up the irritation, and to prevent the further extension of the ulceration along the margins of the lids. The first indication is fulfilled by the application of stimulants, combined with attention to the general health; to prevent the second, we should have recourse to great cleanliness, while we frequently besmear the margins of the lids with some mild unctuous matter to, defend them from

the irritating discharge. These means will not fail quickly to remove the disease.

We also find that the ducts common to these minute glands sometimes become torpid, or get completely obstructed; now, in consequence of the want of this mucus, so necessary to lubricate the motions of the lid, it is attended with a considerable degree of irritation. This makes the eye look red, and we find it suffused with tears, which will often in some degree derange perfect vision, while it occasions the appearance of a halo round the flame of a candle by night. Now also the patient may experience a sensation of gravel between the lids, and has a sense of itching rather than acute pain. With the assistance of a lens we may distinctly see the ducts loaded with secretion, shining through the transparent conjunctiva. There is more inconvenience than danger attending this disease; we should, however, be fully aware of all the symptoms; for I have known this suffused condition of the eye to be mistaken by a very able practitioner, for determination of blood to the retina, and treated in consequence with copious depletion, a practice which seemed rather to increase than remove the disease.

Our object here must be to excite secretion from the obstructed ducts, by mild stimulants, the best of which is the unguentum nitricum applied at night to the patulous extremities of these canals, by means of a camel's-hair brush, and assisted by the frequent use of solution of opium, or the zinc lotion, during the day, while at the same time we may employ gentle alterative doses of some aperient. These means will generally excite a secretion, which lubricating the surfaces of the conjunctiva, will speedily remove the disease.

DISEASES OF THE CILIA.

The cilia, as I have shown, are placed upon the margins of the tarsal cartilages, arising from a little monticulus, which is covered by a serous membrane. A disease frequently affects this apparatus, known by the name of *tenia ciliaris*; which we find is sometimes a primary, but much more frequently a secondary complaint. Inflammation of the monticulus, or root of the hair takes place, and ulceration not unfrequently follows; at first a slight secretion occurs, which causes a little branny crust to surround the lower extremity of the cilia; this by degrees increases, and becomes acrimonious; we soon find the ciliary margin excoriated more or less, when the more fluid parts evaporating, leave a scale on the surface of the lids. Suppuration of the bulb now sometimes happens, the hair is destroyed, and falls out, causing considerable disfigurement; it is very seldom reproduced, while a morbid and very acrid dis-

charge proceeds from the diseased apparatus, and serves to keep up the irritation; at this stage it is always combined with an affection of the meibomean follicles, which disease produces effects that differ but little from the consequences of this complaint; indeed they are so similar in character, that we shall always find them yield to the application of similar remedies.

We also find that the shaft of the hair sometimes becomes morbidly harsh and dry, losing its softness and pliancy; that it is often variously distorted, instead of assuming the beautiful and graceful curve natural to it; should this cause any irritation to the eye, of course it ought to be immediately extracted.

DISEASES OF THE LACHRYMAL GLAND.

INFLAMMATION.

Inflammation of the lachrymal gland will sometimes occur; this complaint is said generally to commence in the surrounding cellular tissue, and gradually to spread inwards, implicating its internal structure. We find, from the commencement of this complaint, that the eye becomes unpleasantly dry, in consequence of the complete cessation of all secretion; a fixed acute pain occurs at the outer margin of the orbit, often shooting along the temple. A swelling now commences, which occupies the situation of the lachrymal gland; this is hard, tense, and painful to the touch. As the complaint proceeds, the surrounding conjunctiva becomes implicated, the ball is protruded from the socket, its motions are considerably impeded, while the cornea is depressed, and driven inwards towards the nose, and we now find that vision is not unfrequently impaired. The eye itself may become implicated in the inflammatory action, when the disease may be accompanied with very considerable symptomatic fever. Should this state last for two or three days, and these symptoms gradually increase, accompanied with a throbbing pain, a sense of weight and coldness in the upper eyelid, we may expect that suppuration is about to take place; indeed a distinct fluctuation very soon becomes perceptible, generally pointing under the upper lid.

Inflammation of this gland may arise from cold, or be propagated from some neighbouring texture; while it has been said to be produced by immoderate weeping, and to occur most frequently in young persons whose constitution is disposed to scrofula.

The treatment must of course be regulated by the activity of

the disease; if at an early stage there is much fever, a strong and full pulse, and the ball considerably implicated in the affection, it will be necessary to bleed freely from the arm, which must be repeated according to its impression upon the symptoms; while it may be assisted by local bleeding, such as cupping and the application of leeches, means which, when the disease is not very extensive, will often suffice for its cure, assisted by the application of cold, the exhibition of purgative medicines, and a spare diet. These remedies will generally stop the progress of the complaint; but we sometimes find that a chronic thickening and enlargement remains, which will require the repeated application of blisters for its removal. Should, however, the inflammatory action be so intense, or we not see the disease until far advanced, suppuration may take place, when, by the application of poultices and warm fomentations, we may endeavour to accelerate the formation of matter, and as soon as we can discover its fluctuation, we should make an opening with the lancet. We should always be careful to make this early, and directly under the upper lid, for if allowed to proceed to ulceration externally, there not unfrequently remains a fistulous sinus consequent upon the external opening. As soon as the matter has been discharged, the pain ceases, the eyeball generally returns into its socket, and the disease will usually soon disappear. We sometimes observe, especially if the opening has been made externally, through the fibres of the orbicularis muscle, that one or more of the minute ducts may be cut across, when we shall find the discharge mixed with the tears; this orifice may remain open, constituting the fistula glandulæ lachrymalis. We may sometimes, by the application of caustic to the bottom of the wound, produce granulations and adhesions of the walls, and so remove this defect.

SCIRRHUS.

Scirrhus of the lachrymal gland is by no means a common disease; but that this apparatus sometimes becomes affected with it, is equally true. Its commencement in the first instance is marked but by very obscure symptoms, such as slight uneasiness, which is commonly felt at the upper and outer edge of the orbit: this is accompanied by a frequent and involuntary discharge of tears; the uneasiness soon, however, amounts to pain, which is of a shooting or darting kind, generally increased by paroxysms. The gland gradually enlarging, becomes irregular and knotty to the touch; it pushes the eye downwards and inwards, while it protrudes it from the socket, so that it may be forced out upon the cheek, when vision will consequently be impaired, or wholly destroyed. As the disease proceeds, the

neighbouring parts may become implicated, and the eyeball itself participate more or less in the cancerous affection. We now find that the lancinating pains become excessive, preventing the least rest. The patient's countenance assumes a yellow cadaverous hue; his stomach and bowels become disordered, while his general health is sadly deranged, and he very gradually sinks under his excess of suffering.

Here, as in all other cancerous affections, the knife is the only remedy from which we can anticipate any real advantage; but if the patient is decidedly averse to the extirpation of the gland, we may apply those means recommended in similar diseases, which may afford temporary relief to his sufferings. We may, however, rest perfectly assured, that nothing but its speedy removal will permanently benefit a patient affected with this complaint. We ought, therefore, directly we have decided upon the nature of the disease, to propose that he should submit to the operation without delay. When about to extirpate the lachrymal gland, we should place the patient in a low chair, with the head resting against an assistant's breast, and having previously covered the sound eye with a compress and bandage, we may proceed to the operation. We should now make an incision in the course of the orbicularis muscle with a common scalpel, cutting through its fibres, and the superciliary ligament, and now dissecting carefully around the tumour for a short distance, so as to loosen its superior attachments; after which it is safest, if possible, to accomplish its removal with the fingers, or the handle of a scalpel. If the eye be sound, we may restore it to its proper situation; should it be included in the disease, its entire removal will be necessary. Now, placing the parts in their relative position with sticking-plaster and a tight bandage, we should anxiously watch, lest hæmorrhage occur; should it happen, we may endeavour to stop it, by the application of cold externally; but should this fail, we must re-open the wound, and make compression on the bleeding orifice.

In our examination of the diseased gland after its removal, we shall generally find its external surface figured with many considerable eminences and corresponding depressions; sometimes forming deep fissures: it is firm and elastic, like cartilage; when divided, we find it lobulated; these lobes are of various sizes, often containing a glairy fluid; between this is a firm fatty substance; the whole gland is traversed by many white membranous bands.

DISEASES OF LACHRYMAL PASSAGES.

CONTRACTION OF THE PUNCTUM.

The punta are, as I have described, the commencement of the excretory apparatus : these appear to be liable to disease ; and the most simple variety of which affecting the part, is the constriction or closure of the orifice : it is recorded by Morgagni as a congenital defect : but it much more frequently arises in consequence of disease, producing a swelling and thickening of the cellular substance around the punctum, by pressure impairing its proper action, or altogether closing the orifice ; this, according to its extent, either impedes, or altogether prevents the due passage of the tears into the nose ; so that upon the least excitement of the lachrymal secretion, the eye becomes suffused, and a degree of dimness of sight takes place in consequence of the collection of tears between the lids, which frequently flowing over the palpebræ, fall down upon the cheek, and sometimes excite considerable irritation. If the defect is recent, we should attend to its exciting cause, which is generally attended and kept up by an affection of the palpebral margin ; if this be removed the complaint generally subsides : but, should these means fail, and the disease have lasted a considerable time, we should open the punctum with a fine point, and then introduce a fine probe, which should be allowed to remain for a short time. This operation should be repeated daily, the size of the probe being gradually increased, until the obstruction is removed, and the punctum resumes its natural size and office.

DILATATION OF THE PUNCTUM.

The puncta are observed sometimes to become morbidly dilated, losing both their contractile and absorbing power : this commonly occurs in old people, and is generally attended with more or less relaxation of the lid, which hangs loose, is separated from the globe, and the punctum is consequently removed from its natural situation, and are thereby prevented, had they the power, from absorbing the tears, which flow over the cheek, and are a source of irritation : this relaxed condition of the lid, is generally accompanied by a corresponding state of the rest of the apparatus, a villious and irritable state of the conjuntival, and an increased and vitiated meibomean secretion ; we may frequently also observe the skin of the palpebræ relaxed, and hanging in folds, not unfrequently accompanied by some degree of eversion. The affection is sometimes relieved, but very seldom entirely cured : attention to the general health, combined with the application of mild stimulants and astringents,

will generally lessen the morbid secretion, and excite the parts to a more healthy action; while it may, if the disease be not of long standing, re-excite the punctum to its necessary office. These indications are generally fulfilled by the daily employment of the *vinum opii*, and the application of the ung: *hyd: nit.*

INFLAMMATION OF THE SAC.

Inflammation of the sac sometimes occurs spontaneously, but we often find the affection is propagated from some neighbouring part. It generally commences as a small, hard, and very painful tumour, situated at the inner angle of the eye, about the hollow of the lachrymal bone; it is of a red colour, nearly the size and shape of a small bean, and generally attended with acute pain, especially when pressed. The inflammatory action may soon spread to the neighbouring parts: now the papillæ appear shrunk, and the puncta are obscured; while the nostrils feel dry, and the tears fall over the cheek, in consequence of the compression of the lachrymal passages. As the disease proceeds, a serous effusion is poured out in the cellular texture around the sac, sometimes even spreading to the eyelid; now a severe throbbing pain not unfrequently takes place, and this is soon accompanied by the formation of matter, which occurs in the cellular tissue surrounding the sac: at this stage the sac is always filled with a puriform mucus, secreted from the lining membrane, which must always participate in the same inflammatory action. The swelling now quickly increasing, the skin assumes a shining and polished appearance, gradually becoming of a darker colour, while presently we may perceive in its centre a yellowish, pale, softish spot, marking the existence of matter; this, if allowed to burst, soon becomes thinner, until it spontaneously opens, and permits the fluid parts to escape, and the tumour partially to collapse. The discharge from this opening continues a longer or shorter period; at first it is thick and whitish, and should the patient be of an unhealthy habit, it may become more transparent and limpid. The effusion is now soon absorbed, the swelling begins to diminish, and the puncta may resume their natural office, while the wound also soon heals, and generally without leaving any organic change, or permanent impediment, which may prevent the due passage of the tears into the nose. Such is the progress of inflammation of the sac, which, I apprehend, commences in the ligamentous texture, but very soon implicates the neighbouring tissues, indeed they all become more or less affected; seldom however does the ulcerative stage produce a direct opening into the sac; a circumstance that may account for the quick subsidence of the disease, and the rapid closure of the

wound. It is possible, however, that the texture of the sac may sometimes be implicated in a slough of these parts, which seldom indeed happens but in bad constitutions. When an opening has occurred, we find that the tears continue to flow through the fistulous aperture, and the passage of the tears into the nose may become permanently obstructed, while the bone itself may sometimes participate in the general disease.

If we should happen to see this complaint in its first stage, when but little or no effusion has taken place around the sac, we may, by the application of leeches, the employment of cold, and the exhibition of purgative medicines, endeavour to subdue the inflammatory action. Should the disease, in spite of these remedies, proceed to suppuration, we must, by the use of relaxing fomentation and poultices, encourage its speedy termination; and when the matter is distinctly formed, make an early and sufficient opening, so as to give a free exit to it, and hereby prevent its extending and burrowing far under the surrounding skin, which is very apt to take place, the abscess being left to burst spontaneously. In this variety of these diseases, if we are convinced that no previous impediment existed to the passage of the tears, we must endeavour to close the external opening as soon as possible, which is generally accomplished with facility, even though we may have observed the tears to pass from the external wound, and know that an opening into the sac exists. Should any chronic hardness, or a fungous state, remain, it may require the frequent application of caustic for its removal. Should the passages be impervious, or the bone implicated in the disease, we must adopt the practice specified in the treatment of fistula lachrymalis properly so called.

ACUTE INFLAMMATION OF THE MUCOUS MEMBRANE.

Acute inflammation of the membrane lining the sac not unfrequently occurs: it seldom, however, happens singly, but is generally preceded or accompanied by an acute affection of the conjunctiva; here we find it directly affecting the surrounding textures, and causing symptoms that are precisely similar to those evinced by inflammation of ligamentous texture of the sac: indeed it is to be distinguished from it but by the attendant conjunctival affection, which has somewhat produced it. The treatment that it is necessary to adopt, in consequence of the accompanying conjunctival disease, will generally suffice for its cure: should it not, the remedies and means had recourse to in the succeeding diseases should be employed, and will seldom fail to bring it to a successful issue.

CHRONIC INFLAMMATION OF THE MUCOUS MEMBRANE.

Chronic inflammation of this membrane is by no means uncommon; indeed it not unfrequently gives rise to much more tedious and unpleasant results than the preceding varieties. Its progress is slow, often increasing by imperceptible degrees, without causing any pain or much inconvenience, so that it is generally disregarded by the patient at its first onset. Among its first symptoms we may generally observe an increased secretion of mucus from the membrane, which lodging in the sac, may be pressed out at the punctum, or forced into the nose. The eye, in consequence of this lodgement of mucus, is continually suffused with tears, while the patient usually complains of an unpleasant dryness of the nostril on the affected side. These symptoms are usually accompanied by a villous irritable state of the palpebral conjunctiva, a diseased secretion of the meibomean glands, caused by a chronic affection that may have spread from this surface down the lachrymal canals, and be the source of the present complaint. In consequence of the obstruction of this fluid the sac becomes distended, and swelling may be observed at the inner angle of the eye: this often varies, corresponding with the state of the conjunctiva; sometimes it is large and hard, while at another period it is soft, and nearly disappears. The swelling at this period is similar in colour to the surrounding skin. We also find that the secretion contained in it varies considerably, both in consistency and quantity, at various periods; sometimes we find it thin and serous, but at others we may observe that it is much thicker, of a yellow colour, and not unlike pus: the mucous secretion becomes much more profuse upon the least excitement or increase of the inflammatory action, such as is frequently caused by a cold easterly wind, or debauch, or any other stimulus to the increased activity of its vessels. We sometimes find that the disease almost entirely disappears during warm dry weather, whence people have often imagined, that on the approach of summer the disease had left them; they are, however, generally disappointed, for it re-appears in wet weather, and as winter approaches. These symptoms not unfrequently last a long time, sometimes seeming to subside, but readily return upon the application of the least exciting cause. After a time, in consequence of this protracted irritation, a thickening of this membrane takes place, and may give rise to stricture of some of these passages. This may happen at any part, but the most frequent spot where it occurs is at the termination of the sac in the ductus nasalis, or about midway down the duct itself. These passages having continued more or less pervious for a considerable time, gradually become narrower, and the stricture

more confirmed. Now the sac is greatly distended, so that upon the application of the least irritation, an accession of inflammation is produced, which, implicating the ligamentous structure and neighbouring parts, is attended with considerable pain, the effusion of serum takes place, the skin covering the tumour assumes a dark red colour, and very soon the formation of matter occurs immediately under the integuments. The sac now, as a consequence of its distention, quickly proceeds to ulceration, permitting the escape of its contents, so that now we have the only stage of these complaints to which the term of fistula lachrymalis is applicable: its adoption in every variety of these diseases creates great confusion, and is apt to lead to wrong ideas upon the subject.

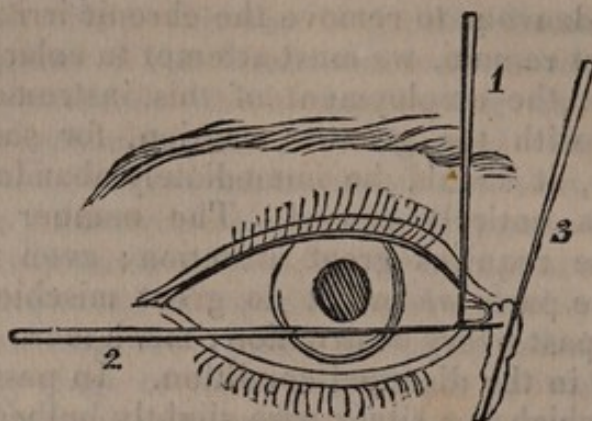
As soon as ulceration has taken place, and the distended sac is relieved, the inflammatory action decreases, the surrounding effusion is absorbed, the tears again enter the puncta, but cannot pass down into the nose, in consequence of the still-existing stricture, so that they now flow through the fistulous opening with the mucous secretion. From this constant discharge the external wound generally remains open, until the obstruction is removed; it may however close, when, after a time, the same process will be repeated, and similar consequences ensue; while, if the irritation which the disease occasions be allowed to continue for any very considerable period, the inflammatory action may spread too, and implicate the lachrymal bone, causing exfoliation, and other extensive mischief.

This disease is said to be a scrofulous affection; but as it is evidently produced by very many exciting causes, I apprehend we have no need to consider it depending upon a disease involved in such obscurity, and have but to look to those circumstances which give rise to chronic inflammation generally, to account for its production.

In the treatment of the first stages of this complaint, we must endeavour to effectually cure the chronic affection of the mucous membrane; this, if the complaint be recent, is generally accomplished by the proper and cautious application of stimulants, combined with strict attention to the general health; remedies, such as the solution of opium, and ung: hyd: nit:, may often be employed with the best effect; the solution should be dropped between the lids twice in the day, and the ointment applied at night: under the employment of these means we not unfrequently find that the disease of the mucous membrane, and vitiated secretion from the meibomean glands, subside, and that the lachrymal passages again perform their due office.

But should the complaint have advanced a step further, and should stricture have taken place, we must adopt the same re-

medies, and endeavour to remove the chronic irritation. Should the stricture yet remain, we must attempt to enlarge the passage with the probe: the employment of this instrument should be attempted but with the greatest caution, for should it excite much irritation, it should be immediately abandoned until that excitement has entirely ceased. The manner of using the lachrymal probe requires great attention; even in the natural condition of the parts we might do great mischief by attempting to force it past every obstruction; much more difficult, then, shall we find it in the diseased condition. In passing the lachrymal probe, which is a silver wire slightly bulbed at the point, and flattened at the further extremity, often having a turn to accommodate it to the form of the brow, we should hold it tightly between the two fore fingers and the thumb, then selecting the inferior punctum; should this be closed, we may, by insinuating the point of a pin, readily dilate the orifice, so as to admit the probe. Now placing the finger upon the temporal surface of the orbicularis muscle, so as to make the ciliary margin tense, and slightly evert the lid, then holding the probe in a perpendicular direction, we shall generally be able to enter the punctum. Sometimes, however, we may see it spasmodically retracted, so as to create an obstacle to the attempt: having entered the punctum and perpendicular canal, we should turn the probe at right angles, that is, in an horizontal direction, and pass it along the lateral canal, until we find it strike against the bone, which is easily distinguished by the resistance it occasions. Now, when the point is fairly within the sac, by a greater turn of the instrument, we again elevate it, and carry it gently outwards and downwards in the course of the nasal duct, until it touches the floor of the nostril, or superior spongy bone. When about to enter the sac, if we do not carry it home before we attempt to rise it, or if we suffer the point to recede in that movement, we generally find that the point will catch in some membranous fold, and we shall certainly be foiled in our attempt to enter the sac: having overcome this difficulty, we shall then be generally able to accomplish the passage. Should we, however, meet with any other difficulty, we shall generally be able to pass the instrument (unless it be a confirmed stricture), by rolling the probe between the finger and thumb. The following diagram may perhaps serve to point out the several directions which the probe should follow :



Thus 1 represents the direction the probe should enter the punctum and perpendicular canal; 2 its course along the lateral canal; and 3 the final passage down the duct into the nose. This operation is easily accomplished by one who is perfectly acquainted with the anatomical structure of the parts. If the stricture be of recent formation, and not very extensive, by the cautious, yet frequent introduction of the probe, we may sometimes overcome it, and cure the disease, hereby averting a more painful operation, and the necessity of future disfigurement.

Should, however, these means be insufficient, and distension have proceeded to the extent that inflammatory action is produced, we may attempt to resolve it by the application of leeches: we shall, however, seldom find them successful, for the cause still remaining, it will generally run on to suppuration, so that when we find there is no chance of preventing the termination, and of relieving the distended sac by other means, we should make an early opening, before the inflammation has proceeded to any great extent, and before the integuments are very much implicated in the process. If we will attend to this indication, we shall generally have less surrounding hardness to contend with, and we shall generally find that the effused coagulable lymph, the cause of the thickening, will be much more quickly absorbed, than when matter has been permitted to form external to the sac. The opening should be made with a spear-pointed knife, and should give a free exit to the contents of the sac. The immediate swelling, and our knowledge of the situation of the sac, should direct our incision. Now having relieved the distension, and permitted the contents of the sac to flow out, we should insinuate a slip of lint into the orifice, to prevent the closure of the wound before we have established the passage into the nose. Should the inflammatory stage have existed for some time, and much matter have formed round the sac, we should recommend the application of poultices, to soothe and relax the parts, while it promotes the due suppurative action. By these

means we shall soon find that the discharge of matter lessens, the surrounding swelling subsides, and the part becomes fit for the further prosecution of our intensions; but should the patient be of an unhealthy habit, a very considerable slough may have formed, so as to include the whole sac, or the wound may be surrounded with a very hard dense tumour that suppurates but slowly, and throws out large flabby granulations; here the application of the *argentum nitratum*, so as to produce a slough, will often excite a more healthy action in the surrounding parts, while it reduces the fungous excrescence. When the inflammatory action has subsided, and the parts have become quiet, we may attempt to force the stricture which has produced the mischief: this is generally accomplished with facility by one who has a perfect knowledge of the parts, and is acquainted with the situation and course of the ductus ad nasum: indeed, we shall find it much more difficult to keep it open after we have made it pervious; to accomplish this with effect, and without personal disfigurement, has been a subject that has exercised the ingenuity of the profession for ages, and even at the present period of our knowledge, affords ample scope for the exercise of talent. To open the passage into the nose, we should use a strong silver probe, to be introduced through the wound in the sac; this should be gently but steadily forced downwards, almost in a perpendicular direction, or rather inclining a little outwards. Now, on the first obstruction we meet, we should remember, that these may be merely folds of the mucous membrane; so we should roll the probe between the finger and thumb, and endeavour to insinuate it past. Should its progress be still stopped, we must force it on in the course of the duct, and we shall generally be able to re-establish a pervious state of the canal; a pointed instrument may be employed by one who is a perfect master of the course it should take: it will give the patient less pain, and cause less subsequent irritation. As soon as we have opened the passage, we should introduce a style, or bougie, formed of a material that will produce the least irritation; for this purpose a smooth and polished piece of whalebone, or a bougie of elastic gum, of about the same size as the probe, have been recommended: when the operation has been easily performed, and the subsequent irritation is very trifling, the common silver style is quite sufficient to fulfil every intention; this, if it produce any pain or inflammatory action, may be frequently removed for a short time, and again introduced, so as by degrees to accustom the part to its presence: this should be continued until every irritation consequent upon the attempt has subsided, and then we should proceed to adopt a more permanent remedy. To fulfil that intention, the late Mr. Ware recommended the continued use of the

silver style above-mentioned: this, for an adult, should be about an inch and a quarter, or an inch and three-eighths in length, of about the diameter of the common probe, and formed with a flat head like a nail at the upper extremity: this should be blackened, and placed obliquely, so that when introduced down the duct its head may lay flat against the surface of the surrounding skin. The continued use of this instrument certainly will remove the constant epiphora; it keeps open the passage into the nose, so that the tears entering the punctum, pass by its side along the duct, and are evacuated by the natural outlet, while the flattened head, appearing like a morsel of court plaster, is seldom objected to by the patient. This style, after having been used a time, is now and then removed, and the wound has been known to heal, and the natural passage to remain permanently open; this, however, very seldom occurs, and the patient is generally obliged to wear it for the remainder of his days. The style should be frequently removed, and the passage cleared of any mucus that may be present, by means of a syringe, when the instrument is to be wiped, and again returned. These are the means most generally employed by the English surgeons; we find it, however, only palliative, requiring very constant attention, and is very often objected to as a source of annoyance, not only from the trouble it gives, but also from the deformity some fancy it produces: while it is but fair to confess, that, in some few instances, I have known the tears escape from the wound, and produce irritation upon the cheek.

It has been recommended by M. Dupuytren, of Paris, to introduce a gold tube into the passage formed by the probe, and to heal the wound over it; this, if not an original idea, we are, at least, indebted to the Baron for its re-introduction into practice: indeed, it is now often used in this country, and with considerable advantage. I think that I cannot do better than give M. Dupuytren's own description, which will be found in Mr. Traver's work; it is as follows:—"Cette canule doit être aussi longue que le conduit nasal: par conséquent elle est de 10, à 14 lignes sur une, ou une et demie de diamètre, cependant sa partie supérieure est un peu plus large; elle offre une légère courbure pour s'accommoder à celle du canal. Un rebord renflé, en forme de bourrelet saillant en dehors, fait le contour de l'ouverture, qui doit aboutir au sac lacrymal; il est destiné à s'opposer à la chute de la canule dans le nez, chute que permettroit à la maladie de se reproduire; l'autre extrémité de la canule est taillée en bec de flûte afin qu'un de ces côtés moins long, ne dépasse point le côté interne du canal nasal, qui finit avant l'externe. La canule est portée sur son mandrin, formé de deux parties, qui se réunissent à angle un peu obtus; l'une d'elles plus longue ap-

platie, est celle qui saisit le main de l'opérateur; l'autre se cache dans la canule qu'un renflement subit l'empêche de dépasser." Again he says, "La malade étoit assise sur un chaise placée vis-à-vis d'une fenêtre, la tête appuyée sur la poitrine d'une aide: Monsieur Dupuytren tend alors avec le *medium*, et le droigt indicateur de la main gauche, le peau des paupières de l'œil droit, en la portant un peu en dehors, tandis qu'avec la main droite armée d'un bistouri à l'arme étroite, il fait à la peau qui recouvre la tumeur, une incision perpendiculaire qui la divise ainsi que la sac lacrymal. On vit bien que l'instrument n'avoit pas dévié, par la profondeur à laquelle il pénétra sans difficulté, et à la sortie de mucosité purulente. Changeant alors de main il saisit avec le droite le bistouri, et avec la gauche le mandrin revêtu de sa canule en or. Le bistouri est un peu retiré pour permettre à l'extrémité du mandrin qui est glissé sur sa lame d'être introduite à mesure qu'on fait entre le mandrin; enfin lorsqu'on est entré à la hauteur du canal nasal il ne reste plus qu'à l'enfoncer. On est averti qu'il a pénétré assez avant, par la résistance qu'on éprouve à l'enforcer davantage; ce qui provient du contact de la canule sur le rebord de la gouttière lacrymale. Voulant s'assurer que la communication existoit entre la sac lacrymal et la fossé nasal. M. D. firma l'ouverture antérieure des fosses nasales, et ordonna à la malade de faire des effort comme pour se moucher aussi-tôt on vit de l'air mêlé à du pus, et à des mucosités sanguinolentes s'échapper par la petite ouverture; on y présenta la flamme d'une bougie, elle fut éteinte. Au bout de vingt quatre heures la petite plaie fut cicatrisée, la tumeur n'existoit plus, le cours des larmes étoit parfaitement rétabli, et la narine de ce côté avoit repris son humidité naturelle." Thus far I have described the instrument and manner of employing it; instead of the gold tube, a silver one will equally suffice, provided we do not introduce it directly after the opening into the sac has been made. I think it far preferable to force the stricture with the probe, and to introduce a style or bougie to accustom the part to the presence of a foreign body, than to pass the tube immediately after the incision has been made: after the use of the bougie there will be much less chance of any succeeding irritation, causing its removal to be necessary. When successful, this is by far the most convenient and comely means of removing this complaint: it is necessary, however, to state, that the tube occasionally becomes blocked up with mucus, which is frequently such a source of irritation as to make its removal indispensable; but if attention has been paid to the time and manner of its introduction, this is very seldom a consequence of its employment: indeed, I can readily bear testimony to the success that has attended Mr. Guthrie's practice with this instrument at

the Royal Westminster Infirmary, for the diseases of the eyes; and, upon the whole, I consider it the most advisable means of re-establishing the pervious state of the lachrymal passages.

Should the bone have become implicated in the disease, and inflammation have been excited, we shall, in all probability, have exfoliation; in this case we should apply poultices, and do our best to prevent the extension of the mischief; should a portion of the bone actually be dead, by slight stimulants we may endeavour to accelerate the natural process, while we are careful not to close the external opening until every diseased portion is entirely removed; for should any remain, we may rest assured, that it will not be long ere the disease returns, and inflammation and ulceration again take place.

EXOSTOSIS OF THE BONY CANAL

Has been known to occur, and to compress the sac so as entirely to prevent the proper passage of the tears into the nose, producing all the symptoms consequent upon obstruction of the duct: this, I think, is the only case in which we are warranted in attempting the formation of a new canal, as it is termed, by breaking through the bony parieties of the orbit. The lachrymal bone, in its natural state, is very thin and brittle, so that it may easily be pierced, if we have a due knowledge of its relative situation; in this disease it may become thickened, but we shall generally find it soft enough to permit the passage of the probe without very considerable force, or consequent injury to the neighbouring parts. When the new canal is formed, we must endeavour to keep it pervious by the use of the style, or the adaptation of a tube, so as exactly to fit its orifice; but from the complicated nature of the disease, we can seldom expect to accomplish much good.

DROPSY OF THE SAC.

The lachrymal sac is liable to a disease, that bears a considerable resemblance to dropsy: it is a large tumour, situated at the inner angle of the eye, almost diaphanous, and containing a thick transparent fluid. The tumour forms slowly and without pain; it is incompressible, and we cannot discharge its contents, both the passages into the sac being obstructed by degrees; this swelling increases, and now the skin covering it assumes a bluish appearance; it is greatly distended, all but the skin being absorbed. The patient also now complains of a sense of tension and pressure around the root of the nose; the distension may go on to ulceration, and its contents escaping, the tumour collapses. If we examine the surrounding parts with a probe, we shall generally find them more or less removed by absorption,

consequent upon the pressure of the tumour. There is a case recorded in Mr. Traver's work, as occurring to Mr. Alexander, in which Mr. T. dissected, so as to expose the sac; he then removed the two anterior thirds of it with the scissors; considerable suppuration ensued, but the wound afterwards kindly healed; no mention, however, is made whether it was necessary to use the style, or by what means the stricture of the passages was overcome, so as to permit the tears to pass with their natural freedom into the nose. As soon as all inflammatory action has subsided, it will be necessary to form a passage, and keep it pervious by the means previously recommended in obstruction of the lachrymal passage; at the lower part this will be easily accomplished, but we shall often find that the tears will not pass into the sac, in consequence of obstruction at its commencement. We must endeavour to remove this by means of the lachrymal probe; but should that not suffice, we may attempt an opening with a sharp-pointed instrument, if we are sufficiently acquainted with the anatomy of the part.

RELAXATION OF THE SAC.

Relaxation of the sac is a disease by no means unfrequent, especially among old and unhealthy people: it is generally attended by a simultaneous affection of the puncta; here we may observe a small tumour about the size of a common bean, situated at the inner angle of the eye; it is filled with mucus, readily yields to the least pressure, so that the mucus may be easily forced down the duct, or out of the puncta between the lids, so as to remove all appearance of a tumour. The swelling, however, very speedily returns again, and is filled with a fresh collection of mucus and tears. In consequence of the retention of mucus in the sac, the eye is generally suffused, and the tears pass over the cheek; we generally find the lower lid hanging relaxed, and it has been said that the want of tone in the fibres of the orbicularis muscle, which cover the sac, and serve in the natural condition to force its contents down into the nose, is the cause of the lodgement of mucus; but the sac itself must more or less participate in this want of contractile power; by some the secretions which are lodged in the sac have been said occasionally to become inspissated, and sometimes to produce a tumour of cartilaginous hardness; by others it has been said to obtain the size of a pigeon's egg.

The indications to be fulfilled in the treatment of this disease, are to prevent the lodgement of the secretions, and to stimulate the sac and surrounding parts to the due performance of their office. To accomplish the first intention, very many ingenious and complicated machines have been recommended; these are,

however, continually becoming deranged, and I have found the more simple apparatus of a compress and roller far more preferable to this ingenious contrivance. We should form a graduated compress of lint; the lower portions should be of such a size as just to cover the sac; the next layer may be gradually increased; they are to be superadded upon each other, until they are of a sufficient height for the bandage to have due effect upon them. The bandage, being passed round the head, is to be made secure by the needle and thread. By local stimulants we may endeavour to rouse the dormant powers of the neighbouring parts, and excite the mucous membrane to a healthy secretion: these means, with attention to the general health, will generally relieve, if it does not cure the complaint.

DISEASES OF THE EYELIDS.

INFLAMMATION.

The eyelids are sometimes affected with inflammation; this most frequently commences in the superior, but very speedily, however, implicates the lower lid. It commences with a red, tense, and painful swelling of the part; this is attended with great heat; it soon impairs the motion, or altogether prevents the action of the lids. The disease quickly spreading, soon affects the neighbouring parts, such as the conjunctiva, the meibomean glands, the lachrymal passages, and sometimes the globe itself. As the inflammation proceeds, the lids assume a bright red colour, and an effusion of serum very soon fills their very lax cellular tissue, which is known by its semi-transparency and elasticity. This by degrees becomes more opaque, and much firmer; coagulable lymph is thrown out: now the pain may become acute and throbbing, the swelling assumes a darker colour, and a conical eminence may soon evince that suppuration has taken place. In a very short time the pain has somewhat subsided, but the centre of the swelling has become more prominent: it is soft to the touch, and of a lighter colour, while a sense of fluctuation is often preceptible, indicating the immediate presence of matter. If left to itself, the abscess will soon open by ulceration, the matter is discharged, and if it happen in a healthy constitution, the wound soon heals. In bad constitutions the formation of matter may be attended with considerable sloughing, implicating the lid to a greater or less extent, usually causing very serious consequences, for when the slough is thrown off, and the wound begins to heal, the contraction which takes

place, in consequence of the loss of substance, produces considerable eversion of the lid; the puncta may be included in the slough, when a constant epiphora will remain, particularly observable upon the least excitement of the lachrymal organs; even the whole tarsus may be removed, but this is an uncommon height of the disease. The effusion of coagulable lymph, which occurs in the cellular texture of the lid, sometimes may become organized, and not afterwards being absorbed, may be a means of preventing the due elevation of the palpebrum, and so cause an unseemly deformity, and prevent the proper exercise of the organ, by intervening between the object and the eye.

Inflammation attacking the eyelid is to be treated on the common principles that regulate our practice in the cure of this disease in other parts of the body. At the commencement we must endeavour to arrest its progress, and this is best accomplished by topical blood-letting, by cupping, or leeches applied to the temples, by application of cold, and by the administration of brisk purgative medicines; these, if employed in due time, will generally move the disease; but should it, in spite of our efforts, proceed to suppuration, we must apply poultices and fomentations, to relax the parts, and hasten the formation of matter. As soon as a distinct fluctuation is observed, and its presence sufficiently evident, we should make an opening for its speedy discharge, and not allow it to proceed to any great extent, for a large quantity of pus will sometimes collect in the lax cellular tissue of the lid, and implicate the surrounding parts to a great extent. Should considerable sloughing occur, we should endeavour to encourage the separation of the slough, by the application of topical remedies, while we endeavour to improve the general health.

An inability to move the upper lid is sometimes a consequence of this disease. Here the eyeball is generally covered, so as to prevent the due exercise of vision; but we can often, especially in the latter stage, observe a degree of motion. This defect should be particularly distinguished from paralysis of the levator palpebræ superioris. It is, as I have shewn, dependant upon an organized deposition in the muscular texture and neighbouring parts; and is generally accompanied by a relaxed state of the integuments,—a consequence of their previous distension, while it is evidently not dependant upon the want of nervous influence. When the complaint is recent, we may, by exerting the action of the absorbent vessels, cause the removal of the interstitial deposition, which may soon remove the deformity; but should it have continued for some time, the disease have become confirmed, and the lymph organized, we can expect but little improvement from such means. We may, however,

sometimes, by the removal of a portion of the integuments, cause such a contraction or shortening of the part, that a considerable degree of vision may be permitted. The extent of the excision of the palpebrum must be regulated by the judgment of the practitioner: the skin ought to be removed from above the upper margin of the tarsal cartilage. When the excision is accomplished, we should bring the edges of the wound in contact, and maintain them in their proper situation by one or two sutures, according to its extent; and these should be aided by plaster and bandage. This means will often so far shorten the lid that the muscle may still have sufficient play, so as to uncover the globe, and to permit the due exercise of its function.

PARALYSIS.

Paralysis of the muscular apparatus very frequently takes place: it is a very obvious and unsightly disease. To understand the varieties of this affliction, however, we must duly attend to the healthy formation of the parts. I have shewn in the anatomical description, that we find two muscles subservient to the motions of the lids: one to raise the upper, the other to close the lids. I have also mentioned, that we have two distinct and separate nerves to regulate these motions. Thus the portio dura is minutely distributed to the orbicularis oculi, to endow it with the power of voluntary motion; while the levator palpebræ superioris is supplied by a branch of the motor oculi, which also brings this muscle under the governance of the will. From these premises, we can easily conceive that paralysis of either of these nerves will produce different effects, when they occur separately; but we should also be aware that they may both happen at the same period, when, in all probability, they are dependant upon, or accompanied by hemiplegia.

Paralysis of the portio dura produces an inability of action in the orbicularis, so that the upper lid is continually elevated, and the eye uncovered. It is left exposed to the surrounding particles of dust, that generally cause considerable irritation, and may produce inflammation of the conjunctiva and opacity of the cornea, so as ever after considerably to impair the use of the organ. The whole muscle is relaxed; the lower palpebrum falls away from the globe; and the tears pass over the cheek; and now that the winking motions, which serve to clear the globe by drawing the delicate apparatus over its surface, no longer exist, a collection of mucus takes place upon the cornea, giving it a dull appearance, and preventing the due passage of the rays of light to the optic nerve, hereby obscuring vision. When paralysis of the portio dura is a distinct and separate complaint, it may proceed from disease of the brain; but it is much more fre-

quently caused by an affection of the nerve in some part of its course. Inflammation and suppuration within the ear may produce it, when we generally find it accompanied by paralysis of the other muscles supplied by the nerve, while it may proceed from the pressure of a tumour upon, or wounds of the nerve, or from inflammatory action, implicating the branches of the nerve in some part of their course to the muscle.

In the treatment we must attend well to their different causes, or we may be led to treat our patient too severely, fearing it to be symptomatic of some cerebral affection, when perhaps it is caused but by a very trivial complaint in the external parts, which should not excite alarm for his safety. When symptomatic of disease within the brain, it must be treated accordingly; but should it depend upon inflammation of the internal ear, we must endeavour to remove the complaint by cupping, or the application of leeches and blisters to the neighbouring parts. Should the disease be obstinate, or have existed some time previous to our being consulted, we shall find a perpetual issue the most likely means to benefit him. If it arise from inflammation or pressure in any part of the face, we have but to remove the cause, and the effect will generally subside. Should it proceed from a division of the nerve, we can expect but little benefit from medicine; at the same time we should also be aware, that inflammatory action may cause such a thickening and deposition within or around the theca of the nerve, as to place a cure out of our reach, and to confirm the disease.

As I have before explained, an inability to raise the upper lid may be caused by disease of the muscle subservient to this particular motion; it is much more frequently, however, a consequence of a deficiency of nervous influence. In this complaint the superior palpebrum hangs loose and pendulous, impairing, or totally preventing the due exercise of vision. If we raise the lid with the fingers, we shall find that it directly falls down again by its own specific gravity, when the support is removed, setting aside the action of the orbicularis muscle. This variety of paralysis is most generally dependant upon disease of the brain. It may be a consequence of orbital inflammation or tumour, which affects the motor nerve in its course, including more or less of the branches of the third pair of nerves, when we shall find that, according to the extent of the cause, the other muscles are deficient in power, while it may possibly only implicate the twig going to the orbicularis. We sometimes find this disease a consequence of blows or contusions on the forehead, which may implicate the whole contents of the orbit, so as to produce permanent blindness as well as paralysis of this nerve.

If this complaint proceeds from an affection within the cranium, we adopt remedies such as bleeding and purging, which will be most likely to prevent the extension of further mischief, while we follow the principles before mentioned in its cure. Should it be consequent upon pressure or inflammation within the orbit, we must do our best to remove the cause, and, if successful, we shall commonly find that the effect will cease.

INVERSION.

This disease consists of an inversion of the margin of the eyelids, and a consequent wrong direction of the cilia, so that some or all of them may turn in upon the globe, and by their friction keep up a constant state of irritation. When of long standing, it is not unfrequently accompanied by contraction and adhesion of the external canthus, which generally produces an unnatural curvature in the tarsal cartilage, tending greatly to confirm the disease.

It has been conceived by authors that this misdirection of the hairs is sometimes consequent upon a morbid increase in the number of the cilia; but I apprehend this to be a mistake, and the arguments adduced by Mr. Guthrie go a great way to support the conclusion: but that hairs will arise from parts not natural to them, is undeniable; for we sometimes find these parasitic growths proceeding from the caruncula lachrymalis, from the sclerotic and corneal portions of the conjunctiva. These pseudo-cilia, as they are aptly termed, are generally much larger and stronger than the proper cilia, and are always of a jet black colour. These, although differing in character and situation, commonly produce very unpleasant effects, similar with the preceding.

The wrong direction of a cilium, or the morbid growth of a parasitic hair, excites general inflammation of the conjunctiva, produces great pain and irritation, especially increased upon the motion of the lids, which is generally accompanied with an intolerance of light and profuse lachrymation, while a very acute pain in the head not unfrequently augments the severe distress of the patient. If the cause of the complaint is not soon removed, the acute symptoms will gradually subside, and an obstinate chronic inflammation supervenes, liable upon the least excitement to the reproduction of the acute symptoms. If this chronic irritation continues, a diseased and vitiated secretion from the meibomean glands may occur; thickening and contraction of the conjunctiva, sometimes even proceeding to ulceration, may be a consequence. Indeed, this may extend to and implicate the cornea, occasioning opacity that may ever after impair the function of this tunica, and cause blindness.

The causes of inversion of the lids are various: sometimes a cilium may suddenly, without any perceptible cause, be inverted, and produce considerable irritation, causing a thickening and ulceration of the conjunctiva covering the lids. This will soon increase the number of the inverted cilia, and materially augment the inveteracy of the complaint; while the excoriation that takes place at the margin of the palpebræ, gives rise to adhesion and contraction of the tarsal border at the outer canthus. This by degrees draws upon, and inverts the whole extent of both the palpebræ, which in a short time will produce an unnatural and vicious curvature in the tarsal cartilage, so as to render this terrible and vexatious disease complete. During all this time the irritation produces a constant winking, and often a spasmodic contraction of the orbicularis muscle, that greatly adds to the misery of the complaint; and it is said, that if we examine the muscle, in a patient that has laboured under this disease, we shall find it considerably increased in size, especially that portion denominated the *musculi ciliares*. Wounds, or other accidents, happening to the palpebral conjunctiva, the existence of small tumours within the cartilage, besides the thickening which I have already mentioned, will produce the first stages of the complaint: the others will generally follow as a consequence.

The treatment of this complaint must obviously depend upon its extent. In the first stage, when but a single hair happens to be inverted, or a pseudo-cilium proceed from any point, so as to excite irritation, we must remove it; and should we be fortunate enough to extract the bulb of the hair, we shall generally cure the disease; but should this remain, it will return. It has been recommended to destroy the bulb with caustic, but we must be cautious in our attempts, for the ulceration and contraction consequent upon its application will often greatly increase the disease. Should it have proceeded a step further, and the irritation have caused its contraction, and the inversion of a greater number of the cilia, we may, by the application of sulphuric acid, produce a number of small ulcers in the skin of the palpebræ, so that when these heal, they may produce a degree of contraction, and draw the margins of the eyelids outwards. This is applied by merely dipping a probe in the acid, and rubbing it over the part in which we wish to produce the cicatrices; its application must be repeated until the desired effect is produced. It has also been recommended to excise a portion of the skin; this has a similar effect, but is far more painful. If the ulceration shall have caused a recent adhesion and contraction of the outer palpebral margin, in addition to the above means we should carefully divide these adhesions, and by the

application of sticking plaster endeavour to prevent their reunion; but should the complaint be of long standing, and this contraction have become confirmed, and have induced the permanent curvature of the tarsal cartilage, we ought to perform the operation recommended by Mr. Guthrie, which will be far more adequate to the removal of this troublesome disease than the excision of the palpebral margin, as practised by some very eminent surgeons; indeed it has been a matter of astonishment, that with the obvious defect and unseemly deformity which this operation occasions, that there should be found persons still willing to perform it. Mr. Guthrie's description of this operation is the following:—"The head being supported, the eyelids are to be gently separated; the patient is desired to refrain from making any effort whatsoever, and the surgeon is to wait until he sees the lids are perfectly quiescent. A small narrow knife, or one blade of a blunt-pointed scissors, is then to be introduced, close to the external angle, and a perpendicular incision made, of from a quarter to half an inch in extent, or of sufficient length to render the eyelids quite free. Another incision is to be made in a similar way at the inner angle, but this should not include the punctum lachrymalis, for although the tears may continue to pass through the lateral canal into the sac, when the punctum has been included in the excision, they do not do so with equal freedom, and there is some observable deformity. The length to which the perpendicular incision at both angles ought to extend, must now be decided by the appearance of the part; they must be continued, if necessary, by repeated touches with the scissors, until that part of the eyelid containing the tarsal cartilage is perfectly free, and is evidently not acted upon by the fibres of the orbicularis that be upon it. The part included in the incision is now to lie completely everted, and retained by the forefinger of the operator's left hand, against the brow of the patient, when if any lateral attachment be observed acting upon, drawing, or confining the lid, it is to be divided, which is in fact, still elongating the incision. On letting the eyelid fall on the eye, the edge of the tarsus and the hairs will frequently appear in their natural situation, in consequence of the relaxation of the angles, which bound them down; but if the tarsal cartilage has become altered in its curvature, this will immediately be perceived, it will turn inwards at the ciliary edge, and be completely bent at its extremities, more especially at the inner one, where it is most powerfully acted upon by the muscoli ciliaries. On desiring the patient to raise the lid, he readily attempts it, but the action of the levator, in such cases of vicious curvature, causes the cartilage partly to resume its situation, and on examination the curve will be observed to be

so permanently vicious for about the eighth of an inch at each extremity, and especially at the inner, that it cannot be induced to resume its actual situation. When this is the case, the cartilage is to be divided, exactly at the place where it is bent, in its length, and in a direction at right angles with the perpendicular. The portion thus slit is only connected with the common integuments of the eyelid; and although this incision scarcely exceeds one, and never two eighths of an inch at both extremities, and in general is only necessary at the inner, it enables the surgeon to move the altered curvature of the part." He further says: "The operation being thus far accomplished, a fold of skin is to be cut away from that part of the eyelid included between the incisions; three or four ligatures are to be introduced; and the divided parts from which the fold has been removed, are to be neatly brought together by ligatures, each of which ought to be twisted, and then fastened to the forehead by several short slips of sticking-plaster, the ends being turned over the plasters near the hair, and retained in that situation to prevent their slipping. In raising the fold of skin, care should be taken to do it regularly with the fingers. It is also essential to the success of this part of the operation, that it is done as close as possible to the margins of the eyelids. It may then be grasped by the forceps of Beer, which have transverse pieces slightly curved, for the purpose, at their extremities, and close with a spring. The piece thus included, which need not be large, may be cut away by one or more strokes of a large pair of curved or straight scissors. The ligatures should be inserted first at each angle; and when the vicious curvation is considerable, I not only pass it through the skin, but take care that the internal one shall include, at its lower part, the outer edge of the margin of the eyelid, which, from its firmness, retains that ligature much longer than those which pass through the skin only, and tend to prevent the possibility of a relapse. The ligatures thus placed, are to be equally drawn up on the forehead, until the eyelid is completely everted, when they are to be fastened as directed. In order to prevent any attempt at union, but by granulation or filling up of the incision, the edges are to be slightly touched with the *sulphas cupri*; the eye and eyelids are now to be carefully cleansed; a piece of lint, spread with the *unguentum cetacei*, is to be placed upon them; a small compress is to be put under the edge of the eyebrow and orbit; a retaining bandage covers the whole, and completes the different steps of the operation. The operation, accomplished with all the care I have described, will still fail, if equal attention be not daily paid to the subsequent dressing, on which, indeed, more depends than on the operation itself: so much, indeed, that I am disposed to

consider inattention to it the most certain cause of failure. On the second day, great attention must be paid that the ligatures keep the lid sufficiently raised: and if any union has taken place, by adhesion at the angles of the incisions, it must be broken through with the probe. On the third day, the plasters attaching the ligatures to the forehead will in general require to be exchanged. The great art of the cure consists in causing the incisions to be filled up by granulation only, so that the eyelids may be lengthened as much as possible, and which can only be effected by a continuance of the means indicated." The same operation is to be performed on the lower lid; but here it is much more simple, and less painful, from the nature of the part. This operation of Mr. Guthrie's is an improvement on the one recommended some time back by Mr. Crampton, of Dublin, and much more successful: indeed, by these means the complaint may generally be removed; but should it not prove fully successful on the first trial, we must repeat the steps of the operation, and with due perseverance shall effectually cure a complaint, which has been considered an opprobrium to surgery since the time of Hippocrates.

EVERSION.

This complaint consists in the eversion of the eyelid, so that its inner surface becomes visible. It is an unsightly and hideous disease, rather than one of much danger: every stage of it, however, is accompanied with unpleasant effects; such as a constant flow of tears, consequent upon the removal of the punctum from its natural position, and from the lodgment of particles of dust and other foreign bodies upon the delicate surface of the conjunctiva, which, now that the proper motions of the lids are prevented, will frequently cause considerable irritation, accompanied with an increased secretion of mucus, that, sticking about the ball, produces some defect of vision. Should the disease be of long standing, this constant irritation may give rise to so much action upon the whole surface of the conjunctiva, that it will become thickened, and being exposed, will appear dried and withered. Indeed, it becomes so altered in its natural texture, as to prevent the passage of the rays of light into the globe, and so form a partial or even a total and irretrievable impediment to the exercise of vision.

Several causes tend to produce the different varieties of this complaint. It is not unfrequently an attendant upon diseased secretion from the meibomean glands, which, producing excoriation about the roots of the cilia, and upon the outer margin of the tarsi, then become thickened, and of a shining red colour; this, when kept up, and increased by uncleanness, not unfre-

quently proceeds to ulceration. A number of minute ulcers are produced: these generally lie concealed under small dry scales, and as they heal, cause contractions of the skin, that more or less evert the lid, turn the cilia from their natural direction, and expose the yellow-reddish conjunctiva lining the palpebra. This, which is the most simple variety, we shall generally find more or less extensive and confirmed, according to the length of time it has existed. The second species is that produced by the purulent ophthalmia. This has been ably described by Dr. Vetch. It generally takes place as the external effusion subsides, when the thickened conjunctiva prevents the due apposition of the lids to the globe, so that upon any sudden action of the orbicularis, the eyelids are everted, and a degree of strangulation sometimes occurs, which, if not speedily relieved, may render the disease very untractable. The third variety is generally produced by wounds of the palpebra, or ulcers affecting the neighbouring parts, when the eversion will be more or less considerable, according to the loss of substance, and consequent contraction that may follow cicatrisation.

The treatment must, of course, be influenced by the variety and extent of the disease. Should we meet with the most simple kind at an early stage, we may generally soon remove the complaint. Strict attention to cleanliness; the application of some mild ointment to shield the part from the acrimony of the discharge, combined with the occasional use of some mild stimulant to improve the vitiated secretion from the meibomean glands: these, together with attention to the general health, will generally be sufficient to effect a cure. But should ulceration have occurred, and considerable contraction be a consequence, it may be necessary to resort to other means: previously, however, we should consider well the depth of the ulcers; for, if they consist but of a trifling loss of cuticle and rete mucosum, accompanied only by a secretion from the cutis, without any breach in its substance, the contraction that takes place will be but temporary, and the eversion is in all probability consequent upon the surrounding thickening, and will subside as that is absorbed. Should the ulcers be formed by evident loss of substance in the cutis, we shall find a permanent contraction, proportioned to its extent, follow the cicatrisation of the wound. When this extent of ulceration has produced the disease, we may, by the application of the sulphuric acid to the surface of the palpebral conjunctiva, sometimes be able to cure the disease. The application, however, of the acid, requires particular care and attention, or we may produce effects worse than the complaint we are endeavouring to remove. Having fully everted and made the surface of the membrane perfectly dry, we should

dip the blunt end of a common probe in the acid, and draw it along the surface, carefully avoiding the puncta, caruncula lacrymalis, and semi-lunar fold: its application will turn the conjunctiva white, and may produce a general contraction of its surface. We should be careful to prevent it extending to the eyeball, and by means of a stream of cold water, thrown from a gum-elastic syringe, should speedily cleanse the eye of every particle. The continued employment of the sulphate of copper, or the nitrate of silver, will commonly, but not so speedily, produce a like effect.

The following are the means recommended by Dr. Vetch, in the cure of that variety which is a consequence of acute conjunctival inflammation. He says, "I take the opportunity which the exposed state of the surface of the palpebra presents, of beginning the cure of the granulated state of the conjunctiva, by a very light and gentle application of the nitrate of silver. The everted portion is to be returned, and secured in its place with a compress, and strap of plaster, or bandage. Every time the eye is cleansed, the same things are to be repeated. In the course of a few days the tendency to protrude will disappear; and generally at the end of a fortnight, the patient may have so far recovered the use of the muscles of the part, as to be able by their means alone, to raise or open the eyelids at pleasure. Whereas, if attention is not given to relieve the strangulation, which takes place every time the membrane protrudes, it becomes a disease of many months' duration, and the eye may be destroyed in consequence, although it might have escaped the violence of the acute stage of the preceding ophthalmia." The means applicable to the cure of the species of eversion proceeding from a wound or large ulcer, must differ according to its extent. If the contraction and consequent eversion is slight, we may, by dividing the cicatrix, and causing it to granulate from the bottom of the wound, sometimes cure the complaint. To accomplish this, we must hold apart the lips of the wound by adhesive straps, and frequently touch the part with the sulphate of copper. But if the complaint should have proceeded to a greater extent, and the whole of the lid be everted, we must not only divide the cicatrix, but should also cut out an angular piece of the palpebra, and bring its two surfaces in direct apposition. By this means we directly contract the length of the palpebra, and afford it support. The two surfaces are to be held in contact by a ligature, so as to cause as speedy union as possible. This, if successful, will hold the tarsus in its proper situation, and if not afterwards influenced by the contraction of the divided cicatrix, may affect a cure of the disease. Should the wound or ulcer, however, have been of such extent as to tie down the

margin of the cartilage to the edge of the orbit, we may endeavour to separate the adhesions, and make the wound granulate from the bottom, while we endeavour to lengthen the lid, and relieve the eversion; but do our best, we shall find this a very troublesome, and, generally, an irremediable variety of this complaint.

COHESION OF THE EYELIDS.

Adhesion of the lids to each other, or a union between their inner surface and the globe, will sometimes take place; these are always the effect of ulceration, or wounds, that entirely destroy the texture of the conjunctiva; for we find it an admirable provision of nature, that the surface of mucous membranes never adhere upon the excitement of slight inflammatory action; for was this the case, it would produce many and irremediable diseases. Adhesion of the edges of the tarsi sometimes occur, in consequence of the application of a compress and bandage to the eye, and when these are in a state of ulceration, we shall find the union here more or less complete, in proportion to the extent of ulcerated surface; but, I think, it is never universal, as suspected by Beer, unless it occurs as a congenital defect; indeed, complete union could never be consequent upon previous inflammatory disease, for the continued passage of the secretions will always present and keep open an aperture, by which we may introduce the probe. Union of the lids to the globe is generally the effect of direct injury to the part, and is not unfrequently compared with the preceding variety. In consequence of the application of some escharotic, such as quick lime and melted lead, we often find a lax and narrow bridge or union connecting the lids, but not preventing the motions of the part. In other instances, when the abraded surface was of greater extent, the connexion of the parts may be more universal, and may take place between the whole of the palpebral surfaces and the globe, and so effectually prevent the due exercise of vision. These varieties of adhesion are generally a consequence of direct union, by the effusion of coagulable lymph, which becoming organised, forms the bond of union; there is another kind not consequent upon direct union, but dependant upon the contraction of a cicatrix: this generally follows ulceration in the angle of a reflection, which the conjunctiva makes when passing from the lid to the ball. This draws down the lid, and will often bring the tarsal margin in direct apposition with the globe, often causing inversion, and preventing the due motions of the part.

When simple adhesion of the lids takes place, we must separate the union by means of a knife; here we must endeavour to introduce a flat probe between the eyelid and the ball, and then cutting on this, divide the adhesion: the revision may

also be effected by means of a blunt-pointed pair of scissors. When the separation is accomplished, by the application of the sulphate of copper and some mild ointment, we must prevent the re-union of the parts. Should the lids partially cohere to the globe, and we find it practicable to introduce the probe under this adhesion, we should in like manner divide it, and by the application of similar remedies, endeavour to prevent a relapse; but should the junction be more general, and the cornea much implicated by the disease, so as to obscure the pupil, we shall commonly find it irremediable, and the less we do to it the better. Or should it be consequent upon the contraction of the cicatrix, as I have shewn, the young surgeon should be warned in an especial manner not to interfere with it, for he may rest assured, that although relief may appear possible by its division, we shall certainly increase the complaint by making the contraction more marked.

TUMOURS.

The palpebræ are as liable to the formation of tumours as any other parts of the body, like them, may be dependant upon inflammatory action, or the existence of a morbid growth; this is, perhaps, the most frequent cause of their production.

The first variety is the inflammatory tumour, commonly known by the name of a sty, which appears upon the margin of the tarsi, seldom exceeding a barley-corn in size; its general and external character bespeaks that it is nearly allied to the common boil. It is said always to occur in the cellular substance that covers the tarsal cartilage, and by some it is imagined to be inflammation and suppuration around a meibomean gland, consequent upon obstruction and over distension. Its formation is commonly first accompanied by an itching sensation, but this quickly amounts to a burning pain, and now the part appears slightly swollen, and is of a scarlet colour. This, however, as the process goes on, soon assumes a darker tint, and the swelling becomes of an oval shape, more elevated and shining, while the inflammatory action often causes an effusion into the surrounding tissue. When arrived at this extent, the apex of the tumour will commonly take on a white or straw colour, indicating the presence of matter; during this stage a little symptomatic fever may occur in very irritable habits, as a consequence of the complaint. This little tumour generally follows the above course more or less rapidly, according to the activity of the inflammatory action. We sometimes find that it is suddenly arrested in its progress towards suppuration; it will then often degenerate into a hardened tumour, that may remain stationary for a length of time; it is always troublesome, and may occasionally pass into a very unhealthy ulcer.

In our treatment of this complaint we shall generally find the application of warm poultices and fomentations, to encourage the suppurative stage, even from the very commencement, to be the most advantageous; for with all our antiphlogistic remedies, we shall very seldom be able to discuss the swelling, and are apt to render it a hardened tumour, often difficult to disperse. As soon as suppuration is fully established, we may open the little abscess with a lancet, and squeezing out its contents, endeavour to remove the slough, which we shall commonly find to be present; by these means, and sometimes assisted by the application of gentle stimuli, we may speedily remove the surrounding deposit, and cure the disease. But should the slough remain, and the wound not appear to heal, by the application of caustic to the part, we may excite its removal; the best for this purpose is the sulphuric acid, which should be applied so as to cause some degree of slough; this will be speedily discharged, when the tumour commonly puts on a better action. Should the swelling not have gone on to suppuration, we must, by the application of stimulants, such as camphorated mercurial ointment, or the compound camphor liniment, endeavour to cause their absorption, but should the patient be of a bad habit, it may be better to attend to his general health, and when that becomes improved, remove the whole tumour with the knife.

Encysted tumours not unfrequently occur in the eyelids: these are of various kinds, being distinguished by the nature of their contents, such as the melicerous, the steatomatous, and the atheromatous varieties; they are seldom large in size, generally occasioning inconvenience and deformity rather than pain; if allowed to increase, they may become so large as to cause eversion or inversion of the lid; when placed within the tarsal cartilage they will turn it inwards, but when they occur in the cellular tissue without, they may cause eversion, and give rise to the several symptoms that attend those diseases. These tumours are commonly situated at a distance from the tarsal margin; they feel round, hard, and elastic to the touch, while they commonly roll with freedom under the fingers, being entirely free from any adhesions. The best and most effectual means of relief is to accomplish their complete removal with a knife. This is generally a very easy operation, and should be attempted in the following manner:—The head of the patient being firmly fixed, the eyelid is to be inverted, and held in this situation by the forefingers of the left hand, when an incision a little longer in extent than the tumour is to be made over its surface with a small sharp-pointed knife; it will now generally start forwards, and may readily escape. Should it be behind the tarsal cartilage, we must cut through this until we have opened the tumour, and exposed its nature;

now its contents generally escape, or they must be forced out by pressure, and the sac be completely emptied by turning a common probe around within it, at the same time to excite a degree of inflammatory action that may consolidate and obliterate the secreting surface : the due degree of excitement may be produced by the application of caustic, repeated every day for a short time, until the proper effect is produced and the cartilage nearly healed. In the atheromatous variety it is recommended carefully to remove the whole of the sac, for we find that unless we particularly attend to this circumstance, the very quick formation of matter will speedily cause the return of the disease.

Warts sometimes occur upon the eyelids ; here their characters are similar to those which occur in other parts of the body, and they require a like treatment for their removal. When they have a long slender root or stalk, we may cut them off with the scissors, or kill them by the application of a ligature. Should they possess a broad base, we may, by the application of caustic or other stimulants, frequently destroy them, for although alive, they appear to possess a very low degree of activity. Should this occur in old people or unhealthy constitutions, we must be careful to attend to the health before we venture to interfere with the disease.

PAINFUL AND SPASMODIC AFFECTIONS OF THE EYELIDS.

In the anatomical description of the palpebræ I have shown that they are supplied by nerves of distinct and separate function ; the one to allow of sensibility, the others to preside over and regulate voluntary motion. The nerve of sensation is known particularly to be the seat of *tic douloureux*, the causes of which disease will, I suspect, be hereafter found to arise from many very different sources of irritation. I think that it may have its seat in the brain itself, in the course of the nerve within the skull, or as it passes through the bones of the face ; and was I permitted to conclude without positive demonstration, I should expect that its most probable situation was in the bony texture, for this is so liable to disease, and when inflamed, it must in many cases unavoidably implicate the nervous matter, causing pain, which, although not obvious at the immediate seat of its production, is often terribly excruciating at the sentient extremity of the nerve, or those points that receive the sensation of feeling.

Somewhat corresponding to the preceding variety we find another nervous affection of the lids, not known, however, by the pain it produces, but by a spasmodic action with which it is obviously affected. This, like *tic douloureux*, most commonly happens on one side, but it may occur in both at the same time.

This disease is particularly marked by the perpetual motion that takes place in the lids: it seems as though the patient was incessantly winking; a circumstance that gives him a very curious appearance, and is apt to make us imagine that it is intentional, rather than the effect of disease. This constant motion is caused by continual and involuntary spasms, causing a contraction of the orbicular muscle of the lids, which quickly intermits, but to return again. The patient cannot command the motions of the lids, and were we to desire him to raise the upper lid, so as to uncover the ball, we should find him unable to accomplish it, not so much from the want of power in the levator, as from the constant action of the orbicularis. Were we to attempt to inspect the eye, in all probability we should excite so rigid a spasm as to render it difficult, if not totally impossible. This complaint is sometimes attended with considerable headache, but far more frequently by a shooting pain, which darts through the ear on the side affected. This complaint I imagine to arise from causes similar to the preceding; but here the motor nerve is affected, and evinces its disease by its disordered function. As the irritation of the nerve of sensibility is rendered obvious only at the points of distribution, so is this disease only perceptible in the derangement of the action over which it presides. When the affection of the nerve is general, to an attentive observer it will show itself in the contracted brow, the motions of the angle of the mouth, and sometimes a general affection of the muscles of the face, which will cause the countenance unconsciously to put on the strongest expression of the various passions, without any corresponding mental excitement.

M. Demours, after having given a description of this complaint, states that he has seen it affecting the muscles of the ball, causing a very frequent convulsive movement. He says: "*J'ai fait connaître un cas dans lequel elle fut bornée aux muscles des globes avec un type intermittent regulier, durant lequel, de deux jours l'un de ces organes etaient dans un mouvement convulsif presque continuel, et tendaient l'un et l'autre à se diriger du côté du grand angle.*" He also states, that when the oblique muscles only are affected, they communicate to the globe a movement of semi-rotation, and that squinting occurs, with indistinctness of vision. In these cases the affection would appear to consist in disease of the motor nerves of the eyeball, such as the third, fourth, and fifth.

In both the preceding diseases the same plan of treatment should be pursued. The best plan of cure, however, as well as the nature of these diseases, are still hid in very considerable mystery, as may readily be inferred from the various remedies that have at times been had recourse to for their removal. If

any symptoms of cerebral disease were present, I should certainly turn my attention in an especial manner to them, and endeavour, by various remedies, to obviate or remove them. Should no cause be obvious, I should prefer the application of leeches, the moxa, or other external irritants, immediately over the spot where the nerve makes its exit from the bony canal, if this can be done without disfigurement; the carbonate of iron, and the other tonic medicines, may be had recourse to: but above all, we should endeavour to improve the general health, in which I would be inclined to put more dependance than in all the other means combined.

DISEASES OF THE ORBITS.

INFLAMMATION.

In the anatomical description of the orbit I have mentioned the nerves and muscles that take their course through it. I have shewn how they are connected, and held in their relative position by a fine and lax cellular tissue, which likewise surrounds and supports the globe; and how all these parts are firmly held together by the bony walls, which are in close and intimate connexion with the very matter of the brain: indeed, from its contiguity, the eye, as we see is the case, must be liable to participate in the affections of this part.

Inflammation of the soft parts contained within the orbit sometimes takes place, and we have but to reflect upon their nature and connexions, to be fully roused to the danger of the disease, and the terrible effects too often consequent upon it. Its very commencement is marked by a most violent, agonizing, and deep-seated pain, which is accompanied by a sensation of tension, often giving rise to the idea that the parts contained within the orbit were about to burst from their cavity; this is accompanied by a swelling of the parts within, that pushes the globe forward, and occasions the lids to become unnaturally protuberant. Even at this stage the motions of the eye are attended with great pain, or even entirely prevented. Now also the patient evinces symptoms of high inflammatory fever; these are not unfrequently attended with delirium, especially marked during the night; and we find the pain not unfrequently aggravated to an intolerable pitch, often accompanied by a throbbing sensation, not confined to the orbit, but extending over the whole head. The ball is now considerably thrust out from its socket, all the surrounding parts are swelled and enlarged, par-

ticularly the eyelids, which are filled with an effusion of serum. The patient is perfectly blind, often however experiencing flashes of light in the eye dependant upon a state of veinous congestion in the retina: the iris has ceased to act, in consequence of the compression of its nerves within the orbit. The pain often now appears somewhat to remit, the patient experiences several rigors, evincing that suppuration is taking place, and in all probability we find the matter will soon point in some depending position: it generally presents itself at the lower margin of the orbit, forcing the fold of conjunctiva before it: it may work its way into the lower lid, immoderately distending it, until it burst by ulceration. Its contents are then evacuated, after which the complaint will generally subside, sometimes however leaving a thickened and indurated state of the cellular tissue; or should the bony walls have been implicated in the disease, a sinus may form, that may be of long continuance. When the inflammatory action spreads to any considerable extent, or raises to any great height, it may pass to and implicate the several tunics of the eye itself: sometimes even the external apparatus do not escape. When these several parts become affected by the disease, they evince many peculiar symptoms dependant upon this complicated state of disease.

If we meet with this complaint in its early stages, we must adopt the strictest antiphlogistic treatment: we must bleed freely from the arm, according to the age and strength of our patient, and keeping our eye fixed upon the dangerous nature of the disease, must not let trifles interfere with the abstraction of blood, which should be the point on which all our hopes are dependant. At the same time we may purge smartly, keep up constant nausea with tartarised antimony, and endeavour, by quiet, and every other means in our power, to subdue the disease: but should it, in spite of all our endeavours, go on to suppuration, we must make an early opening for the exit of the matter, and endeavour by these means to limit the extent and consequences of the disease. As soon, then, as a fluctuation is obvious, indeed almost as soon as by the alteration of the pain, and the rigours that the patient has experienced, we are convinced that matter has formed, we must with a lancet endeavour to reach it, and provide for its speedy exit; this, however, must be performed with due caution, taking care that we wound no part of importance. As soon as an exit has been provided, and the matter discharged, the suppuration will gradually diminish, the eye may return to its natural situation, and the patient be again enabled to discern the light. It however most frequently happens after this disease, especially if it has been of great extent, that he ever after remains perfectly blind, and sometimes

is even unable to move the globe. In some cases we find the actions of the iris partly or wholly paralysed, more or less of the ciliary nerves being implicated in the suppurative action. The several motions of the globe, or the levator palpebrum, may be impaired, while the sensibility of the forehead, and even the parts below the eye, may be entirely lost. Should a sinus form, a consequence of diseased bone, we must endeavour by injections to hasten the exfoliation, while at the same time we provide for the closure of the wound. Should a thickened and indurated condition of the cellular tissue be a consequence, we must, by the exhibition of alterative medicines, and the application of stimulants to the neighbouring parts, endeavour to excite its absorption.

PARALYSIS OF THE MUSCLES OF THE GLOBE.

A paralytic affection of the muscles of the globe will sometimes take place: it may be consequent upon disease within the brain, tumours within the orbit, or a sequel of the preceding complaint: it may be partial, that is consequent upon compression, or disease of one or more of the nerves which supply the recti muscles, and are subservient to motion, when we find it produce the several varieties of this disease commonly called squinting. It may be dependant upon a paralytic affection of the third pair, which may implicate the whole, or be confined to one of its divisions, while one only of its twigs may be affected: this will be evinced by loss of motion in the muscles supplied by the affected nerve. Squinting may likewise be a consequence of disease in the sixth pair of nerves; as is known by the paralytic affection of the rectus externus muscle. It is also necessary that we are aware that squinting may be produced by some opacity or change in the transparent media, some disease of the retina or brain, from which a change may occur, so as to produce a difference in the perception of objects, in consequence of which the diseased eye is turned from the axis of vision, to prevent and remedy the confusion consequent upon this change of structure. These paralytic affections are sometimes consequent upon disease of the brain, and are then generally accompanied by a similar condition in other parts of the body. In this instance also a similar disease of every nervous tissue belonging to the organ of vision can generally be observed. A loss of motion of one only of the muscles of the globe is most generally dependant upon disease within the orbit: it is not unfrequently consequent upon blows of the forehead, and concussion of the orbit.

When paralysis is dependant upon disease of the brain, as evinced by the attendant symptoms, the indications in the cure

of the cerebral affection must be attended to, and on its removal must depend all our hopes of curing this complaint. If this disease has been caused by inflammation within the orbit, but faint hopes remain to us to be of much service, and these mainly dependant upon the extent of previous disease. If the cause was recent, and not very extensive, by bleeding, and the other remedies recommended in the treatment of orbital inflammation, we may endeavour to remove the complaint: but we must remember, that when even this has, to all appearances subsided, the healthy action of the muscle will not always return, on account of the thickening of the theca, or altered structure of the nervous matter itself. When dependant upon pressure from other causes, such as tumours, &c., we must remove these before we can expect to alleviate the deformity. When squinting is caused by a diseased state of any of the transparent media, it is necessary in the first place to remove this defect; and secondly, when this has been remedied, we may endeavour to cure the habit which the muscles of the eye have obtained, of turning the pupil from the axis of vision. Some have attempted this by putting a bandage over the sound eye, and by those means calling into action the energies of the affected organ. Others, when the pupil was turned outwards, have applied a piece of black plaster to the nose, so as to attract the attention, and call the internal rectus muscle into frequent action. When the pupil was directed inwards, a similar object was aimed at, by fixing a piece on the outer margin of the orbit.

TUMOURS WITHIN THE ORBIT.

Encysted tumours sometimes form within the orbit, among its lax and delicate cellular tissue; they are of various kinds, and produce many symptoms, which are consequent upon the extent of their growth. They may form at the bottom of the orbit, or very near to its margins; they are generally consequent upon a morbid and undefined action, that takes place in this as well as in other parts of the body. They generally contain a fatty, or oleaginous matter, sometimes fluid like the white of an egg, when they may be confounded with hydatids; but they are also found of a hard yellow matter, sometimes known to take on the character of scirrhus. The generality of these tumours form slowly, and without much pain, save a slight feeling of tension that is sometimes attendant upon their incipient state. The first symptom that leads us to suspect their formation, is a gradual protrusion of the eyeball, which may afterwards even amount to extreme deformity; and now we not unfrequently find them accompanied with an acute and perhaps a lancinating pain; there is a constant flowing of the tears, consequent upon the pro-

trusion of the eye, which removes the puncta from their natural situation; this also produces a difficulty of closing the lids, while it permits the lodgement of extraneous particles, that irritate and may produce inflammation of the conjunctiva; this extending to the cornea, causes an opacity of that tunic, and an increased and vitiated secretion from the neighbouring parts; even should the cornea be sufficiently transparent to admit the rays of light, the function of the retina and iris may be deranged by the surrounding pressure, that may also form a complete impediment to the various motions of the ball, while a want of sensation in the integuments of the glabella and forehead may accompany the other symptoms, and be consequent upon the super-trochlearis nerve, being implicated in the disease. In the latter stages of these affections I have seen the vessels of the choroid coat become varicous, being enlarged and distended to a great size, from pressure upon the ophthalmic vein.

When small in size, and situated near the margin of the orbit, we should make a careful dissection through the conjunctiva and surrounding parts, until we reach them, when, by means of a hook, we shall sometimes be able entirely to remove them, but when they are larger, deeper seated, and appear to contain a fluid, we may puncture them so as to permit the escape of their contents, and then by the introduction of some extraneous body, such as a piece of bougie, or by cutting off a portion of the sac, endeavour to excite such a degree of action that may produce consolidation, and unite the secreting surfaces, which may perhaps so cure the disease. But when we imagine, from the lancinating pain, the hardness of the tumour, and sallow cadaverous look of our patient, that it may be a cancerous affection, we should, if our suspicions prove to be well founded, remove the whole contents of the orbit. In the latter stages of these diseases the patient is invariably blind, and the immense protrusion of the ball, which causes a very great disfigurement, will often be an additional reason for the removal of the whole.

HYDATIDS WITHIN THE ORBIT.

Hydatids are sometimes found within the orbit; they are composed of cysts, filled with a perfectly transparent and limpid fluid; they are most frequently connected with the lachrymal gland, forming without, and connected with, or attached to its envelope: at other times they may proceed from the bottom of the orbit. They produce symptoms which precisely correspond with the foregoing diseases; indeed they are very difficultly distinguished from them; they are, however, said to have a feeling of greater elasticity, so that if pressure be made, the protruded ball sinks into the orbit, but quickly resumes its former situation,

as that pressure is removed. In some instances, when the protrusion is very considerable, fluctuation may be more or less distinctly perceived, especially round the margins of the orbit. Sometimes the protrusion of the cyst is so excessive as to cause inflammation and ulceration, permitting the escape of the fluid contents, and by these means, sometimes, curing the disease, the attendant inflammation having produced adhesion of the secreting surfaces: indeed these are the indications pointed out by nature, and in our treatment we should endeavour to imitate the natural process.

ANEURISM WITHIN THE ORBIT.

Aneurisms of the ophthalmic artery sometimes occur; they must cause the protrusion of the ball, and other symptoms attendant upon tumours within the orbit; but from the very commencement this affection is particularly marked by a hissing noise, and a sensation of pulsation experienced within the head: this is particularly increased when the patient is in a horizontal position, or after any great exertion. There is a case of this kind recorded by Mr. Guthrie, when the ophthalmic artery after death was discovered, in both orbits, to have formed an aneurismal sac, of about the size of a large nut; here the ophthalmic vein was considerably compressed; it was enlarged in consequence of this obstruction to the return of blood; the four recti muscles were also much increased in size, and of a cartilaginous hardness.

Aneurism by anastomosis may also form within the orbit; this is a peculiar complaint, formed by a diseased condition of the arterial and venous extremities, connected by cellular tissue, and having many of the characters of aneurism. This affection always produces great protrusion of the ball, and is sometimes attended by excruciating pain. There are several cases on record, one especially by Mr. Travers, and another by Mr. Dalrymple, of Norwich, which should be especially noticed. Among the first sensations experienced by these patients was a snap within the orbit, accompanied with pain and a whizzing noise; this was soon followed by an effusion of fluid into the eyelids, which was shortly after succeeded by an intolerable increase in the severity of the pain, particularly marked when the head fell below the natural level. In both these cases the carotid artery was tied with complete success.

DISEASES OF THE BALL.

GENERAL CONSIDERATIONS.

The eyeball, as I have described, is formed of many and various textures; some hard and fibrous, others delicate and transparent, that contain the various humours of different degrees of consistency. Each of these parts may be separately affected by disease, giving rise to a great variety of different complaints; and since most of these individual tissues are open to inspection, their different diseases will be marked with distinct and obvious symptoms. While some of the diseases affect but one of these parts separately, we must not for a moment forget, that bound together, and connected as they are, the affection of one may soon spread to and implicate the neighbouring textures, sometimes affecting every portion of the ball; and we must moreover recollect, that although the eye may be described separately from the body, that by a similar circulation and connexion it is endowed with life, and its diseases evince stages and processes similar to those which arise in other parts of the system; which, however, here, from the delicacy of the structure, is better within the reach of observation.

DISEASES OF THE SCLEROTIC COAT.

INFLAMMATION.

The sclerotic coat is a hard and fibrous texture, little supplied with red blood, in the natural state of the parts circulating but a serous fluid; this, like similar textures in other parts of the body, is liable to be affected with inflammation, which is marked by an increased vascularity; here we find the minute serous vessels now enlarged, admitting the passage of red globules, and these, in consequence of their minuteness, and the depth at which they are situated within the fibrous tissue, are known by a lively carmine or pink colour, while they are particularly distinguished from the conjunctival vessels, both by the peculiarity of their tints and their perfect immobility. These enlarged vessels are also generally diffused over the whole tunic, shining through the fibrous structure; individually they are scarcely distinguishable by the naked eye, but taken as a whole, cause the peculiar tints I have noticed. An acute lancinating pain is felt in the orbit, from the very commencement of the disease; it generally spreads to the brow, and very frequently implicates

the temple on the affected side; this is particularly increased at night when the patient is warm in bed; it is in all probability dependant upon the distension which the fibrous texture now experiences. This stage of the disease is frequently attended with intolerance of light, a contracted pupil, and an increased secretion of tears, symptoms which I suppose to be dependant upon the implication of the nerves which pass through, or are connected with this texture. We should also remark, that at the commencement of pure sclerotic inflammation, that a white line, or a vascular zone, is seldom to be found around the circumference of the cornea; this, however, may in process of time become visible, if the disease should extend to the iris, without implicating the cornea. Should the disease be very acute in its progress, we shall generally find it attended with great symptomatic fever, sometimes accompanied with such intolerable pain as entirely to prevent the least repose. Very soon after the commencement of the complaint, the vessels of the conjunctiva may become more or less affected; indeed their profusion and redness, sometimes amounting to the extreme height of purulent inflammation, might possibly mislead us, did not the attendant pain point to the proper seat of the complaint: in process of time also the cornea or iris may become implicated in the disease, evincing the various symptoms which serve to characterize the diseases of these different textures. I think I have observed, that when the conjunctiva becomes affected early in the disease, the cornea generally soon participates; but when this is not among the most prominent symptoms, the iris becomes soonest implicated in the inflammatory action, which spreads to it from the neighbouring tissue. Should the disease be permitted to take its course without the exhibition of efficient remedies, it may spread to every texture of the globe, so that we find the cornea may become opaque, and even ulceration take place; the pupil may be closed; the choroid coat, the retina, and even the transparent media, may become more or less deranged in function, or have their texture completely disorganised, while supuration of the globe takes place. Indeed inflammation of the sclerotic coat seldom proceeds to any considerable height, without implicating these several textures; and if we only see the complaint at this period, it is often rendered so obscure that we can scarcely recognise the original complaint.

The causes of sclerotic inflammation are those which can excite a similar disease in other parts of the body, such as the sudden application of cold, when the system is preternaturally heated. This disease frequently accompanies, or even alternates, with a rheumatic affection of the joints, which leads us to conclude that the inflammatory action is connected with this dis-

ease, a position which the similarity of the texture affected greatly tend to confirm. And here, also, we find that the improper use of light wines, cider, or hard beer, which often cause an acidity in the stomach and bowels, are not unfrequently the immediate exciting cause. Notwithstanding this obvious connexion with rheumatism, I think I have seen it arise as a simple and unconnected disease, when it was ushered in with rigors and other symptoms of inflammatory fever. This disease may occur in one or both eyes at the same time, attacking them simultaneously; or the affection of the one, may follow the subsidence of that in the other.

The cure of this complaint, when an idiopathic disease, will require the rigid adoption of the antiphlogistic treatment, especially in the first stage, when the pulse is full and quick, the pain excessive, and the fever great: here we must bleed freely from the arm, cup the patient upon the temple, and purge him briskly with calomel and salts. The use of the lancet generally moderates the pain; but should it return again with the same vehemence, we must repeat it according to the age and constitution of our patient. These means commonly moderate and even soon remove the disease; should, however, the other textures of the eye become implicated, we must adopt the remedies especially recommended in their treatment, particularly calomel and opium, so as to affect the system.

When the disease is obviously dependant upon a rheumatic diathesis, it is generally attended with symptoms of derangement in the prima via, such as a foul tongue, nausea, and loss of appetite. When the symptoms of the disease are very acute, we may bleed both locally and generally, act upon the abdominal viscera, and keep our patient upon low diet; these, combined with the employment of colchicum, or calomel, antimony, and opium, so as to excite all the secretions, and relieve the pain, will generally cure the disease; not, however, in some instances, until the medicines have produced very obvious effects upon the system, almost amounting to mercurial salivation.

DISEASES OF THE CORNEA.

INFLAMMATION.

As the corneal texture is widely different from the sclerotic coat, so we find its diseases evince symptoms peculiar to its formation, and that corneal inflammation is not necessarily dependant upon any affection that may arise in the sclerotic coat,

though it may frequently be accompanied with it, in consequence of the manner in which the vessels pass to supply the cornea. Among the most prominent symptoms of corneal inflammation, we find a slight haziness or obscurity to occur in this previously transparent tissue: indeed this is necessarily among the first; it is produced by the minute serous vessels, which pass into and supply its texture, now being both increased in activity and size, carry a denser and whiter fluid; this renders vision slightly indistinct, and the patient complains of a mist or cloud before his eyes. Almost coeval with this appearance, we may observe the pink sclerotic vessels carrying blood to the inflamed part; sometimes they may even be seen passing into its substance; they here leave no white line or margin around its edge, but when the disease has proceeded a little further, they may be observed forming a beautiful halo or zone of minute recti-lineal vessels, that evidently pass over the margin of the cornea, carrying red blood into its texture. A universal pink colour of the sclerotic coat is generally present; but I have seen two or three cases, where a very marked vascularity existed around the circumference of the cornea, but was almost entirely wanting near the folds of the conjunctiva, indicating also by other symptoms, that the sclerotic coat was scarcely implicated in the complaint. This disease will be attended with more or less pain, according to the amount of sclerotic inflammation which accompanies it, for I have witnessed a great height of corneal disease, without a proportioned degree of pain. As the disease proceeds, the cornea becomes more opaque, its serous vessels now circulate a very dense coagulable lymph, and some of them even the red globules, so that its tissue is perfectly impervious to the rays of light, while the excessive action of its arteries now go on to the effusion and deposition of lymph, between the transparent layers, and in the cells of the corneal structure. The conjunctiva now generally becomes implicated, especially the corneal and sclerotic portions; indeed every tissue of the globe may gradually become affected: or the disease may now subside, and the effused lymph be gradually absorbed; but should it continue to increase, the cornea becomes perfectly white, from the interstitial deposition; should the activity of the diseased vessels at this time gradually abate, the lymph may become more or less organized, vessels shooting into it from the surrounding parts, so as completely to change the character of this previously transparent tunic; its cellular conformation no longer exists, but is filled up with a very thick and firm matter, very different from its original texture. Should the inflammatory action continue to increase, ulceration or sloughing of the cornea may take place to a greater or less extent, when its surface loses the lustre

commonly to be observed, and assumes a peculiar hue, that has been ably characterized by Mr. Saunders with the terms "cindry, ragged, and flocluent." It also loses its tension; and when the slough is partially separated, it has hung relaxed between the eyelids, and has been mistaken for a portion of inspissated mucus. Before the disease has arrived at this height, it is always accompanied with very acute inflammation of the conjunctiva, while it is not unfrequently consequent upon the extension of conjunctival disease to this tunic. If the ulceration, or sloughing, is but partial, the aqueous humour may escape, and the iris be prolapsed through the opening; but should the opening be of greater extent, all the contents of the globe may be expelled, and suppuration taking place, the eye sink back into the orbit. Inflammation of the cornea, as an idiopathic disease, does not very frequently go on to this extent, seldom proceeding further than the effusion of lymph into the cellular texture, or ulceration and partial prolapsus of the iris, while sloughing of this tunic is generally observed when this complaint is implicated in the purulent conjunctival inflammation.

Inflammation of the cornea may be partial, implicating but a portion of this tunic; when in the course of the disease, a formation of matter may occur, as may be seen in the institial abscess. Here all the previous symptoms evince themselves, such as the partial haziness, and opacity, with a minor affection of the sclerotic vessels. These go on to the effusion of coagulable lymph, and in a short time the formation of matter takes place, known by a perfect opacity of a pale straw colour. Save in the partial inflammation, the formation of pus is a very unfrequent termination of corneal diseases.

The causes of inflammation of the cornea would appear similar to those which call forth this disease in other parts of the body; it is said especially to occur in scrofulous constitutions, that are known by the fair complexion, thick lips, and flaxen hair; while the disease, as I have said above, is not unfrequently connected with sclerotic or conjunctival inflammation; these, from the proximity of texture, are very apt to spread to it.

The treatment of corneal inflammation must be regulated by the activity of the symptoms, the habit of the patient, and the exciting cause of the disease. Should it happen in a strong robust man, and be attended with much fever, pain, and sclerotic inflammation, we must bleed from the arm, so as to make an impression on the disease; this may be assisted by cupping, and blisters applied to the temples, while at the same time we act freely upon the bowels with active cathartics. In extreme cases, originating in the sclerotic coat, the use of calomel, and opium, as recommended in that complaint, must be had recourse

to. These means, judiciously applied, in an early stage of the disease, will commonly prevent the effusion of coagulable lymph, or occasion its quick absorption when it has taken place. Should ulceration or sloughing of the cornea take place, after having carried the depleting plan as far as is necessary to allay the inflammatory action, we must have recourse to bark and sulphuric acid, assisted by astringent lotions and a generous diet.

CONSEQUENCES OF CORNEAL INFLAMMATION.

Inflammation of this texture, as I have explained, is always attended with a loss of its transparency. This is dependant upon the effusion of coagulable lymph giving it a chalky whiteness or pearl colour, generally to be distinguished from conjunctival opacity by its more polished appearance, its greater depth, and its soft and spongy feel. In very many instances, soon after the effusion of lymph, we find that this matter is quickly removed by absorption; and its arteries having ceased to carry such a dense fluid, the texture soon resumes its wonted brilliancy and pellucid condition. The fact is particularly remarkable in the infant eye; for in consequence of acute conjunctival inflammation, or the small-pox pustule, this texture may become perfectly opaque, and the disease may proceed to greater extent, and exist for a longer period, in the cornea of a child, than would be consistent with its subsequent absorption, were it to occur in the eye of an adult. This is perhaps explained by the more pulpy and vascular texture of the foetal cornea. The lymph poured into the cellular structure of the cornea (in all probability) at first, is like the water in dropsy, an adventitious effusion always within the reach of the absorbent vessels; but should this deposit be considerable in quantity, so that it is not quickly removed, minute vessels shoot into it, and now it becomes organized; that is, it undergoes a regular absorption of the old, a deposition of new, and similar matter takes place; for unless this be allowed, how can we account for this white mark remaining in the cornea during the long life of a person? Can it be imagined that the lymph here deposited was in connexion with the absorbent mouths during half a century, and not taken up? No: it is an established law in the animal economy, that each part undergoes a continual change, which is strikingly exemplified even in the hardest of its materials. So then must the cornea; and, in all probability, every particle of that texture which existed during the deposition of the lymph, would in a very short time be taken up as effete, and thrown out of the system; and can we then imagine that the lymph only remained in the same state as when effused into the cellular texture? No; it must have become organized to have remained within the body.

It may be said, Why, then, does not the cornea become transparent, when this is removed agreeable to this natural process? This, I think, may be answered; for if we consider that the organized lymph differs in its structure from the surrounding pellucid tissue; and if we recollect that each vessel ultimately deposits a texture precisely similar to that to which it individually belongs, we shall see that in this instance, when the lymph is effused into the cells of the cornea, the minute vessels are of sufficient size to admit the denser particles of the blood; and should the deposited lymph become organized, the vessels that connect it with the living system must still continue, (although they pass through the transparent tissue,) to carry a material precisely similar for its regeneration, and so keep up an absorption and deposition of the same substance, which accounts for the long continuance of some opacities. The long existence of a grain of powder in the very substance of the cornea, may be brought as an argument against the organization of the lymph. Some may be led to infer that this lymph continues in a similar condition. We should, however, be aware that the foreign body, the grain of powder, continues there but under a different tenure: it forms for itself a little cyst, that is surrounded by a serous membrane, so that, although within the cornea, it is decidedly without the general and circulating system. Indeed, I think, that I may say, that all lymph deposited will be absorbed, unless it becomes organized; and when this takes place, our expectation of its removal must be but trifling, and can only be dependant upon a hope, that the surrounding tissue may so influence the vessels that pass through it, to this new-formed substance, so as to induce them to carry but a serous fluid, similar to that which circulates within the cornea. This gradual assimilation of parts, I think, may sometimes happen; but it takes place very gradually, and but after a lapse of years. As the effusion of lymph may be more or less universal in the corneal cells, so may its organization be more or less complete: when but partial, it may occupy but a small space of this lucid texture: but when the opacity becomes complete, so as to implicate the whole cornea, the greater portion may become organized; and now, when any irritation is kept up in this new-formed substance, it tends to increase its growth, which may in time form a staphyloma, as this white protruberant formation in the cornea is denominated. We should particularly remark, that there are several degrees of this opacity, differing in the proportion in which they interrupt or obscure vision. The first is, when a small portion only of the cornea is affected by this adventitious growth, which may remain notwithstanding all our efforts for its removal. The second is, when a larger portion

takes on this condition: this may increase in growth, and take on the projecting form, although it is surrounded with a transparent portion of the cornea. The third variety is where the whole of the cornea has become implicated, and has taken on the same action. It may be of a conical form, which often causes it to grow so large that the lids cannot cover it, and now it will often become a great deformity, and a source of considerable irritation and annoyance. The cause of the excitement which tends to increase its growth may be within the eye, as some have supposed, or may be produced by the action of the lids upon this new-formed part; either are not positively demonstrable to observation; but although the cause is doubtful, the effect is sufficiently obvious.

There is sometimes also an opacity which takes place in that texture at the posterior part of the cornea, denominated the membrane of the aqueous humour. This may be affected distinct from the substance of the cornea. It is marked by no particular symptoms, save the depth of its situation, which is easily distinguished by an experienced eye. In a woman who had had the operation for keratonyxis performed, which inflamed the capsule of the lens, this membrane was affected with a great number of minute opaque spots, evidently not on the substance of the cornea, but quite posterior to it. I have also seen it in a variety of cases, especially when the iris has been inflamed; while we find it is a very frequent attendant, indeed it almost always forms one of the characteristic symptoms of Iritis.

That pus may form within the substance of the cornea, and be one of the terminations of its inflammatory affections, is sufficiently obvious in the acute interstitial abscess. This always commences deep in the substance of the cornea, putting on all the symptoms of inflammation, such as haziness and opacity. This disease generally begins as a small but opaque spot, which in process of time becomes particularly obvious. It is now surrounded by a lighter-coloured opacity: at first the central nucleus appears of a dead white; but in a short time it becomes of a straw colour, and now, if touched with a probe, it feels softer than the surrounding surface of the cornea. It contains matter in a cyst, which may become very extensive. This matter is soon either absorbed, or, ulceration taking place, it escapes through the conjunctiva. I have, however, when the matter has been deep seated, seen it pass backwards, and be effused into the anterior chamber of the aqueous humour. In both cases it leaves an ulcer, which is gradually filled up, leaving a greater or less permanent opacity.

Ulceration is a consequence of inflammation, which sometimes occurs in this, as well as other parts of the body. It is marked

by distinct characters, which are either dependant upon the manner of its formation, or its modification by the habit of the patient; and as it cannot occur without a similar affection of the conjunctiva, we ought to include in our consideration ulcers of that tunic. Ulceration may take place in consequence of the formation of abscess. It may follow the separation of a slough, or be dependant on a want of power in the part, or the constitution generally, following inflammatory action; or it may be caused by a wound which does not heal readily. When the contents of an abscess escapes, it leaves a breach in the continuity of the part, proportioned to the extent of its formation. Ulceration may follow a conjunctival pustule, or, as I have said before, be produced by an interstitial abscess. Thus, in a healthy constitution, where the formation of matter appears to be the means which nature takes to resolve the disease, the ulcer will soon heal by the formation of granulations. When, however, this ulcer occurs in an irritable or unhealthy state of the constitution, it is always attended with more pain, intolerance of light, and profuse lachrymation; the edges of the ulcer have a ragged and broken appearance; and there is generally a thin, unhealthy secretion from the surface of the wound. In this case the ulcerative action often proceeds, until it spreads through the whole of the corneal layers, and so makes an opening into the anterior chamber of the aqueous humour; that fluid escapes, and the iris falling forward, may adhere to the wound, and so form a plug, which will prevent the further escape of the aqueous humour. Here it leaves a black spot, surrounded with more or less opacity, dependant upon the deposition of coagulable lymph, while the pupil is more or less deranged, and may even be entirely closed. If accompanying the ulceration the effusion should be considerable, as is often the case in purulent ophthalmia, it may produce some of the different varieties of staphyloma. The variety described as the most frequent is the spherical, that is, it is marked by the adhesion of the iris to the cornea, and is always a consequence of more or less ulcerative action. It is distinguished by its shape, being much flatter, while the other varieties, dependant upon the effusion of lymph only into the texture of the cornea, are more prominent and tapering: hence are denominated conical staphyloma. Should the ulcerative action be very extensive, a large portion of the iris may protrude, and this may form a considerable tumour of a dark irregular and knobbed appearance, in process of time covered by a shining membrane. This, when injured, bleeds freely: it produces great deformity; is a source of considerable pain and irritation; and has been said to take on a malignant action. The speedy swelling and change of appearance in the iris is in all probability caused by the veins

of the protruded portion of the membrane, experiencing a degree of compression, so as to prevent the free return of blood, while the arterial branches continue to supply the prolapsed portion. This produces a distension and varicose condition of these vessels: or it may be dependant upon that want of general support and compression, which these vessels must experience when within the eye; this being now removed, the vessels become more distended than usual. This disease has been called *staphyloma* of the iris. If less inflammatory action should be present, the disease may proceed more slowly and silently, be attended with less pain and intolerance of light. Still, however, the ulcerative action proceeds: by degrees it penetrates each layer of the corneal texture; and presently we may observe a little transparent vesicle to appear at the bottom of the wound. This is said to be the membrane of the aqueous humour, which is protruded forward by the pressure from behind. This vessel, however, commonly soon ulcerates, permitting the escape of the aqueous humour, and prolapsus of the iris. In this instance, however, ulceration generally proceeds to no very great extent, but the wound soon granulates and heals; save in an extremely irritable constitution, when we occasionally find that the healthy action proceeds but slowly; and here the exposed surface presents a scabious appearance. In process of time, as the cure advances, the jagged edges of the ulcer evince a rounded and smooth surface: it is surrounded by a layer of coagulable lymph, which continues until the loss of substance is completely filled up, leaving an opacity of greater or less dimensions, according to the extent of the wound, or the amount of the preceding inflammatory action.

Ulceration would sometimes appear to be consequent upon a loss of tone in the arteries of the part, while, if in bad constitutions, or debilitated habits, inflammatory action attack this part, the arterial branches, which at the first impulse of the disease have an increased action, appear soon to lose their power; a state of collapse is now obvious, they do not deposite with the same freedom the proper and necessary material, while the absorbents seem to act with their wonted vigour: these remove the part, but no corresponding deposition taking place, an ulcer must obviously be the consequence. This ulcer is particularly marked by its transparency; it appears as though a piece had been cut out of the cornea, or that it had been indented with some hard substance. I think I have remarked this condition as most frequently taking place in the corneal conjunctiva, but it may also spread to, and implicate the cornea itself; it is never accompanied with much pain, and this, with its perfect transparency, serves to form its most prominent diagnostic mark; as

the healthy action returns the ulcer assumes a whiter base, a light-coloured halo surrounds it ; the vascularity of the sclerotic coat is more marked, and now that the arterial branches carry a dense material, the deposition of lymph soon fills up the breach, and the ulcer is cured.

Sloughing is also a consequence of this disease ; it is more or less extensive, according to the intensity of the inflammatory action : it is the direct death of a part ; this death is more or less extensive, in proportion to the vehemence of its exciting cause ; but when this ceases to act, the slough is generally soon removed ; the neighbouring absorbent vessels take up the contiguous texture, so insulating the dead material, it falls off, leaving an ulcer, which, in process of time, heals by a natural action. We should here also remark, that most of the consequences of corneal disease occasionally present themselves, such as the formation of a staphyloma and prolapsus of the iris, &c. Sloughing of the cornea is seldom the consequence of inflammation commencing in this texture, while it may arise from wounds, or be the effect of escharotics applied to the part. I think, however, that it seems most frequently to be consequent upon the extension of purulent inflammation of the conjunctiva to this tunic.

The treatment of this variety of diseases must be regulated by all the principles which guide us in the like complaints attacking other parts of the body. In recent opacity of the cornea, having, by the several means recommended in the treatment of corneal inflammation, reduced the activity of the symptoms, we must now endeavour to excite the absorption of the effused lymph. This is to be accomplished by the application of stimulants ; these appear to produce their effect by exciting the larger vessels, which the inflammatory action caused to carry coagulable lymph, now to contract and prevent the passage of so dense a fluid, and as soon as the minute arterial branches cease to convey the lymph, the venous radicles or absorbents remove that which has been effused ; but, as I have before shewn, if the lymph that was effused be considerable, it may become organized, and then this process ceases to have effect. The adaptation of stimulants require attention and care, both as to the time of their use and the strength and frequency of their application. In the latter stages of inflammatory action, where, by bleeding and purging, we have overcome the activity of the disease, and a degree of collapse seems to occupy its place, we may, by a weak solution of the nitrate of silver, or the aqueous solution of opium, gently stimulate these vessels to a more healthy action. If, however, by the application of these means, we re-excite the inflammatory action, we must stop until it has again subsided, while, by the application of a blister and gentle purgatives, we endeavour to

hasten its removal; in some instances a kind of chronic or irritable state seems to supervene, this will be best removed by attention to the general health, and the application of the above-mentioned remedies, whenever an opportunity offers. In the employment of stimulants, we often find, that when used for any length of time they appear to lose their power, so that we find it always necessary gradually to increase their strength; indeed I have sometimes made use of a solution of the nitrate of silver, amounting to twelve grains to the ounce of distilled water, whereas one is quite sufficient at the commencement. We should, however, be aware that the long-continued use of this substance will often change the colour of the sclerotic coat and conjunctiva, giving them a muddy brown appearance, very disgusting, and exceedingly difficult to remove; indeed, sometimes a permanent disfigurement; in this case a solution of the sulphate of zinc, or the oxymuriate of mercury, or several other stimulants, may be used with advantage, provided their due strength and proper period of application be attended to. These means, combined with attention to the general health, will soon remove the lymph, which has not become organised, but in some instances where this change has taken place, to any considerable extent, I fear these means are often only liable to increase the disease; where, however, it is not of great extent, their long-continued use has certainly been attended with beneficial effects, as I have often witnessed among the old invalids at Chatham. We must be careful to prevent any application which may re-excite the inflammatory action, or tend, by irritation, to increase its growth.

Should the opacity be placed so as to overhang the pupil, and form an impediment to the due exercise of the eye, as an organ of vision, we may sometimes, by the constant application of the belladonna, so dilate the pupil as in a great degree to remedy this defect. Should the opacity, however, be placed immediately opposite to the pupil, leaving a large transparent circle around it, and should the patient be blind of the other eye, we may make an opening in the iris opposite to the lucid portion of the cornea, which has been termed an artificial pupil, and will enable the patient to see sufficiently to perform all the common offices of life, while it serves to guide him from surrounding danger. Previous to attempting this operation we must see the patient is in a good state of health, while we adopt those remedies most likely to prevent the supervention of inflammatory action. When duly prepared for the operation, the patient may be placed upon his back on a table, his head resting on a pillow, and the eye turned to a good light: the lids are now to be held open by an assistant; when the eye is fixed, we must seek out, if possible,

a healthy portion of the cornea, for wounds of any new growth will sometimes go into ulceration, or will not unite kindly again. We should then introduce a common cataract knife through the cornea, about a line from its junction with the sclerotic coat: this must be carefully, yet quickly, pushed forward, so that no aqueous humour flow out until the knife is withdrawn, when this should escape with a sudden gush, and will in all probability bring forward a portion of the iris with it through the opening; this must be pulled out with the blunt forceps until it sufficiently protrudes. Should not the iris fall through the opening, we must introduce the forceps, and carefully and slowly drag it out; then by the curved scissors we must cut off the protruded part, and return the iris to its proper place, taking care that no part of it remain prolapsed, for that will often prevent the success of the operation. We now bring the edges of the wound in contact, and if the operation has been properly performed, and the patient in good health, adhesion soon takes place; the aqueous humour is again secreted, and if a sufficient number of the rays of light be now admitted through this opening, the eye will again be of inestimable use. When the iris does not protrude upon the first incision, it is recommended to make pressure upon the globe; but this had always better be avoided, as it is liable to dislocate the lens from its capsule, and may increase instead of relieving the blindness. It is also said that it is absolutely necessary to remove a portion of the pupillary margin of the iris, and that we should seek this out, and include it in our excision; but I apprehend that this is not absolutely necessary, and that when the opacity covers the whole of the pupil, it will be better to make a sufficient opening in the iris, than occasion a protracted operation by searching for it. After the operation by the belladonna, we should endeavour to keep the opening in the iris dilated, while, at the same time, we employ bleeding, and the exhibition of purgative medicines, should the attendant inflammation become excessive.

Should the corneal opacity be more general, and but a very small portion of its texture free from disease, the above operation will not be applicable; but even here we may sometimes, by detaching the iris from the ciliary ligament exactly opposite to a transparent portion of the cornea, enable the patient to obtain sufficient vision to guide himself about. To perform this operation, the patient being placed in a position similar to that just recommended, we must make a cut in the cornea of sufficient size to introduce a hook, with which we are to take hold of the ciliary margin of the iris; this hook should be very small, somewhat similar to the instrument used in extraction, to tear the capsule of the lens, but rather more curved. When introduced

into the opening it must be carried with its convexity towards the lens, so that we do not injure its capsule ; then turning it round, we must hook the iris, and then again turn it upon its axis ; we now gently pull it backwards, detaching the iris, and when we have got the hook near to the opening, we must cut it out with the scissors, removing with it a portion of the iris. The hole at which the hook is introduced should not be very far from the portion of the iris to be detached ; it should be about the quarter of the circumference of the cornea removed from it, for if it was it would almost be necessary to tear the whole of the membrane from its attachment before we could remove a part. It is necessary to see that no portion of the iris be prolapsed, for if it be we must carefully return the membrane, and close the external opening, and by the several means recommended in the former operation, endeavour to moderate the inflammatory action, and procure adhesion by the first intention. While, if we successfully accomplish our object, the operation will be of great use to the patient, enabling him to discern surrounding objects. If, after the operation, we find that the lens or its capsule should be implicated in the inflammatory action which caused the corneal disease, it will be necessary, after we have formed the artificial pupil, and have permitted the eye to remain quiet for a short period, to cut up the lens and the capsule, and procure their absorption. Should the corneal disease have proceeded to a greater extent, and a conical staphyloma have formed, which from its size is protruded between the lids, preventing their due motion, while it is a cause of constant irritation, keeping up a state of chronic inflammation, and is often an annoyance and deformity to the patient, here we should remove a considerable portion of the projecting growth, by means of the knife. The patient being laid upon his back, and the head being properly secured, an assistant must elevate the upper lid ; if a child, this is to be effected by means of Pellier's speculum, which may also make slight pressure on the globe, to steady it, and prevent the rolling motion so common in such cases. The operator now takes a spear-pointed cataract knife, and passes it directly across the centre of the staphyloma, then cutting the instrument out, through one-half of its circumference, should lay quickly hold of the flap with the forceps, and remove it with the scissors. When this is accomplished, we may permit the lid to fall, but should at the same time keep the patient quiet, for at this stage the slightest exertion may make the lens, and even the vitrious humour, escape, and occasion the eye to fall collapsed within the socket. We should now apply a soft compress and bandage, and be cautious to moderate the inflammatory action, should it proceed to any very considerable extent.

When the cornea has been thus removed, the iris, perhaps the lens and its capsule, may be exposed: it is soon covered with a soft purulent-looking matter, and in the course of seven or eight days a thin membrane will be spread over this surface, at first appearing partially transparent, but by degrees becoming more opaque, assuming a bluish-white appearance. This new membrane is formed by a deposition of coagulable lymph, which becoming organized, supplies the place of the cornea; and now the eye will be found flattened, and in a condition fit for the application of an artificial eye, which, properly adjusted, will often successfully remedy the deformity; and now that the projection is removed the consequent irritation will subside.

Having recommended the application of an artificial eye, I should now speak of the nature of that instrument, and the mode of its application. Artificial eyes are now made so well that the most clear-sighted are easily deceived; they ought to be made of enamel, light, thin, but sufficiently solid; their size and curve ought to be adapted most accurately to the remains of the eyeball. The colours of the instrument ought to be lively, and perfectly like the healthy eye; indeed the most delicate shades and finest polish can be given to it, so as by the nearest comparison to imitate the sclerotic coat, iris, and pupil. The introduction of the artificial eye, so as to fix it in the orbit, requires some attention. Having chosen one of sufficient size, we should hold it perpendicularly between the fingers and thumb, the most convex part upwards; it should slip easily under the upper lid, and then introduced above the under, and adjusted as to its position. This should be repeated frequently before its use is commenced; by and by it should be permitted to remain in its situation for a short time; this is gradually to be increased, until the part gets accustomed to its use. It may very easily be removed, by depressing the lower lid, and just moving it with the point of a pin. At first the instrument always excites some irritation; this, however, is of advantage, as it causes the parts to become consolidated, and the artificial eye fits with more exactness. It is recommended in the first instance to employ a large instrument, and afterwards to apply a smaller, so that it may move with each motion of the globe, a circumstance of absolute necessity, to prevent any defect being observed. The artificial eye should be frequently removed and cleaned, and when once used we should not omit its introduction, as the parts soon become unaccustomed to it. Perhaps the following rules would serve every useful purpose:

1st. See that the eyeball is of good form, and free from all causes of irritation.

2d. To introduce the instrument with lightness, and without painful efforts.

3d. To employ it of small size, and gradually to increase it to that we should wish to keep it.

4th. To be certain of the absence of all pain, and every species of fungus; to see that the lids play easily over the artificial eye, and cover it well; that it moves with facility, is placed conveniently, and well adapted to the eye.

5th. It is indispensable to remove it every evening, to wash it; also the parts it covers.

6th. We ought to renew the instrument every time it is altered or spoiled, for when injured, or if a bad kind be used, we often find that it will do more harm than good.

If an interstitial abscess is about to form in the layers of the cornea, we should, by the application of leeches, and the exhibition of purgative medicines, endeavour to prevent the suppurative stage; but should the abscess be already formed, and the matter pretty considerable in quantity, while we can feel a fluctuation with a probe, we should puncture it, and permit the contents to escape, while by the employment of warm fomentations we endeavour to soothe the surrounding irritation: should this continue excessive, the wound putting on a ragged margin, discharging a glairy fluid, attended with considerable pain, the application of the nitrate of silver, so as to destroy the irritable surface, will generally cause the wound to granulate and heal. Should the matter escape into the anterior chamber, and thus cause or be connected with a partial affection of the iris, we can generally excite absorption, by the employment of a small quantity of mercury, which will also speedily remove the ulcer, and clear the cornea when opaque.

The treatment of corneal ulcers must be conducted upon the same principles that regulate the cure of such diseases in other parts of the system. If, for example, an interstitial abscess has opened, the ulcer consequent upon the evacuation of the matter generally soon heals; the intolerance of light and pain subside, as the vessels seem to relieve themselves by the formation of matter; and now that the inflammatory symptoms have ceased, granulations quickly spring up, and speedily close the breach: but should the action of its vessels now appear to flag, and this process not directly take place, the application of a gentle stimulant speedily excites them to healthy action. But after the matter has escaped, should the inflammatory action continue, the intolerance of light, and profuse lachrymation still be present, we shall find it necessary to continue the employment of topical blood-letting, and the exhibition of purgatives: these remedies will generally put a stop to the ulcerative process, and then, with

due caution, we should have recourse to local and general stimulants. Should the ulcerative process follow the escape of the matter, and penetrate all the corneal layers, leaving but the membrane of the aqueous humour, which is pushed forward, it is recommended, repeatedly to touch this little vesicle-like formation with a fine pencil of the nitrate of silver: this, in some instances, has been said to prevent the ulcer from extending into and opening the anterior chamber: should this, however, take place, the aqueous humour escape, and the iris, falling forward, be prolapsed, we shall always have more or less derangement of the pupil. Should the opening be very small, and the iris merely opposed to it, so as to prevent the further escape of the aqueous humour, we should endeavour to stop the ulcerative action by topical bleeding and purgatives, and if we succeed we may have the satisfaction of seeing the iris return to its proper situation, without causing any permanent derangement of the pupil; for as the slight layer of lymph which glued it to the opening is absorbed, by the action of the belladonna, or any other cause that will move the iris, it may necessarily return to its situation, provided the wound has been in the interim closed. Should the aperture in the cornea, however, be more extensive, a large portion of the iris may be prolapsed, and now we always find a very considerable increase of pain in the eye, generally extending to the head: it is consequent upon the strangulation which this delicate and sensible membrane now experiences; indeed sometimes the pain is very excessive. The means of relief hitherto had recourse to is the application of the nitrate of silver; this is to be scraped to a point, and rubbed on the protruded iris, so as to cause a slough, and now the pain almost entirely ceases, for the nervous tissue of the apparatus is no longer exposed to the same irritation; the slough, however, soon falls off, when similar symptoms are again evinced, and again we must have recourse to the caustic, and this must be repeated until the pain and excitement has subsided, and the wound healed. In this case the prolapsed iris, which is now adherent to the cornea, served as a plug, to prevent the further escape of the aqueous fluid, so that this is again soon secreted, but the pupil ever after is more or less deranged, nay sometimes even entirely closed. Should the prolapsed portion of the iris, which is very considerable, have been neglected in the first instance, staphyloma of the iris may occur, which, from surrounding irritation, may in process of time take on a malignant action. In this case we should cut off the protruded portion with the scissors, and apply the nitrate of silver to the whole surface.

We should, after having spoken of the means employed to relieve the various consequences of corneal ulceration, return

to the consideration of its individual treatment. Should we find, notwithstanding the cupping and blistering, that the pain, intolerance of light, and very irritable condition of the ulcer remain, moreover that the patient should be of an unhealthy habit, his tongue furred, his skin hot, and other symptoms of fever be present, we should attend to his health in an especial manner, while by the application of the nitrate of silver, so as to produce a slough, we may often allay that local irritability, and induce the wound, when the slough is detached, to granulate and heal. When ulceration is dependant upon a loss of tone in the arteries of the part, as is known by the absence of acute pain, and the transparency of its surface, we can generally stop its progress by the employment of local stimulants; at the same time we must attend to the state of the constitution, and we shall generally find it advisable to recommend the adoption of a generous diet, and a certain quantity of wine, which may be assisted by the use of bark and acids, means especially called for if there is any constitutional debility present. As the ulcer heals, we observe its surface to become more opaque, and when the cure is effected shall generally find an opacity remaining.

If a spherical staphyloma occur, as a consequence of the excessive inflammatory action and ulceration, we shall generally find it to obscure vision. If the effusion of lymph has been but partial, so as but little to obscure the pupil, or the change of position but little to derange its form, we may find the application of the belladonna sufficient for every useful purpose; but should the opacity be placed immediately opposite the pupil, or this be deranged in consequence of its adhesion to the cornea, we must have recourse to an operation, so as to admit sufficient of the rays of light to the retina, that the patient may again enjoy partial vision. This, however, is only to be attempted when the eye is perfectly quiet from all irritation, and the other eye is useless. Having properly secured the head, and elevated the upper lid, an opening is to be made into the cornea with a cataract knife; we must push it forwards with care, and separate the adhesion by gently cutting the iris in connexion with the cornea; we may introduce a hook, and draw out a portion of the iris opposite to a transparent part of the cornea, which is now to be cut off with the scissors: should this be impracticable, we may introduce a fine pair of scissors, and cut out a portion of this membrane, taking great care to make no pressure upon the ball, or to touch the capsule of the lens. Having made a sufficient opening, we must close the edges of the incision, apply a compress and bandage, while we besmear the temple and forehead with the extract of belladonna, and take every precaution to prevent the supervention of any considerable inflammatory

action. When the opacity is of greater extent, and but a small portion remaining transparent, here we may detach the iris from the ciliary ligament, which will often form an artificial pupil, that may be of great use to the patient. If after this, or any other variety of artificial pupil, we find the lens, or its capsule, to have participated in the inflammatory action, or from any other cause be opaque, we must adopt the particular means afterwards to be recommended for the removal of cataract. Should the opacity of the cornea be complete, and should a spherical staphyloma have formed, as is generally the case with adhesion of the iris, we shall commonly find the cornea much thinner than in the conical variety. Here it is recommended to apply a pencil of the nitrate of silver, so as to produce an ulcer, which opening into the anterior chamber, may permit the aqueous humour to escape, in consequence of which the ball subsides, and does not produce the same amount of irritation. Having scraped the caustic to a point, we should apply the fine point with a steady hand for about a minute to the surface of the staphyloma, so that it may produce a slough; this is to be repeated every second or third day, until it penetrates through the layers of the cornea. The application of the nitrate of silver excites a degree of inflammatory action, that by degrees, as the aqueous humour escapes, appears to consolidate the contents of the globe, and prevent the re-production of the aqueous humour. In the application of this material, however, we should be cautious that no particles of it be separated, and fall between the lids, for they might produce more extensive sloughing than was intended. To prevent this disagreeable effect, we should, after each application, wash the everted lids with water thrown from a gum elastic syringe. We should likewise be careful to prevent too great an extent of inflammatory action, for when once arrived at a certain extent, especially in the infant, it may be difficult to control.

If sloughing of the cornea should occur, we must in the first instance endeavour to subdue the inflammatory action which has produced it, by means corresponding to the habit of the patient, and when this has been duly attended to we must have recourse to local and general stimulants, so as to excite the vessels of the part to separate the slough, and fill up the breach that has been committed in the corneal texture.

Invariably in these diseases, if we shall endeavour, by means of the formation of an artificial pupil, to restore the patient some degree of vision, we must be cautious that we do not perform a useless and painful operation, without procuring the expected benefit. We should particularly inquire if the patient can distinguish light from darkness: we should mark well that

there are no symptoms of glaucoma, or any positive disease of the nerve, the existence of which would be incompatible with success.

CONICAL CORNEA.

The disease known under this denomination is a transparent projection of the cornea, supposed to depend upon the interstitial absorption and thinning of its centre, produced by an increased secretion, or diminished absorption of aqueous humour, which pushing forward the centre, causes the protuberant formation, at the same time that it lessens its thickness. The true cause of its formation is, I apprehend, however, still hid in considerable obscurity. The transparent projection always causes a very great refraction of the rays of light, so that the vision of the patient is very confused when viewing a distant object; indeed, as the disease increases, this is augmented, so that in time he is unable to distinguish surrounding bodies, and the eyes are rendered useless as an organ of vision. The light is always reflected from the conical surface, so as to produce a peculiarly brilliant appearance, likened to a drop of transparent water, or the surface of a cut gem placed upon the cornea. This disease rarely happens in infancy or old age, but is commonly confined to the middle period of life, and when once arrived at a certain height will generally remain stationary ever after, unless excited by corneal inflammation, when it may sometimes take on all the characters of true conical staphyloma. This disease is sometimes observed in one eye only, but it may often be found to affect both, so as to render the patient entirely blind.

The treatment, as well as the cause of this disease, as I have remarked, is involved in considerable doubt and obscurity. A great variety of remedies have been recommended; such as an issue to the temples, frequent cupping; while some have recommended puncturing the anterior chamber, and the evacuation of the aqueous humour; all which have been tried, without obtaining any obvious benefit. A slight improvement, however, in vision may sometimes be obtained by the application to the diseased eye of a pupillary aperture, set in a black ring or frame of about a quarter of an inch or more in depth: this, when the convexity is not very much increased, serves to direct the rays of light to the central part of the projection, and permits them to impinge upon the retina, after passing through the thinnest part of the cornea, without that marked and unnatural refraction which the more lateral rays experience, and which is the chief reason of the confusion of vision.

MALFORMATIONS OF THE CORNEA.

The cornea, as I have described, is of a certain degree of thickness and convexity in the perfect eye, that it may cause the due refraction and convergence of the rays of light, so that they fall with necessary precision on the retina; but should this be deranged, more or less confusion in the perception of objects is the result.

Should the cornea have too great a degree of convexity, we find that the convergence of the rays of light will occur before they reach the nervous tissue, and again diverging produce considerable confusion. In this variety of these complaints the patient can see objects that are placed very near to the eye, but cannot distinguish the more distant. It occurs principally in young persons, especially those of studious habits, or whose employment requires considerable attention with this organ.

The best means of remedying this defect consists in the adaptation of concave glasses, so as to correct the refraction of the rays of light, and properly adjust them, so that they fall with necessary precision upon the retina. This affection, although by no means unfrequent, very seldom proceeds to an unmanageable extent; and we have the consolation to reflect, that as we descend towards the latter term of our existence, nature very frequently removes the morbid convexity, by a silent and imperceptible process, so that we may be enabled again to see without the aid of glasses.

As a morbid increase of the convexity of the cornea will produce indistinct vision, so will a deficiency cause a derangement, and prevent a due perception of objects. Here the rays of light are not sufficiently refracted, and the necessary convergence does not obtain, so that considerable confusion is the consequence. In this variety of these diseases the patient can see distant objects with more perfection than he is able to discern those which are near to him. This affection generally occurs in old age, and depends upon the gradual decrease of the corneal convexity, which appears to take place about this period of our existence; that, however, it may occur at an earlier age, is proved by the following case. Mr. M-c-y, who was twenty years of age, had experienced considerable confusion in the perception of objects, from his birth. On the morning that I saw him he had rode into Stirling from his house in the country, and had managed to find my house. Upon questioning him, he told me that he could not distinguish near objects, but from the window of the room could see the distant hills, which were between forty and fifty miles off. On looking to a book, he did not observe any particular deficiency in the page, but all was a mass of confusion; the letters appeared to run into each other. I

was particularly struck with the evident flatness of the cornea, which caused the eye to appear large. He had tried a great variety of glasses, and could find none to be of any service whatsoever. He had consulted the first oculists, both of England and France, all of whom gave him different opinions: some recommended cupping and issues, others calomel and tartarized antimony, &c., all of which was employed without any obvious benefit.

In cases of deficient convexity of the cornea, the use of convex glasses are often of much service, and will sometimes enable the patient to see distinctly.

DISEASES OF THE IRIS.

INFLAMMATION.

Inflammation is a frequent disease of this various-coloured membrane, hung as a curtain in the anterior chamber of the eye. From being perfectly visible through the transparent cornea, the different changes and various stages of its diseases may be marked with an accuracy that few other internal parts of the body will admit of. This disease may arise spontaneously, or spread to the iris from some other texture; in both cases the symptoms of iritis are the same, and its effects, if it proceed to similar extent, exactly correspond. In the latter variety, however, it should be recollected, that these may sometimes be obscured by the preceding disease. The first symptom of iritis is marked by a change of colour, which takes place in the membrane; it is dependant upon the greater flow of blood to the part than is usual, so that if the iris happen to be of a blue colour, this additional quantity of the red particles makes it assume a greenish tint; but if it occur in a dark coloured membrane, brown for example, the immediate change is not so distinctly marked. Here, however, it puts on a redder hue, and may generally be detected by an experienced eye. We must, however, be aware that there is sometimes a natural difference of colour between the two irides of the same person, and even between different parts of the same iris. In a grey or light blue iris, you will sometimes see one-third or one-fourth of a light brown colour, which if not known may sometimes lead to considerable mistake. The brilliancy of colour fades, the pupil becomes contracted, perhaps at first dependant upon the greater irritability which the iris now appears to possess; afterwards this, however, may become fixed and permanent from another

cause, interstitial deposition within its cellular texture. We now also find great intolerance of light, and sometimes a profuse lachrymation. The iris would now appear to swell; its margin becomes puckered, or slightly irregular; it loses its acuteness, while the pupillary extremity appears turned backwards into the posterior chamber of the aqueous humour; and if we now examine it with a microscope, we may observe a number of flocculi of coagulable lymph, forming a fringed or serrated margin around the contracted pupil. The sclerotic coat may now be observed to assume the pink or rose colour, marking a participation in this disease, and clearly evincing, that a larger quantity than usual of red blood, is sent to these parts. If we are minute in our examination, we shall frequently find that these pink-coloured vessels do not extend universally, but usually appear to stop short at the margin of the cornea, passing through the sclerotic to go to the iris at the point of the direct, and not the apparent termination or union of the cornea; so that, as a consequence of this circumstance, a white circle is left around the margin of the cornea, particularly marked by this difference of colour. We sometimes now find that very considerable pain is experienced; this is first felt in the eyeball itself; it gives a sensation of distension, much increased upon motion, while an acute and lancinating pain is particularly marked as attacking the temples and forehead: this generally comes on by paroxysms, most commonly in the evening, increasing until midnight, then gradually diminishing until about three or four o'clock, when it comparatively subsides. When this disease runs to any very great height, we generally find it attended with considerable symptomatic fever, a quick full pulse, a foul tongue, and great heat of skin. As the disease proceeds, we find the eye has a muddy appearance, or the anterior chamber becomes somewhat obscured, while the patient complains of a cloud-like appearance before the eye. This in some instances is dependant upon the posterior membrane of the cornea being implicated in this disease, and stands as a proof, of considerable weight, of the existence of the membrane of the aqueous humour; sometimes also it may be caused by an effusion of very fine particles of lymph floating in the anterior chamber; of the two, the first is the most general, but they may sometimes both occur at the same period. Lymph is now often thrown out in a considerable quantity, first into the cellular texture of the iris, and then into the posterior chamber of the aqueous humour, between the pupil, which is now closed, and the capsule of the lens. This lymph is sometimes poured out in very great quantity, so as entirely to fill the least remains of the pupillary aperture, and to push the iris forwards towards the cornea. Sometimes, when the disease

has proceeded to this extent, we may observe minute vessels shooting into the lymph, this becoming organized, will firmly close the pupil, and permanently fix it to the capsule of the lens, so as ever after to prevent the due motions of the iris, depriving it of this very necessary function, while it entirely excludes every ray of light, and renders this important organ useless. Even in some instances the disease may go on to the formation of pus, which will be observed in the anterior chamber: if small in quantity, it sinks to the bottom, when the eye remains at rest, and forms an appearance known by the name of *unguis*, or *onyx*, from its resemblance to the finger nail. This is of a bright orange colour, and may gradually so increase as entirely to fill the anterior chamber; but when arrived at this extent, all the other tissues of the globe soon become more or less affected. Sometimes, long before the disease has proceeded thus far, even before the pupil is entirely closed, we may observe a minute orange-coloured spot to arise upon the surface of the iris; this gradually enlarges until it assumes the size of a small pea; it now contains a small quantity of yellowish matter, which finally bursting, its contents fall to the bottom of the anterior chamber; more than one sometimes appears at the same time, when they will often take an oblong figure, and may frequently be observed to hang down before they burst, proving that they are contained within a cyst or bag. I have sometimes imagined them to bear a resemblance to the cutaneous pustule, while I have thought that they were a consequence of syphilitic iritis, never having recollected to have seen them in the other varieties of this disease. Indeed they are generally accompanied by the papular eruption of the skin, which frequently follows the patchy excoriation of the genital. The quantity of pus effused from these formations is sometimes so extensive, as entirely to fill the anterior chamber; indeed the disease may speedily extend to, and quickly implicate every part of the eye, while it produces permanent disorganization of every tissue.

There are several varieties of iritis mentioned by authors, such as the idiopathic, syphilitic, the mercurial, the rheumatic, and the gouty. The idiopathic is the most simple variety; it may arise spontaneously, or be consequent upon a wound; it is marked by change of colour in the iris, and speedy closure of the pupil: there is, however, but little pain, never bearing any proportion to that which occurs in the rheumatic varieties, unless the sclerotic coat has become implicated in the disease. The syphilitic variety also commences in the iris; here the intense pain is at first generally wanting, indeed in some instances I have observed that the disease has arisen to a very considerable height, even to the formation of the pustule, before the patient

has sought advice. The mercurial, the rheumatic, and the gouty, I conceive, are but varieties of the same disease, only differing as to the immediate exciting cause. These, I think, I have observed, always have their primary seat in the sclerotic coat, spreading from that texture to the iris; they are always marked by a very great and lancinating pain, present from the very commencement of the complaint: here we often find that the patient comes to us sometimes even before the iris is implicated in the disease. We should always look to the exciting cause of the disease, for in the rheumatic and gouty varieties we shall often find it to alternate with or follow the affection of the joints. I am, moreover, borne out in my conclusion by Dr. Schmidt, of Vienna, who, in speaking of gouty iritis, distinctly declares that it commences and is always attended with excruciating pain. If we are minute in our examinations of each case, we shall generally, in idiopathic or syphilitic iritis, observe the white margin, or circle around the edge of the cornea; while in the other varieties it cannot be seen; a circumstance which tends to prove that the iris is but secondarily affected in the latter, while in the former it is the tissue primarily diseased.

The treatment, in the commencement of iritic inflammation, must be proportioned to the activity of the disease, and bear a reference to the speedy mischief it will very soon occasion, unless very active remedies are had recourse to. In every kind of this disease, especially where there is much pain, a closed pupil, a discoloured iris, or much attendant fever, and the patient a strong plethoric man, we must bleed to syncope, smartly purge him with calomel and salts, and enjoin a very spare diet. The bleeding will generally relieve the pain, or lower the force of the inflammatory action; but should this again return with the same violence, we may repeat the bleeding, take twelve or fourteen ounces of blood, by cupping, from the temple, which must also be repeated according to the state of the case. If the patient happens to be a thin emaciated creature, and the disease be of some days' standing, perhaps cupping will be the greatest extent to which we can venture. This, however, must be repeated, according to the condition of the patient and the circumstances of the case, always bearing in mind, that what might be considered an excessive bleeding in one case, it would be trifling with this complaint to depend upon in another. It has been recommended to open the temporal artery, or to bleed from the jugular vein; I must confess, however, I cannot perceive any advantage that they possess over general bleeding from the arm. Indeed, I think, in such cases, I have observed the increased impetus given to the local circulation has more than counterbalanced any advantage derived from the abstraction of

the blood in the neighbourhood of the diseased part. There is not, perhaps, the same objection to opening the jugular vein; but if we consider that most of the blood that comes from the eye is returned into the internal jugular vein, we can very easily comprehend that the inflammatory action can be but very partially benefited by the locality of the abstraction. Every variety, then, of iritis, must be commenced by blood-letting, giving due consideration to the kind and activity of the complaint; and these must more particularly be attended to in the choice of other remedies; for what would be of inestimable service in some kinds, must obviously be very deleterious in the other varieties. In the idiopathic and syphilitic varieties, we should endeavour, as quickly as possible, to put the patient under the full and effectual influence of mercury: if the symptoms are very acute, attended with considerable pain, we should give a pill composed of two or three grains of calomel every four or five hours, varied, according to the age of the patient, and his known susceptibility to be affected by the mineral. In cases where the pain is excessive, or the mercury acts too much upon the bowels, we should add the fourth of a grain of opium to each pill. At the same time we should employ friction, with mercurial ointment, every night: a drachm should be rubbed into the temple going to bed. These remedies should be persevered in, until the system has been fully put under the effect of the medicine; for as soon as this takes place, we shall perceive a very marked and speedy change to occur in the complaint. The pain soon subsides; the effusion of coagulable lymph is suspended; and that which is poured out will be quickly absorbed; and if we gently keep up the effect by the exhibition of very moderate doses, we shall generally, if the case has been properly discriminated, have the pleasure of finding the disease speedily subside, leaving few or no evil consequences behind it. At the same time, however, that we advise the exhibition of mercury, we should be aware that in some constitutions it acts as a virulent poison; and when we perceive that this peculiar idiosyncrasy is present in the system, we must immediately discontinue its use, and have recourse to the other means which will be recommended in the different kinds of iritic inflammation. We shall also sometimes find that the consequences and sequel of the exhibition of this medicine, such as the sore mouth and great constitutional debility, are brought as arguments against its employment; but those who have made a full and candid trial of the remedy, will soon find that its advantages fully outweigh its bad effects. If the mercury should produce much constitutional debility, or otherwise derange the general health, we should have recourse to tonics, change of air, and the other remedies applicable to this condition.

Among the varieties of iritis, there is one which has been said to supervene upon the use of mercury, and therefore called mercurial. I do not remember to have seen it, and suspect that it is sclerotic inflammation, which has spread to this texture. If it occurs when the system is saturated with mercury, the continued use of the mineral must obviously be detrimental. Here, then, bleeding and the general antiphlogistic treatment should be persevered in; but should the disease increase in spite of these means, we must have recourse to the remedies employed in rheumatic and gouty iritis. In the gouty and rheumatic varieties, the use of mercury is seldom attended with such obvious benefit as in the two first-mentioned kinds of the disease. In some cases I have seen it, although pushed to its fullest extent, have no corresponding influence over the disease. Calomel, antimony, and opium, should always, nevertheless, be employed in the commencement of the disease, after having been preceded by blood-letting; for we shall generally find it arrest its progress; where it fails, we must have recourse to the extract of colchicum, or wine of the seeds: one grain of the former, or thirty drops of the latter, should be taken every three or four hours, until considerable nausea, and a sensation of debility are produced. Indeed, from the very commencement of gouty or rheumatic iritis, especially where disease of the eye alternates with the affection of the joints, it may be employed with advantage, and its use must be pushed to a considerable extent, so as to make the whole constitution feel its influence, when we shall often find the patient loudly complaining of the excessive debility which the medicine occasions; but if we now look at the eye, we shall generally find it greatly improved, the pain will nearly have ceased, the effusion of lymph be arrested; and, if we gently keep the patient under its influence, we shall generally find that the disease will speedily disappear; and then we should attend to his general health, and, by proper means, remove the debility consequent upon the use of the medicine.

We should be particular to observe, that in every variety of iritis, as soon as we have made an impression on the activity of the symptoms, by the means above-mentioned, we must have recourse to the extract of belladonna, so as to dilate the pupil. This should be smeared upon the brow and temple of the affected side: it always produces the wished-for benefit, without acting as a stimulus so as to increase the inflammatory action, as it is apt to do if the solution be dropped into the eye. The manner in which this narcotic produces its effect, has been differently explained by various pathologists; it has been said to act particularly upon the radiated muscular fibres of the iris, and there to possess some specific influence over this part of the apparatus. I think that this must be a mistake, and I apprehend that it acts

upon the nerves, to the extremities of which it is applied, causing a partial paralysis, which being communicated to the principal trunks, subsequently implicates the portions which go to form the minute ciliary branches that supply this membrane. That the dilatation caused by this medicine is a paralytic affection, is confirmed by our sometimes finding, that after its continued use, the iris may become motionless, while it hangs flaccid in the anterior chamber, proving distinctly that it is free from adhesions.

CHRONIC INFLAMMATION.

This is a variety of iritic inflammation, which is very slow in its progress, generally occurring in weak or debilitated habits. Among the first symptoms to be observed is a slight irregularity of the pupillary margin of the iris, which by degrees loses its colour; and now we often find that it has formed many adhesions with the capsule of the lens, which at first are but very small points of connexion, but gradually increasing, sooner or later, involve the greater portion of the pupil. As soon as the iris adheres to the capsule of the lens, an effusion of lymph may be observed to form the bond of connexion, and in process of time a similar action would appear to spread to the capsule; this gradually becomes opaque; and now should the belladonna have been applied, we shall often observe portions of the pigment adhering to the capsule of the lens. Previous to the application of this medicine the pupil is much more contracted than natural, but it is never entirely closed; sometimes the anterior chamber is rather cloudy, and the membrane of the aqueous humour may become affected. Now the patient often experiences a partial loss of vision, which always becomes more confirmed as the opacity of the capsule of the lens increases: in this disease, however, he seldom experiences any pain, save sometimes a slight uneasiness in the eyeball, to which he seldom pays any attention; indeed, the loss of vision is generally the cause that excites him to seek medical assistance. Should this disease now continue to increase, we shall generally find that by degrees it implicates the neighbouring textures with a similar complaint, and in the end may terminate in total blindness and confirmed glaucoma.

In this case general bleeding will seldom have so marked an effect as in the preceding disease (acute inflammation), topical blood-letting, however, will sometimes be admissible; but I think that I have observed the greatest benefit to be derived from the gentle influence of mercury: it seems to change the general habit of the patient's constitution, and give a spur to the activity of his system. With these means we may combine the decoction of sarsaparilla, moderate but generous diet, good air,

and plenty of exercise, which should be employed as soon as the effect of the mineral are obvious upon the system ; here also the application of the belladonna is required, to dilate the pupil ; should capsular cataract, or glaucoma, have already taken place, the different indications recommended in those diseases must be had recourse to.

CLOSED PUPIL.

One of the most frequent consequences of iritis is a closed or permanently contracted pupil : this is caused by the coagulable lymph that is thrown out becoming organized ; it takes place in almost every instance, when the disease has proceeded to any great extent, and especially when the complaint has been neglected in the commencement. In some instances, we may observe only a slight adhesion to the capsule of the lens ; for the pupil dilating as the inflammatory action subsides, leaves a minute point connected to it. This causes a slight irregularity of the pupillary margin ; in some instances, when the belladonna has been had recourse to, in the latter stage of the disease, the iris, quickly contracting under its influence, has ruptured the point of connexion, and left a portion of the black pigment, or uvea, adhering to the capsule of the lens. Several cases of this kind, which I have witnessed, so considerable a portion of this matter adhered to the surface of the capsule, as entirely to prevent vision, even after the iris had assumed its proper situation, and still enjoyed its several functions : in these cases the pupil still appearing black, an indifferent or careless examiner might be deceived, and mistake a curable disease for an apparently confirmed and incurable amaurotic affection. In some instances the iris not only adheres to the capsule of the lens, but the interstitial deposition within its own texture becomes organized, and so prevents the proper action of its muscular apparatus. This is commonly the case when the pupil remains permanently contracted. In some instances this may be but partial, and the contraction happen to the extent, that vision is only impaired, while the rays of light are not wholly prevented from entering the eye. In most instances, however, of iritis, its closure is complete, and in these the lens and its capsule being implicated in the same affection, and becoming opaque, may tend to increase the defect of vision, and even wholly to prevent the admission of any of the rays of light ; for although they may pass the pupil, they may be obstructed by the opacity behind it. We should also be aware that the choroid coat, and even the retina itself, as well as the transparent media, may have been combined in the diseased action, and the consequent change of the tissues cause permanent and irreparable blindness.

Iritis, and its consequence, a closed pupil, I have explained, may be produced by disease, or caused by the local injury of the iris itself; among the latter the operation for cataract was one of the most prominent of its causes; and before the advantages of the belladonna in dilating the pupil were understood, it was a very frequent result of the operation.

When, then, this complaint has occurred, either from accident or disease, and the patient is blind of both eyes, we may, by making an opening in the iris, or by forming that which is termed an artificial pupil, often again restore him to sight, and enable him with but comparatively trivial defect, to enjoy the beauty of surrounding scenery, when, perhaps, after many years of darkness, he had despaired of ever again participating in the numerous and exquisite pleasures which the use of this small but admirable little organ can convey; for the history of the origin and progress of this operation I shall beg to refer the reader to the elaborate treatise of my talented preceptor, Mr. Guthrie; indeed, it should be carefully perused by all who hope to make themselves perfectly acquainted with the varieties of it that have been recommended, performed, then laid aside for some imaginary defect, afterwards again adopted and improved. We must be careful, however, previous to performing any operation, to attend to the exciting cause of the defect; mark whether it proceed from disease, or was produced by some local injury. If it is the effect of disease, we must endeavour to discover if the retina has been implicated, or if it still possesses such a degree of sensibility as to afford a rational hope of success: if the patient can distinguish light from darkness, and the anterior chamber of the aqueous humour be healthy, of its proper dimensions, and the eye otherwise appear free from disease, we have every chance in our favour: even, however, should he be unable to discriminate light from dark, we must not hastily condemn the attempt, for an opacity of the lens or its capsule may assist to form the impediment. If, however, with total blindness, he has been long subject to red flashes or sparks in the eye, attended with much pain, we shall generally find the operation useless; but even here did the eye appear otherwise quite healthy, I think we should give him a chance, after having properly explained the probable result; but should the veins of the choroid coat be in a varicose condition, the vitreous humour disorganised, or the eye affected with glaucoma, we must not attempt it, for these equally contra-indicate its utility, and give us reason to think that it would do more harm than good, by exciting an unhealthy action in these parts. Should the closed pupil be a sequel of the extraction of the cataract, it will commonly be successful, provided no disease has supervened. This, indeed,

is the most favourable case for the operation; for the lens being removed, will obviate the occurrence of that irritation, which its subsequent absorption might produce; but should it follow reclin-
ation, we must be alive to the probability of its failure.

Previous to the day of operation we must attend to the health and constitution of our patient; if he be of an inflammatory habit, we should lower the activity of the circulation, or if he be in a low and irritable state, we must endeavour to improve his condition, by remedies adapted to his particular symptoms. When, then, the symptoms of the case permit us to attempt the operation, it is to be performed in the following manner. The patient being seated in a chair, and desired to direct the eye towards the nose, where it should be fixed with gentle pressure, by an assistant, who must also elevate the upper-lid. An iris scalpel, with its edge turned directly backwards, is then to be introduced about a line and a half, or two lines posterior to the junction of the cornea, with the sclerotic coat; we should be careful to mark the distance in our dissections; for if we pass it much anterior to this point, we may strike upon the ciliary ligament, and so detach the iris from its natural connection: then passing it in its transverse diameter, the point must be pushed through the iris into the anterior chamber, at about a third of its width from the ciliary margin, the scalpel is then to be passed onwards, taking care not to touch the posterior surface of the cornea. The iris is then to be cut by a sawing motion, until we have divided its central third; this is accomplished with various degrees of facility, in some instances flying apart upon the slightest touch, at others requiring repeated attempts to accomplish it, while its union with the capsule of the lens may be so firm, that it will separate at the ciliary ligament, rather than give way in the centre; if this accident should occur, we instantly desist, and change the kind of operation. When we have made the necessary cut in the iris, we are gently to separate its edges with the knife, so as to enlarge the opening; and now, should the lens have previously been removed, the instrument is to be withdrawn; but should that body remain in its natural condition, or only its capsule, we must cut them into many pieces, and separate them from their connexions, that they may be taken up by the absorbents, and so removed from the axis of vision; this, however, is seldom accomplished in the first attempt; but should any portion of the capsule remain attached to the canal of Petit, or have formed a union with the posterior surface of the iris, it may be removed by the needle at a subsequent period. If we find the lens is hard, and not likely to be soon absorbed, we must endeavour to push it through the cut in the iris, which under these circumstances should be made rather larger than is generally recommended, so

as to facilitate the attempt to pass it into the anterior chamber; when we get it there we must make an opening in the cornea of sufficient size to extract it; but should it fall back into the vitrious humour, it may be a source of irritation to the retina, and perhaps cause amaurosis, while it may move about in the eye, raising or sinking, according to the position of the head. In this case, I think, it would be advisable to make a small opening in the cornea, introduce a fine pair of forceps, or a hook, into the anterior chamber, pass it through the opening in the iris, seize the lens, and bring it into the anterior chamber, then having waited for a time we should enlarge the wound in the cornea with the scissors, and quickly draw it out; this will require the greatest care, for possibly the vitrious humour may already be in a disorganized condition, so as to be forced out with the slightest pressure. If in the early stage of the operation we happen to separate the iris from the ciliary ligament, we had better make an opening in the cornea with a cataract knife, then introduce a pair of lancet-edged scissors, and cut out a portion of the iris so separated, while at a subsequent period we endeavour to remove the cataract by the means which its kind or consistency may indicate. Directly after the performance of any of these operations, we must apply the extract of belladonna to the temple, so as to keep the pupil dilated to its fullest extent; for this is a circumstance of considerable importance, on which the successful termination of our attempts will often mainly depend; we should likewise, by way of prevention, abstract a certain quantity of blood, according to the condition of the patient; while at the same time we watch the accession of inflammatory action; and, when sufficiently obvious, have recourse to the means recommended in the treatment of iritis.

PROLASSUS IRIDIS.

I should here, perhaps, speak of protrusion of the iris through the cornea: it is of frequent occurrence, and very important in its consequences; for the iris, floating naturally in the aqueous humour, supported by pressure on all sides, should any opening occur in the cornea, the aqueous humour is poured out, and the iris is forced against the breach, and through the opening, causing a sort of hernia. The extent of the protrusion must, of course, vary according to the nature of the exciting cause, and the extent of the opening: it may be small, not larger than a pin's head, while it may embrace nearly the whole surface of the iris.

Protrusion of the iris may be caused by a wound of the cornea, or, as I have previously explained, be a consequence of corneal disease. If the protruded portion of the iris be small, and the opening in the cornea not very extensive, the aqueous humour

immediately escapes, and a dirty brownish tumour presents itself; this being rubbed by the lids, the friction causes very considerable pain, intolerance of light, and sometimes general inflammation of the eye. Should the inflammatory action be moderate, adhesion of the sides of the membrane to the cornea takes place, the aqueous humour is again secreted, the irritability of the tumour subsides, and it becomes somewhat diminished in size; still, however, the iris remains adherent to the cornea, leaving a black or bluish mark, surrounded by a white margin. The pupil is always more or less deranged, while blindness is sometimes the result. If the portion of the iris included in the opening be near the margin of the pupil, very great impairment of the organ may occur; while, if it be near to the ciliary margin, it is not so likely to cause blindness. The whole of the iris may be protruded, in consequence of an injury, or sloughing of the cornea, when we find an irregular protruded mass in front of the eye, which bearing some resemblance to a bunch of grapes, has been called *staphyloma racemosum*.

The treatment of protrusion of the iris must in some degree depend upon the nature of its cause; if the effect of accident, the protruded portion of the iris considerable, and the wound small, we may sometimes, by very careful means, be able to return a portion of the iris, and hereby lessen the derangement of the pupil; but we cannot expect to return the whole, indeed, it is in general absolutely necessary the iris should adhere to the cornea, and fill up the breach, so that the aqueous humour be again quickly secreted; for unless this should occur, the anterior chamber would be very much lessened in its dimensions.

If the portion protruded be small, we may touch the point with a pencil of the argenti nitratum, so as to form an eschar, which generally gives great relief to the pain and attendant irritation, and must be repeated as the slough falls off; for the symptoms generally, in some degree return, when this occurs.

When the portion is larger, we must be careful that the inflammatory action consequent upon the injury be not more extensive than is necessary for union by the first intention, but if it should, we must freely bleed, and use all those remedies recommended in inflammation of the iris. Should blindness be the result of the accident, we must adopt those operations and means fully specified in the treatment of the consequence of corneal disease.

PARALYSIS OF THE IRIS.

In this disease the iris loses its sensibility to the rays of light, and, ceasing to perform its natural and necessary motions, is no longer a guard upon the retina; we here find the pupil permanently dilated, so that a superabundance of the rays of

light falling upon that sensible apparatus, the retina, cause considerable irritation, and produce a sympathetic flow of tears: the glare of the sun at noon-day first excites considerable pain, but this by degrees diminishes, as the nerve becomes accustomed to the stimulus: the enlarged pupil likewise produces great confusion of vision, and the patient cannot distinguish near objects; in many cases these unpleasant results will be obviated by adjusting a small hole in a black card, about the size of the natural pupil, to the diseased eye, this permitting but a proper proportion of the luminous rays to strike upon the retina, the patient can again distinguish objects without confusion; a circumstance that affords a proof, if any was wanting, of the cause and nature of the disease. This complaint may be a symptom of disease of the brain, such as apoplexy, epilepsy, or hydrocephalus, when we generally have the optic nerve comprehended in the disease, producing blindness; or it may proceed from some affection of the nerves in their course, which may be produced by blows upon the forehead, &c.: these produce such a degree of concussion, as to lacerate, or otherwise injure some of its nerves, or sometimes it may be an effect of effusion, or a slight degree of orbital inflammation, immediately around some of the delicate branches that take their course to the iris; so in like manner it may be attendant upon sclerotic and choroid inflammation.

The opinion of M. Demours upon this subject is so clear, and in such perfect correspondence with my own ideas, that I cannot refrain adding the weight of his authority to what I have already advanced. Speaking of the dilatation of the pupil, he says, "*La cause de l'élargissement ne se trouvant ni dans les humeurs, ni dans la retine, ou le nerf optique, doit donc considérer dans l'iris même, ou dans les parties destinées à lui communiquer la sensibilité d'où resultent ses mouvemens: c'est là ce qui caractérise particulièrement la dilatation idiopathique de la pupille, et ce que la distingue de celle qui n'est que symptomatique.*"

"Il result d'un examen attentif des differens cas des mydriase, que cette maladie est toujours due à une lesion des nerf ciliaires, soit que la cause de cette lesion se trouve au point où ils s'épanouissent dans le tissu de l'iris, comme lorsque la mydriase est la suite d'une contusion; soit qu'elle se trouve sur leur trajet entre la sclerotique et la choroïde ou dans l'épaisseur même de la première de ces deux membranes, qu'ils parcourent sur une longueur de deux ou trois lignes, au nombre de six ou sept, auprès du nerf optique, en quittant le ganglion ophthalmique qui les fournit. La lesion peut encore avoir lieu dans ce ganglion même, ou dans le trajet des nerf dont il est composé.

“ On est d'abord surpris que les sujets attaqués de cette maladie ne voient les objets que d'une manière confuse, puisque la retine et le nerf optique sont en état de transmettre au cerveau les ébranlemens que la lumière leur fait éprouver. L'étonnement cesse quand on réfléchit qu'il doit arriver aux yeux de ceux qui sont attaqués ce que arrive à tous les yeux sains lorsque d'un lieu très obscur, où la pupille se trouve très-dilatée, on les expose subitement à une lumière trop vive. Dans le premier instant, les yeux sont éblouis et ne peuvent distinguer aucun objet, ils n'aperçoivent d'abord qu'une grande clarté dont ils sont frappés d'une manière incommode, et à laquelle succede quelque fois l'apparition des principales couleurs, telles que le rouge, le jaune, et le blue, que paraissent ordinairement l'une après l'autre, selon que les ébranlemens imprimés par la lumière aux fibres de la retine perdent de leur force, cet état d'éblouissement dure jusqu'à ce que l'organe se trouve dans la situation convenable pour supporter aisément l'impression d'une lumière vive, et une des conditions essentielles est que la pupille se rétrécisse au point de n'en laisser passer qu'une quantité proportionnée au degré de sensibilité de la retine. Cela est si vrai que, jusqu'à ce que le rétrécissement ait lieu, ou est obligé de fermer les yeux.”

In another place he states, “ Les signes diagnostique de cette maladie sont les suivans ; la pupille est dilatée et reste dans cet état, à quelque degré de lumière qu'on expose l'œil, elle paraît noire comme dans l'état naturel, preuve toujours certaine de la transparence des humeurs ; l'iris est entièrement immobile. En examinant l'œil avec attention, et sous differens points de vue, on aperçoit quelquefois dans la pupille un léger brouillard ou nuage ; mais ce nuage est plus uniforme, plus étendu et plus profond que celui qu'on remarque au cristallin quand il commence à se cataracter. Il disparaît même ou change de situation, selon les differens mouvemens que l'observateur fait faire à l'œil du malade, ce que prouve que ce brouillard apparent dépend uniquement de quelques rayons lumineux réfléchis de l'intérieur de l'œil qui s'échappent au travers de la pupille à raison de sa trop grande dilatation. Quand on fait regarder les malades par un petit trou percé, par exemple, dans une carte à jouer non-seulement ils supportent plus facilement la lumière, mais ils distinguent mieux les objets.”

In the treatment of this complaint, if it be the effect of cerebral disease, we must follow the means prescribed for the cure of that complaint, and we shall generally find that the paralytic affection keeps pace with it, should it increase or diminish. Should it proceed from a blow upon the forehead, we must cup the patient upon the temples, and administer some active purga-

tives; these means should be repeated according to the extent of the disease, or amount of pain which may be felt on the orbit, and should we suspect that it proceeded from effusion of blood, gentle doses of mercury may tend to excite absorption, which may produce a cure; but, at the same time, we should be aware that these means may fail, from the change produced in the theca of the nerve, nay, sometimes even from the direct division of some of the fibres. Should the disease become permanent, we may, by the adaptation of the hole in a black card, remedy the attendant inconvenience, by admitting but a necessary proportion of the rays of light to the retina. This card may be fixed in a ring, and constantly worn before the affected eye.

I have seen a case of partial paralysis of the iris, in which the pupil was permanently dilated on one side, which remained motionless, while the opposite still appeared to possess its natural sensibility; here, I conceive, that the ciliary nerve or nerves running to this portion of the iris, was implicated or affected by some disease.

DISEASES OF THE CHOROID COAT AND CILIARY PROCESSES.

INFLAMMATION.

Inflammation may occur in the choroid coat and ciliary processes: when the disease begins in the choroid, among its first symptoms is an intolerance of light, that proceeds from the retina partially participating in the disease; this soon becomes excessive, and is attended with a profuse lachrymal discharge, sympathetic of the irritation. Pain is now felt deep within the orbit, and as the disease advances, this becomes a very prominent symptom; it soon extends to the forehead and back of the head, being not unfrequently at first mistaken for rheumatic inflammation of the sclerotic coat. As the disease advances the patient becomes more or less blind, the pupil loses its bright shining lustre, and if inspected in the onset of the disease, there will sometimes appear a slight opacity or cloudiness deep in the vitreous humour, in all probability produced by an increased flow of red blood to these parts, which also slightly changes the colour of the choroid coat; by degrees the whole eye assumes a muddy appearance. The iris now becomes affected, its colour changes, lymph is effused upon its surface, but the pupil never becomes contracted, as when the disease commences in this membrane. This, I apprehend, is caused by the ciliary nerves, which run

between the choroid and sclerotic coats experiencing such a degree of compression, as to paralyze the motions of the iris before the inflammatory affection spreads to that membrane; while, I think, it is never produced by the increased secretion of the aqueous humour, as some have been led to imagine. When the disease has arrived at this extent, the sclerotic coat has assumed the pink colour, with the pain evincing its participation in the complaint. The disease may now subside, leaving a certain degree of blindness; or should it continue to increase, the cornea may become prominent, and the eyeball so greatly distended, as to appear protruded from the orbit, giving to the globe a feeling of stony hardness. Now the ciliary processes would appear to be implicated in the complaint, the distension and protrusion of the ball being supposed to be produced by the increased secretion of aqueous humour, which is then said to take place. I consider, however, that it is principally caused by a general congestion of the internal tunics. Soon after the sclerotic vessels have become enlarged, the disease would seem to spread to and implicate the cornea; it is rendered dull: this change, together with those of the iris and pupil, greatly impair the natural brilliancy and expression of the eye. Should the disease subside, it will generally leave the iris changed in colour, fixed, and dilated; the pupil of a greenish colour, with loss of vision, amounting to total blindness. If the affection proceed, the lens becomes implicated, losing its transparency, while it assumes a yellowish green, or dirty white colour: while I have seen the posterior parts of the eye become so considerable, that they have pushed the opaque lens through the pupil, even to touch the cornea; indeed, the inflammatory action speedily spreads to every texture of the globe, sometimes even going on to suppuration, and so causing a complete destruction of the organ. When the disease commences in the ciliary processes, the redness of the sclerotic coat, and the distension of the ball, are among the earliest and most marked of the symptoms.

In the treatment of this disease, we must speedily adopt the means recommended in the cure of iritis; we should employ general and local bleeding largely and repeatedly, according to the extent of the symptoms, and the degree of intolerance of light. We must have recourse to the exhibition of mercury, so as quickly to affect the system, while, at the same time, we enjoin abstinence and quiet, and so endeavour to cut short as speedily as possible the inflammatory action. When the cornea has become prominent, and the eyeball tense and full, we may, perhaps, by evacuating the aqueous humour, afford temporary relief to the pain, and give the disease an opportunity to subside. The cornea is to be punctured with a cataract needle near to its circum-

ference, taking particular care not to wound the iris, or touch the capsule of the lens; and now the aqueous humour being permitted to escape, the wound soon heals, and this is again quickly regenerated. This operation, however, will seldom be of much benefit, unless combined with the means above recommended, on which our reliance for the cure should mainly depend.

CIRSOPHTHALMIA.

Cirsophthalmia is the name applied to the varicose condition of the veins of the choroid coat. This is a disease slow in its progress, seldom attended with much pain, but speedily, after its commencement, affecting vision, and as it proceeds finally induces complete blindness: this, indeed, from the proximity to the retina, of the numerous *vene vorticosæ*, we should naturally be led to expect. Soon after the commencement of the disease, the sclerotic coat generally exhibits a bluish tint: it becomes thinner as the complaint advances, so that the colour of the enlarged veins shine through it: now it is sometimes attended with a sense of distension, the iris at first slow in its actions, quickly becomes immoveably fixed. About the same period the patient becomes perfectly blind, and if seen at this stage is said to have one of the forms of amaurosis. If we now examine the pupil, we shall generally find it muddy; this is perhaps caused by a similar disease affecting the vessels of the vitreous humour or absorption of the black pigment. If the disease continues to increase, the sclerotic coat becomes very attenuated, so that the distended veins are seen bulging out, covered but by a very thin layer of its fibres: these forming large and knotty protuberances that cause deformity, and even sometimes becoming so large as to obscure the cornea, and prevent the closing of the lids, so that the part is exposed to surrounding irritation: a chronic state of inflammation is the consequence, which being kept up, adds greatly to the misery of the patient: this may even go on to the ulceration of some of these protrusions that afterwards may assume a malignant character, marked by an acute lancinating pain which now presents itself, and by the frequent hæmorrhage that occurs.

I apprehend that this disease may be a consequence of choroid inflammation, but that it is much more frequently produced by inflammation of the sclerotic coat, which has induced a thickening or some other change in the structure through which these veins pass; this causes a degree of compression, so as to retard the course of the circulating fluid: it may also arise from the pressure of tumours within the orbit.

We can seldom expect to afford much permanent relief in this disease, and therefore must limit ourselves to the keeping of it

in a quiet condition ; so that if we cannot even prevent its increase, we may endeavour to remedy the irritation attendant upon it. This may sometimes be accomplished by topical bleeding and gentle stimulants, alternated according to the attendant symptoms. In the latter stages, where it protrudes so as to prevent the due closure of the lids, it has been recommended to remove a considerable portion of it with the knife, in the same manner as the operation for staphyloma is performed ; this, however, must be attempted but with due caution, for the bleeding that follows is often very troublesome ; indeed, I consider it preferable to remove the whole of the eyeball, as must necessarily be had recourse to, should the disease take on a malignant action.

DISEASES OF THE RETINA.

INFLAMMATION.

Inflammation of this very delicate membrane sometimes occurs, and, as we could easily anticipate from its structure and sensibility, is particularly marked by an intensity of symptom very speedily running on to the complete disorganization of the sensitive apparatus. As in other parts of the system, the first symptom of disease in the nervous tissue, is an increase of sensibility, that rapidly amounts to great intolerance of light ; this, however, is seldom distinctly marked, and is generally so transient, that if observed, would, in all probability, be quickly forgotten, for the disease very soon produces an acute, vehement, and intolerably distracting pain, which dashes through the whole eyeball ; this is so excessive that it absorbs every other feeling and sensation, and the patient, were it to continue any length of time, would scarcely be able to support it. In the course of a very few hours this gradually subsides, leaving a slight muddiness or opacity deep in the vitreous humour, in all probability caused by the effusion of coagulable lymph within this previously transparent tissue. The inflammatory action thus speedily going on to the effusion of lymph, which, with the enlarged and distended vessels, produce a pressure upon the nervous matter that obscures and deadens the sensibility of the retina, so that it no longer carries that intensity of sensation to the brain ; however, as the great pain subsides, the patient becomes totally and often irrecoverably blind ; although the pain is very materially diminished, he still experiences some in the head, especially in the forehead and temple ; he has giddiness, and very considerable symptomatic fever, while now the extremity of the nerve

conveys to the brain the idea of vivid sparks, or flashes of light. If we now examine the iris, we shall generally find the pupil largely dilated, and commonly immoveably fixed, especially if the disease has in the least implicated the choroid coat. The disease may now subside, leaving one of the varieties of amaurosis; but if the symptoms have been rather less severe than I have here described them most frequently to occur, it is possible the effusion may be absorbed, the vessels regain their natural condition, and, by the application of proper and effectual remedies, more or less sensibility to the perception of objects may return. Richter records a case in which the retina was totally insensible, excepting at one small point: this was situated obliquely over the nose; it was so minute as to require a considerable lapse of time before its precise situation could be discovered: but he also tells us, that it was so sensible, as not only to discern the light, but even the spire of a distant steeple. I have also observed a case in which the man, a porter, suddenly became blind on a hot summer's day: immediately before he lost his sight he experienced, as he expressed it, "a terrible dazzling sensation." He also stated, that the loss of vision was attended with excessive pain for a time, but this soon subsided, when he was perfectly blind, and continued so for a few days; he then again gradually began to discern light, and now has the sensibility of the expanded nerve in every part, excepting directly in the centre. He can see perfectly surrounding objects, but cannot discern those that are placed immediately before him.

The case of the celebrated Sir W. Herschell very nearly resembles the above: he had lost the power of vision in the centre, in consequence of the intense rays of light (conveyed by his prodigious telescope while viewing the sun) striking the eye, and producing disorganization of this portion of the retina.

The causes of this disease are numerous, the principal of which are the sudden application of concentrated or intense rays of light to the retina; these the frequent use of optical instruments are apt to produce, or they may be caused by the vivid reflection from bright bodies, as frequently happens to travellers in countries covered with snow.

In the treatment of this complaint, if we see the patient in its commencement, we should bleed largely, both locally and generally, have immediate recourse to the employment of mercury, so as obviously to affect the system, which, assisted by the application of blisters in the neighbourhood, will afford him every possible chance of escaping the horrors of complete darkness. Should the disease have existed some time, the employment of frequent topical bleeding, the moderate exhibition of

calomel, which may afterwards be assisted by counter irritation, produced by a perpetual blister or issue in a neighbouring part: with all our endeavours, however, we shall very seldom be gratified by our patient regaining the power of perception, if we do not happen to see him in the earliest stages of the disease.

AMAUROSIS.

Amaurosis is a term of very extended application, used to express the loss of vision generally; it must, therefore, from the complicated connexions and form of the organ subservient to this function, have its seat in very different parts of the visual apparatus; each of these must produce distinct symptoms, referable to the immediate source. Hitherto these variety of symptoms have presented but a chaos, void of connexion or regularity. I think they may at least be orderly arranged; but while I humbly attempt to trace cause and effect, I am perfectly aware of the difficulty of the task, and shall be contented if I succeed in removing a few of the obstacles that present themselves, and those the most trivial in degree.

I conceive that amaurosis may be consequent upon disease of the retina, the optic nerve, or the brain itself: affections of each of these parts will separately produce it; but we must also recollect, that a simultaneous affection of two or all of these parts may exist at the same moment, and produce a combination of symptoms bearing reference to this general complaint.

AMAUROSIS FROM DISEASE OF THE RETINA.

Several varieties of amaurotic insensibility of the retina are attendant upon organic diseases of the whole eyeball, being more or less present in the different changes of glaucoma circsophthalmia, and fungus hæmatodes. When a consequence of these diseases, we cannot expect to benefit vision; indeed it must be obviously impracticable, unless we could cure the disease. As I have before explained, amaurosis is sometimes a consequence of acute inflammation of the retina, and in the consideration of that disease I have explained its symptoms and treatment. There is another variety of amaurosis, which I think may be said to depend upon chronic inflammation of this tissue; this generally commences with or is attended by a morbid sensibility, which in a bright light often amounts to intolerance; this, as the darkness of the night approaches, subsides; but if the patient use strong artificial light, he is again troubled with it in a more trivial degree, while he now finds that the eye becomes sooner tired, especially when viewing minute or bright objects, which will sometimes produce a dazzling sensation, perhaps even amounting to pain. The patient is now much annoyed by

flashes of light, which assume various colours and shapes, sometimes red or blue; sometimes he imagines that fiery balls or flashes of lightning pass before the eye; these luminous appearances occur as frequently when the lids are closed as when the eye is exposed to the light, often exciting very considerable alarm in the mind of the patient. These appearances should be particularly distinguished from the *musæ volitantes*, or we may often be led to imagine that our patient's complaint is more serious than it really is; we may mistake that simple malady for chronic inflammation of the retina, and, what is more, may put him to severe torture, to cure a disease over which we appear to have no obvious control. We should particularly mark that the *musæ volitantes* are perfectly white and moveable, depending upon some slight opacity in the transparent media, which I am led to believe is never the colour of the luminous appearances that are present, or depend upon disease of the nerve: here they are always coloured, and afford a peculiar sensation; indeed we shall find that they are always produced whenever the retina be irritated. At this period of the disease we generally find there is a sense of distension, or weight in the ball, sometimes amounting to pain, which may extend to the temple or forehead. These symptoms come on gradually, the irritability, meteoric flashes, and pain, seeming to alternate with the state of the stomach, or the general health of the patient, for we may generally observe the tongue to be furred, and find the bowels more or less out of order. Sometimes, in the very onset of the disease, we may observe a momentary increase in the power of perception, when the patient is able to distinguish very minute objects; this lasts but for a very short time, and as it subsides he is unable to recognise surrounding objects; sometimes even in a very bright light, or as often happens in tropical countries, the patient may be able to see when the sun shines, but directly it sets he more or less suddenly becomes perfectly blind. These changes may sometimes alternate for months, without the person perceiving that he becomes much worse; often, however, he is gradually becoming more blind, especially marked in the evening, when as the disease increases he will find luminous appearances much more frequently present in the eye; indeed in some instances it may happen, that in a bright light he will observe a black net-work spread before the eye; this, in the dark, has a fiery or vivid appearance, frequently seeming to alternate with the pulsation of the artery, and is observed to be particularly increased when the patient strains, or performs any bodily exercise. In this variety of these diseases, especially in the commencement, the iris acts freely, and the pupil is commonly more or less contracted; but as the

sensation of distension increases, this afterwards becomes more torpid in its action, and the pupil becomes dilated, and sometimes even irregular: we can frequently at this time observe an opacity or muddiness deep in the vitreous humour, the situation of which, combined with all absence of any sensation of a cloud-like appearance before the eye, will serve to distinguish it from incipient cataract. As this disease advances it may spread to the neighbouring textures, and so may eventually become a case of confirmed glaucoma; while in some instances it may remain stationary, permanent blindness, a dilated and irregular pupil, being the result.

This disease would appear to arise from determination of blood to the retina. If every case, especially at its commencement, does not amount to chronic inflammation, this would appear to take place, should it have arisen to any considerable extent, or should it have continued for any considerable time; this causes some organic change in the texture of the part, which will have effect with more or less speed, according to the activity of the symptoms. Every sensitive apparatus in the body, like the brain itself, requires a certain degree of activity in its circulating system for the perfection of its office; when this becomes excited, its functions are rendered more acute; such, for example, is the effect of any stimulant upon the brain; but if this excitement should increase to a great extent, its functions are oppressed, and complete disorganization may be produced, causing death, from the universal influence of this part. Should a similar excitement occur in the retina, we may observe its stages of activity and oppression, and should a change of structure be a consequence, the functions of the part must evidently be affected, in proportion to the amount of disorganization. Again: the application of light, which is a natural stimulus to the retina, always excites a proportioned action in its vascular system; if this becomes excessive, either in quantity or quality, it over-excites the activity of the vessels, so that a similar state of oppression is produced, which may end in disorganization. Indeed so intimately connected is the vascular system of these parts with the correct performance of their functions, that we cannot be surprised at the changes which occur, especially if we reflect upon the delicate texture of the apparatus. The causes, then, of this disease are any that can excite the activity of the vascular system of the retina, either directly by a local injury, or indirectly as through the sensibility of its nervous tissue; this often happens to people of studious and sedentary habits, especially when the profession of the patient requires the exercise of the organ upon minute or glaring objects.

In the treatment of this complaint, if we meet with it in a primary stage, when the patient experiences but a partial loss of vision, accompanied by various-coloured flashes of light, and the patient be of a plethoric habit, we must bleed freely from the arm, so as to reduce the action of the heart and arteries, and make an effectual impression on the complaint: if not completely removed, we may have recourse to cupping on the temple, which may be repeated according to the state of the case. We should also exhibit active purgative medicines; these, assisted by a spare diet, and the removal of the exciting cause, will generally cure the disease: but should the patient be of a low irritable habit, and the complaint have existed some time, the employment of cupping to a greater or less extent, the application of a perpetual blister, or a caustic issue, will often tend to relieve the disease, but, above all, we must attend to his general health; this may frequently be improved by the exhibition of some mercurial alterative, and attention to his diet, which should consist of a moderate quantity of light digestible food; these means should always be assisted by the employment of proper exercise, and will often restore the patient, if complete disorganization has not taken place within the delicate texture of the retina; but when this has been produced, we can expect but little improvement from the application of any remedies.

AMAUROSIS FROM DISEASE OF THE OPTIC NERVE.

The optic nerve may be affected by disease, inflammation, for example, in any part of its course, from the thalami nervorum opti-corum to the sclerotic coat. The symptoms which this evinces are rather obscure; but I imagine they do not materially differ from disease of the retina: when uncombined, however, with the two other varieties, we always find that the iris, even in the last stages, and the most confirmed disease, acts with its accustomed sensibility; in all probability, in consequence of the ciliary nerves not having been included in the diseased action. Should, however, (as is sometimes the case,) this disease be combined with an affection of the brain, or of the retina, this symptom will not be observed. Here, as in the delicate tissue of the expanded nerve, an effusion of lymph or change of structure may occur, that will render blindness permanent.

The treatment of this disease must be regulated upon precisely the same indications as the foregoing variety, and exactly the same means must be employed. We should, however, be aware, that we sometimes find this variety of amaurosis dependant upon a circumscribed tumour within the orbit, pressing upon the optic nerve. Two cases are recorded by Mr. Travers;

in which both the pupil acted with perfect freedom, and, as he describes it, "the iris was even vivacious," although the patient was completely and irrecoverably blind. A similar disease has been produced by a concussion, or partial fracture of the orbit, which has only influenced this nerve, without affecting the third or fifth pair.

AMAUROSIS FROM DISEASE OF THE BRAIN.

Amaurosis may be caused by disease of the brain; inflammation of that organ may produce it; or it may be a consequence of apoplexy or epilepsy, and it may be more or less complete, as these complaints implicate the origin of the optic nerves. Here we shall generally find the symptoms sufficiently marked, and must employ the treatment recommended in each variety, according to the actual state of the disease.

A variety of this amaurotic affection sometimes commences with pain in the forehead, extending round the temples, and sometimes even to the occiput; the patient feels giddy, has a flushed face, tinnitus aurium, and sometimes an unsteady tottering gait; symptoms marking the evident seat of the disease. As the complaint increases, the patient sees double, even though one eye be shut; here, however, we should recollect, that double vision may occur from a slight difference in the axis of the eyes, when the closure of one must necessarily remove this affection. Schmucker relates the case of a major of hussars, that saw the three lines of his squadron double; and I have known a gentleman who, when driving his carriage and four, thought he saw eight horses before him. In some instances this disease increases but slowly; objects appear confused, distorted, bent, shortened, and sometimes inverted; which, in all probability, depends upon some irregularity or change in the immediate seat of perception, and is not produced by any affection of the retina, the organ that receives the impression. The pupil is sluggish from the first, and it soon becomes fully and immoveably dilated, while the eye otherwise puts on a healthy appearance. The pain in the head, which at first was moderate, now becomes very severe; while, at the same time, the giddiness is also increased, so that the patient cannot stand: these often slightly intermit, but soon return again, and there is frequently a perceptible diminution in the power of vision after each attack. He is sometimes attacked with nausea, and even vomiting; has generally a furred tongue; and should the disease proceed to any great extent, he has fever, accompanied by more or less delirium, that may be followed by lethargic symptoms, even ending in death. The complaint seldom proceeds to this extent, but gradually subsides in seven or eight days after the com-

mencement of the attack, leaving a greater or less degree of blindness, which may in time be removed. This disease may appear periodically, occurring at certain seasons of the year; or be produced by different unwholesome substances taken into the stomach. By the application of proper remedies, however, these symptoms may be removed, and the patient perfectly restored to vision; it always, however, leaves a great predisposition to return, upon the application of any exciting cause; and after a number of attacks may render the patient perfectly blind.

This disease would appear to be dependant upon an affection of the membranes of the brain, particularly those covering the anterior lobes of the cerebrum, with which, in all probability, the substance of this organ, particularly at the roots of the nerves, greatly participates. We have many reasons, derived both from the symptoms and morbid appearances after death, to conclude that these membranes may be in a state of partial inflammation; the several stages incident upon this affection may take place; but we are unable to specify the extent which it is necessary it should proceed to, to cause blindness. In some cases I apprehend that the enlarged and distended vessels may produce it, and will be more or less permanent according to their condition: in others, these vessels may quickly unload themselves by a slight effusion of serum, when the disease will be removed as this is absorbed. I, however, consider it necessary that some other change, besides the mere distension of the vessels, or effusion of serum, must happen, when the amaurosis becomes complete and perpetual. There is a variety of these diseases mentioned by Beer, in which the patient sees better after a good repast, the enjoyment of excellent wine or liquor, or after unexpected joy. This, at first sight, would appear to militate against my ideas of this subject; if, however, we look to the history of the disease, we shall find that it has approached slowly, and in its progress has been attended with the several symptoms indicative of cerebral disease: these, however, have been but slight in degree; he has had occasional head-ache and giddiness; while the derangement of his general health has appeared to keep pace with his increasing blindness. In this instance the vessels may have become slowly enlarged, perhaps even varicose, having a very languid and imperfect circulation; but upon the increased action of the heart and arteries, this part of the system has participated, and when its necessary activity had obtained the power of perception, is again restored.

The causes of this disease are various, being those that produce an irregular distribution of blood, whence the weakest will suffer; when this happens to be the membranes of the brain, we find amaurosis is a consequence; or should an increased quantity

of blood suddenly circulate through the system, consequent upon the recent cessation of any accustomed discharge, this part may be affected. We also find, that these causes are more or less powerful, according to the general weakness or unhealthy condition of the system. To enumerate every exciting cause that has been said to produce this disease, would be tedious and useless; suffice it to notice, that it is most frequently excited by the several depressing passions—indulgence in the pleasures of the table, or of venery; by taking unwholesome and unnutritious food; or by long-continued discharges, such as cholera, dysentery, profuse salivation, hæmorrhoids, uterine flooding, or the sudden healing of extensive ulcers.

The treatment of this complaint must be regulated according to the symptoms and constitution of the patient. If we happen to see the disease in its commencement, the subject be a strong adult, and the symptoms very acute, we must bleed freely from the arm, which must be repeated according to its effect; while in some instances cupping from the temples may be advantageously substituted, which should be particularly had recourse to when the patient is too weak to bear general blood-letting. Here, however, we must be cautious, for the apparent is often more obvious than the real debility. At the same time, we must have recourse to active purgatives, or, as has been recommended, we may employ small doses of tartarized antimony, so as to produce and keep up a constant state of nausea, without, however, exciting vomiting, which might be deleterious; this, combined with small doses of sulphate of magnesia, will commonly soon relieve the pain and giddiness; but should the patient still continue amaurotic, the use of a perpetual blister, or an issue, may sometimes remove this unpleasant symptom. Again, should we not be applied to, until the disease has lasted some time, and most of the active symptoms have subsided, we shall sometimes find that the employment of a seton, assisted by alterative doses of mercury and some mild purgative, will be of service: with these must always be combined attention to the general health.

DISEASES OF THE AQUEOUS HUMOUR.

INFLAMMATION OF THE MEMBRANE OF THE AQUEOUS HUMOUR.

I have explained in the anatomical description, the nature of the aqueous humour, the mode of its secretion, and have shewn that it is contained within a serous membrane which extends over the posterior surface of the cornea, both sides of the iris,

and upon the anterior capsule of the lens: this membrane is liable to inflammation, which may either arise spontaneously in the part, or extend from some neighbouring tissue. The inflammatory action may be general, embracing the whole; or partial, not extending beyond that portion of the membrane which lines the cornea. The surfaces of this serous membrane are like similar textures in other parts of the body, prone to adhesive inflammation, and the effusion of coagulable lymph.

In the very commencement of this complaint there is an obvious dulness in the cornea, deep seated, and easily recognized to be in its posterior part: there is a cloudy state of the aqueous humour. The smaller vessels of the sclerotic coat may be observed to be enlarged, and sending red blood into the eye. These surround the cornea in the form of a zone, leaving a whitish mark at the corneal margin: when the disease is extensive, there is some change of colour in the iris; it loses its clearness and brilliancy; and, as the disease continues, the pupillary margin becomes thickened; soon, also, an effusion of lymph may be observed to occur in the anterior chamber; it is of a yellowish colour, forming the appearance called an onyx. This material is secreted by the inflamed membrane, and, falling to the bottom of the chamber, gives the appearance above-mentioned; it appears thick and viscid, and is generally stationary; but I have seen it move when the position of the head was changed. Sometimes, from the very commencement of the complaint, there was a sense of distension in the ball; it may now even amount to pain, extending to the head and temples. If the portion of the membrane covering the iris has been inflamed, adhesion of the margin of that texture takes place to the capsule of the lens; and this must be proportioned to the activity and duration of the disease; if of very long continuance, or the inflammatory action be very active, the disease may spread to the neighbouring textures, causing cataract, closed pupil, abscess of the globe, and even complete disorganization of the eye.

The treatment must consist in general and topical blood-letting, according to the extent and nature of the case; the exhibition of active purgatives, assisted by the employment of calomel, so as to affect the system. These means will generally put a stop to the inflammatory action; while the subsequent use of alterative medicines will cause the absorption of the effused matter. Some have talked about making an opening in the cornea, to let the matter out, but we should generally find, that although we make an opening, we cannot remove the thick and viscid substance from the anterior chamber, while we might re-excite the inflammatory action by our attempts, which should

be most certainly avoided. Here, as in almost all diseases implicating the iris, the use of the belladonna is particularly indicated, and should be commenced immediately after the bleeding has produced a beneficial effect upon the disease.

DISEASES OF THE LENS, AND ITS CAPSULE.

INFLAMMATION.

Inflammation of the lens and its capsule will sometimes take place. It may be acute or chronic: when acute, it is always attended with iritis, which must effectually obscure its particular symptoms; but when chronic, it is much more under our immediate observation, and is marked by certain appearances, that serve to distinguish the disease. This complaint was first described by professor Walther, in 1810. It generally commences with some degree of pain in the eye; a slight degree of vascularity of the sclerotic coat immediately around the margin of the cornea, leaving, however, as in iritis, the same white circle. The patient now complains of a white cloud, or mist, before the eye; the candle at night appears to have a mist or glory around it. The iris may now act freely; but commonly, as the complaint advances, we find it more sluggish than usual. If we examine the pupil, we may observe a slight opacity, accompanied by several red vessels, which now being enlarged, carry a denser-coloured fluid, which produces the white cloud-like appearance; some of these may even be observed by the naked eye; but if we use a magnifying glass of sufficient power, we shall be able to distinguish a vascular net-work: the vessels which form this pass from the periphery around the ciliary processes, towards the centre, forming many inosculations, and producing a kind of plexus or arterial circles. Should the lens have become simultaneously affected, posterior to this net-work of red vessels, it is said we may distinguish a tissue deeper seated, the trunks of which are also derived from the circumference, and are finally subdivided and distributed to the substance of the lens. As the disease proceeds, we may observe that a deposition of lymph may take place in the centre of this vascular net-work: upon the capsula, forming one of the varieties of cataract, denominated the *Cataracta Centralis*, this opacity may become organized, while the surrounding deposit is absorbed, leaving but this mark in the centre of this tissue; or should this not be the original seat, but should the vessels of the circumferences be first excited to the deposition of lymph, it may in like manner leave

a number of white striæ tending to the centre, producing the variety distinguished by the name of *cataracta striata*. We can now sometimes observe the lens itself becomes opaque, and may be distinguished from the capsular opacity by the shining smoothness of its surface, its greater depth, and by its bluish equable appearance, while, as the opacity increases, it becomes quite white, and perfectly impenetrable to the rays of light, being denominated a lenticular cataract. Should, however, at the same time, the cavular opacity increase, and become general, this will be obscured; and we may remark, that the surface of the capsule is of a perfectly dull white colour, not unlike silver paper, or of a velvety appearance, evincing the existence of a capsular cataract. A similar morbid action may occur in the posterior capsule: but the process of its formation is not so marked and obvious; from the depth of the part we are unable to distinguish but the effect. In all probability the process is similar; but it would seldom appear so general a disease, or so liable to spread to the neighbouring tissues. The opacity here is distinguished by the formation of striæ, similar in form to those which appear on the anterior capsule: they are known by the depth at which they are placed causing them to take on a yellowish or muddy appearance. That a partial deposition sometimes occurs upon the capsule of the lens, is sufficiently obvious; but that it is often an individual and primary disease, would not appear to be supported by fact, for it is generally connected with a more or less partial disease of the iris, which having changed its colour, is frequently adhering to the capsule; indeed, these parts are so nearly connected, that the disease of one very often is communicated to the neighbouring tissue.

As this disease, when acute, is generally combined with iritis, so that we are unable to mark its several stages, we are therefore obliged, in our treatment, strictly to follow the practice laid down in the cure of that disease. We must use general and topical bleeding, and have recourse to the prompt employment of mercury. In the chronic kind, we may attempt to stop its progress by the employment of cupping on the temple, especially if there is any pain in the eye, while, by the moderate use of mercury, so as slightly to affect the mouth, we endeavour to produce a change in the morbid action; after which, the use of tonics may be had recourse to, so as to improve the health: these, combined with change of air and wholesome diet, will afford the best means of relief. In the mean time we may sometimes find much benefit to be derived from a constant drain kept open in the neighbouring parts. When, however, the complaint has lasted for some time, or when the opacity

has become permanent, we can expect but little benefit from these remedies.

CATARACT.

Cataract is an opacity of the lens, its anterior or posterior capsule. Of these each may occur separately, or be combined in the same eye: when obvious to our sight, they are marked by distinct appearances, that seldom or never fail us in our diagnosis; these ought to be particularly attended to, as they indicate the kind of operation that it will be requisite to perform. To comprehend the many varieties of cataract, we should have a correct idea of the anatomical structure and formation of the parts concerned; we should particularly attend to the connexion between the lens and its capsule, and have a just conception of the minute, delicate and transparent texture by which it is held in connexion with life, and the general whole; and if we pay due attention to the natural and healthy condition, we shall be the better able to comprehend and appreciate the minute and varied distinctions which have been given to these several varieties, that, taken as a whole, indiscriminately thrown together, serve but to confound and perplex us: if, however, we stop to trace cause and effect, I conceive, we may be able to speculate upon the consistency of each that is presented to our observation.

When considering inflammation of the lens and its capsule, I explained how cataract was always a consequence of that complaint, and how that disease may be acute or chronic, complete or partial. When it is consequent upon an acute affection, that is, where the lens and its capsule have participated in the disease, and have become wholly opaque, which opacity is caused by a deposition of coagulable lymph within this previously transparent tissue, with this condition of the lens, we generally find a closed and permanently contracted pupil, for the most part adhering to the capsule, and mechanically preventing our seeing its peculiarities; but when the iris is not positively implicated in the complaint, we may observe a dense opaque capsule, which sometimes contains an enlarged lens. The opaque capsule has a dull white appearance, which very much resembles the colour of the tissue paper that jewellers envelop their gold and silver ornaments in; this, indeed, particularly distinguishes it from the lenticular opacity. If with this disease the lens is enlarged (which certainly is not always the case), the posterior chamber of the aqueous humour is abolished, the iris is sluggish in its actions, and has a black mark around its pupillary margin, most distinct in the blue eye; this is caused by an eversion of the uvea, or pigment, on its posterior

surface: sometimes even this membrane is pushed out of its vertical position by the enlarged and protruding lens. If the iris was previously contracted, upon the first application of the belladonna it becomes largely and permanently dilated, provided it has formed no previous adhesion. Should, however, any union or connexion have taken place between the uvea and the capsule of the lens, the application of the belladonna may rupture this adhesion, leaving the pigment sticking upon the capsule, forming a variety of these diseases that has been called the *Cataracta Choroidalis*. In this disease the lens has lost its transparency, but we cannot observe it through the morbidly thick and opaque capsule. When, however, we come to operate upon it, we generally find that it is not much harder or firmer than the natural structure, a circumstance of material consequence in the choice of our operation. This disease may be produced by a chronic affection, when the opacity will be more or less extensive, according to the intensity or duration of the disease. This morbid action, which I venture to designate by the term chronic inflammation, often takes its course silently, without much pain, so that it does not even rouse the attention, or excite the fears of our patient. However, soon after the commencement of this disease, the patient finds that objects appear somewhat indistinct, and if examined with attention they seem as though covered by a mist, or as though we looked through a glass that had been breathed upon; while at night, as I have already explained, the candle appears to have a halo or glory around its flame; indeed these are the most distinctive marks of incipient opacity in any of the transparent media; they cannot possibly be confounded with disease or partial insensibility in the nervous tissue, for this always presents a dark or black spot, or general deficiency in the power of vision. If we now apply the belladonna, so as to dilate the pupil, (which should be an invariable practice, so that we may observe all the peculiarities of the complaint before we presume to form our judgment of its kind), then the patient will be better able to distinguish objects, from the dilated pupil admitting more of the rays of light to fall upon the retina: the same effect occurs at evening, which is a symptom that should strongly confirm our suspicions of the nature of the disease, even before we can recognise any opacity in the transparent media. Here also, in disease of the retina, the vision is generally most perfect in a good light, but declines as the evening approaches. Now also that the pupil is dilated, we may sometimes begin to see a slight haziness or dense appearance, or we may, if the disease is in the capsule, observe the vascular plexus I have before mentioned: these, as I have shown, may go on to the deposition and formation of the

several varieties of cataract, or this morbid action may subside, being controlled by our remedies, when it is possible that the effused lymph may be absorbed, and the disease disappear; but should it become organized, it will remain permanent, nay, even the disease may go on, and the opacity become general. It will here perhaps be correct to notice, that in several instances I have observed opacities evidently deeper situated than the lens, which I think may correctly be referred to an opacity in the *sepimenta* of the vitrious humour, and might be confounded with cataract, especially of the posterior capsule.

Besides these opacities that are most generally seen to commence in the capsule, we may observe a variety that invariably begins in the lens itself; this is seldom observed but in old people, and would seem to be the product of a chronic action, bearing some very slight analogy to the preceding variety. This disease is commonly very slow in its progress, so that as the opacity commences the patient experiences the same indistinctness of vision, that is partially removed by the dilatation of the pupil. He has the same cloud before the eye, and observes a similar halo around the flame of the candle; these particularly mark the diminished capability of the transparent media, to transmit the rays of light to the sensible retina. The iris here commonly acts with freedom, but the pupil is generally dilated, from the diminution in the number and power of the rays that pass through the only partially transparent lens. Now if we examine the pupil dilated by the belladonna, we shall generally observe that the lens is of a greyish amber, or yellowish colour, much more dark in the centre than at the circumference, obviously depending upon the varied thickness of the opaque body, and this, if the lens only is affected, has a fine polished surface, which is particularly distinguishable from the dull white of the capsular opacity: as the disease increases the patient becomes more or less blind, and the lens assumes a darker colour, even amounting to a walnut brown. We may now often observe that the capsule begins to be affected: it may sometimes be seen to commence by many triangular-shaped stripes, that often take on an appearance somewhat similar to mother-o'-pearl, or, when more opaque, look like spermaceti that has been fractured; while in some instances it may take on a dotted or variegated appearance, which has been compared to veined marble, and from this circumstance it has been denominated the *Cataracta Marmoracea*. This affection may go on until the whole capsule becomes opaque, so as to obscure the hard lens: should we see it now for the first time, we may be deceived as to its nature and consistency. In other instances I have observed the capsule to become thin, and appear to lose its natural strength, as may

sometimes be witnessed during the operation of extraction. I suspect that this state is combined with a solution of the vitrious humour, when in some few instances the hard lens has been known to fall back, so as to be removed from the axis of vision, thus producing a spontaneous cure of the cataract. In this variety of disease the lens is seldom larger than natural, but is always observed to be considerably harder; this indeed appears to vary with the depth of its colour, which, while still in *situ-naturale*, forms an excellent criterion by which to judge of its consistency; and if we examine the lens after extraction, we shall find that the centre nucleus bears a relative proportion to the circumference, so that in some instances in which this has been found very hard and firm, the centre has been said almost to equal bone in the density of its texture.

In addition to these varieties of Cataract, there is obviously another which may be seen to occur in all ages, while it is most frequently met with in the foetal eye, and has been commonly known under the appellation of Congenital Cataract. In the commencement of this disease, we may observe that the lens presents a bluish-white opacity, still covered by its shining capsule; if we watch its progress, we find that the lens gradually becomes whiter, but that it is obviously soft. After a time its capsule is dotted with opacities, or streaks of a dull white appearance; this increasing becomes general; and now we may frequently observe that the capsule contains a fluid of different degrees of density, so that by attentive observation, in a pupil largely dilated by the belladonna, we can, if the eye be kept still for a time, see the denser and whiter particles subside, occupying the lower margin; but upon the first motion of the ball they again appear mixed in the general mass, and the cataract assumes an equable appearance. At this period the capsule commonly appears swelled out, as is obvious by its effect upon the iris: when this has existed for a time, its size begins to diminish, and this appearance of the iris to subside, while now it may be observed to become smaller than before, and as is often observed in congenital cataract, a dark ring may form around the circumference of the capsule, evidently not produced by the everted margin of the iris, but depending upon the collapsed capsule, permitting the rays of light to pass between it and the ciliary processes, and thus enabling us to see the dark pigment of the choroid coat through the transparent vitrious humour. I have known this considered as the most positive proof of the congenital nature of this disease. At this stage the iris sometimes appears to have a vacillating motion dependant upon the loss of support, which the containing membranes of the eyeball experience upon the removal of the lens from its natural situ-

ation: indeed, if we are now to perform an operation, we might find it wholly absorbed, or perhaps there might be a thin scale, or the original centre nucleus remaining; but even this in time is removed, and the anterior lamina of the capsule retires upon the posterior; until approximated they form but one membrane, perfectly opaque, white, and elastic. Nobody, I think, having just ideas of the anatomy, can contemplate the progress of this disease without at once recognising the cause and effect; and if in the congenital varieties any doubt should still exist, one has but to reflect upon the course and termination of that cataract produced by a blow upon the eye, or a rupture of the capsule, to be convinced of its correctness. Indeed, if we examine the eye, and observe with what facility the lens starts from its capsule, we may perhaps be duly able to appreciate the tenuity of those vessels that form its connexion with the capsule; for I am convinced every thinking mind must allow that such exist, although their extreme delicacy prevents our discovering or demonstrating them. If, then, the lens escapes so easily upon the rupture of its capsule, we can at once perceive how slight must be that concussion which will break through these vessels, which, I believe, may be broken without the capsule being opened, and should the lens thus be separated from the living system, it becomes a foreign body, and though still enveloped in its capsule, is a source of irritation. This variety of cataract may arise from a blow upon the eye or forehead, producing a sudden concussion, that acts upon the part so as to rupture the vessels that support its life and connect it with the capsule: consequent upon this separation, the lens, now being dead, gradually becomes opaque, and, to all intents and purposes, acts as a foreign body. It produces a degree of irritation upon the inner surface of the capsule, which causes an increased secretion of the Liquor Morgagni; if this is continued, or increased, the vessels of the capsule deposit lymph within its texture, causing it to become opaque, which at first being but partial, is laid down at certain points, causing the spotted appearance often observed. The lens now begins to dissolve in the Liquor Morgagni, and is slowly absorbed with that fluid; soon after this the capsule becomes wholly opaque, putting on the dull white colour peculiar to its variety, but still it is evidently swelled out by an increased secretion of fluid. This projection, however, decreases as that fluid and the lens are absorbed, until it is entirely removed. At this period the lamina of the capsule are collapsed, look shrivelled and contracted, and we may perceive the black rim around its circumference. This, in some instances of congenital cataract, may be caused by the capsule not increasing in size, in proportion to the rest of the eye (now the lens is removed), but

continuing of its original extent, while the vitrious humour and ciliary processes are fully developed, which must necessarily admit the light to pass between the capsule and these bodies. That this is the most common and frequent cause of congenital cataract, I am led to believe from much attentive investigation; although I know, that some varieties may be produced by partial inflammation of the capsule. I have observed the common variety to follow tedious labours: in all probability the frontal bones, which at this period are separated into two portions, may experience a lateral compression; they may even collapse over each other, when the pressure must affect the globe, and may rupture the vessels of the lens. That this is the common progress of the disease, is strongly corroborated by the observations of Saunders and Gibson, while their discrepancy of opinion may now be easily explained, by considering that they must have seen the patients at various periods, when different and distinct stages were present. Indeed, it would appear, that in the successful operation of the keratonyxis, when properly performed, this variety of cataract is always produced, which being a natural process, is made subservient to the cure of the disease. The cataract produced by a wound of the eye, and a rupture of the capsule, with or without an escape of the lens, differs from that just noticed but little: it undergoes similar stages; in process of time the capsule becomes opaque, the lens is absorbed, and the shrivelled lamina of the capsule takes on an appearance which has been characterized by the term *Cataracta Arida Siliquosa*.

The cure of these different varieties of cataract must be attempted by various means, according to their kind or consistency: previous, however, to any attempt at their removal, we must give such attention to the case as to convince ourselves that it is not complicated with Glaucoma, Amaurosis, or any other disease, that will render the attempt to restore vision abortive. If the patient is troubled with chronic inflammation of the lids, or has any affection of the appendages, we should endeavour to remove the complaint previous to any operation, and should the patient be subject to gout or rheumatism, we must not attempt it, if he be threatened with a fit. If the eye appears healthy, the iris acts with freedom, and the patient can perceive the light, we may look for success in our operation; but when he cannot distinguish light from darkness, when the motions of the iris are paralysed, the eye has an unhealthy appearance, and especially when the disease has been attended with much pain in the eye or temple, we should be cautious how we interfere with the complaint. In many instances, however, where the patient cannot distinguish light from darkness, we must not hastily conclude that we can render him no as-

sistance ; for the light may only be prevented from striking upon the healthy retina by the size and thickness of the cataract : even should the motion of the iris be paralysed, we must recollect that it may be caused by firm adhesions, or a distant affection of its nerves ; so that should the opacity never have been attended with much or long continued pain, nor the eye have an unhealthy appearance, we are bound to give him a chance, after having fully explained both to himself and his friends the doubtful nature of the case.

The propriety of performing the operation for cataract, when one eye only is affected, has often been doubted, and as frequently recommended and approved of. In several cases, in which the lens had been removed, and by that means the foci of the two eyes were rendered different, I had an opportunity of observing that squinting was a consequence : the diseased or imperfect eye was turned from the axis of vision, to remedy the confusion resulting from this change in the refraction of the light. In most cases, also, the patient sees nearly as well with one eye as with both, save, however, he has not the same expanse of lateral vision on the side affected : indeed, several cases are noticed, in which the patient had been blind of one eye from this disease for years, without observing the defect, until by chance he has discovered it, when he has become greatly alarmed. In some cases of cataract in one eye only, however, the operation may be performed : when the opacity has been complained of as a great deformity, especially in young girls, we may occasionally have recourse to it.

Previous to attempting any operation for cataract we should consider the general health and constitution of our patient : if he be a strong plethoric adult, the loss of a little blood may be of great service, and if we keep him on moderate diet, occasionally administering gentle purgatives, we may considerably lessen his liability to subsequent inflammatory action. If he is of a low unhealthy habit, we may often, by the judicious employment of alterative and tonic medicines, so improve his general health, as to render the chances of success far more probable.

A great variety of operations have been recommended for the cure of cataract, at different times ; an admirable account of which may be found in Mr. Guthrie's "Operative Surgery ;" many of these, when employed in appropriate cases, will be found to have their attendant advantages ; but as a general rule we should have it firmly impressed upon our minds, that in every instance the operation must be adapted to the kind and variety of cataract, rather than the eye to the operation, which was frequently the case when they made use of but one kind of operation in every instance.

For the cure of that variety of cataract, the consequence of acute inflammatory action, when the lens and the capsule are equally affected, the division or breaking up of the cataract will generally be found the best, and most speedily successful ; but even this should be adopted but under necessary limitations ; for if the lens is very large, and encroaches much upon the posterior chamber of the aqueous humour, it will be apt, if employed in the first instance, to excite considerable, and perhaps destructive inflammatory action. When, then, the lens is of the natural size, and the eye otherwise healthy, we may, after having fully dilated the pupil with the belladonna, proceed to the operation. If we operate on the left eye, the patient should be seated in a low chair, resting his head against the breast of an assistant, who should also elevate the upper lid ; then the operator placed before should depress the lower, and fix the globe with his left hand, while with the right he introduces the needle. If the cataract be in the right eye, the operator may stand behind upon a stool, supporting the head upon a pillow, placed at the back of a low chair ; the assistant depressing the lower lid, and steadying the head, the operator should with the left hand raise the upper lid, and apply the necessary compression to fix the globe. If the operator be ambi-dexter, he may obviously make use of which hand or method appears to him best and most convenient. Thus, taking a needle eight-tenths of an inch long, the thirteenth part of an inch broad, and of sufficient strength to penetrate the sclerotic coat without bending, he should hold it lightly between the thumb and two fingers, as a writing pen. The needle should be spear-pointed, gradually thickening from the extremity, so as to prevent the escape of any fluid ; it should be made as sharp as possible upon both its edges for the tenth of an inch, so that it cuts freely near the point when within the eye, but does not enlarge the wound of the sclerotic coat. On the surface of the handle, corresponding to the flat surfaces of the knife, a piece of ivory should be inlaid to mark them, and prevent error. The needle should then be entered into the eye at about a line and a half distant from the margin of the cornea, and a little below the central diameter, so as to avoid wounding the long ciliary artery. It must be passed through the conjunctiva, the sclerotic and choroid coats, and even through the retina ; it must then be carried cautiously in the posterior chamber of the aqueous humour between the cataract and iris, taking particular care not to wound that membrane. When the needle has reached the nasal margin of the pupil, it is to be carried backwards exactly in the transverse diameter, with a drawing or double motion, so as to cut the lens and its capsule in half ; this is to be repeated upon the upper and lower portions, until

they are divided into as many and as small pieces as possible ; we should then endeavour to separate every portion of the capsule from its connexions with the ciliary processes ; and if this be effectually accomplished, we shall find that in process of time they will both be removed by absorption, and the defect of vision remedied. It seldom, however, happens that we tear up every part from its connexions, in the first attempt, but a portion remaining continues to live, and will require a second operation to remove it. The quantum of force necessary to divide the lens must obviously vary with its density : in the varieties proper for the operation it is seldom harder than natural ; but if it should happen that from the thickness of the capsule we have been deceived in its consistency, or should the vitreous humour be softer than natural, so as to yield before the force necessary for its division, the lens is pushed back into the vitreous humour, and in our subsequent attempts, it becomes separated from its connexions, and is floating loose behind the iris. All further attempts at its division would be futile, so that we now have but two alternatives, either to depress it below the axis of vision, or push it altogether into the anterior chamber, and by an incision in the cornea extract it. When of moderate consistency, and likely to be absorbed, the operation of reclinatio may be attempted by placing the flat surface of the needle upon the lens, and depressing it below the iris ; but should it be a hard lens, it will be preferable to push it through the pupil, and afterwards remove it. Having got it into the anterior chamber, we must wait sufficient time to allow the pupil to contract ; we then make a small opening in the cornea with a spear-pointed cataract knife, this should be at the lower margin of the cornea, of sufficient size to permit the lens to be pulled through with a hook or pair of forceps ; at the same time we should be particularly careful to make no compression upon the globe, so as to force out the aqueous humour, which we shall often find in a dissolved condition. When, also, from the size of the cataract, it is thought that it cannot be broken up without very considerable danger of exciting destructive inflammation, it has been recommended to perform the operation of keratonyxis. This consists in lacerating the capsule of the lens, and admitting the aqueous humour, which has been said to cause the absorption of the lens. This operation should be performed in the following manner :— Having taken care that the iris was perfectly dilated by the previous employment of the belladonna, we should take a round sharp-pointed needle, gradually tapering to the extremity, and having previously fixed the lids, push it through the layers of the cornea about a line from its junction with the sclerotic coat, now we should take particular care that it enters perpendicularly

with the layers : the inferior or external margin appears the most convenient. Having entered the anterior chamber, we must push it forward, and gently lacerate the capsule of the lens, merely elevating it upon the point of the instrument, and taking particular care to use but little force, or we shall dislocate the lens from its connexion, and it will start from the capsule into the anterior chamber, and will require to be extracted. If our needle is not properly made, so as to act like a wedge, and gradually to fill up the opening of the cornea, the aqueous humour will suddenly escape, and with a sudden jerk the lens be dislocated from its seat, and perhaps pass into the anterior chamber. In every case in which the capsule is torn, inflammation of that tissue is excited ; but from the very little force that we are permitted to use, this is very partial. It has been supposed that the admission of the aqueous humour into the capsule, and its contact with the lens, is sufficient to excite its absorption. This I consider as admitting of very considerable doubt ; for to cure a cataract by the operation of keratonyxis, it often requires twenty or thirty attempts, while sometimes but a very few are necessary ; indeed, analogy must almost convince us, that it is a mistake, and points out the reason of this difference of success. Here, I imagine, if, as in the congenital variety of cataract, we manage to separate the lens from its connexions, or rather rupture its vessels, without forcing it from its capsule, we shall more speedily have it become opaque, and much more rapidly absorbed ; but if we merely tear the capsule at each attempt, without causing a further rupture of the vessels of the lens, we merely cause an increase of the opacity of the capsule, until by some lucky chance we happen to accomplish this separation. This operation, which has been indiscriminately recommended for every variety of these diseases, is, in my opinion, only to be preferred in those cases, which, from the size of the cataract, we are afraid of the excitement which its division might produce. Indeed, the necessity of the very frequent repetition of this operation will bear no comparison with the speedy (and if properly performed) the beneficial effects of the complete division and separation of the opaque parts, where quick absorption will often remove the whole in a fortnight, while the keratonyxis often requires months, and sometimes years, for the perfection of a cure.

The treatment of partial capsular opacity will require similar operations, and admit of like attempts for its cure. As in these varieties the lens itself is very seldom affected, so we shall find the operation comparatively easy ; in every instance, however, this body must be cut into many pieces, and the capsule completely separated from its connexions, and then left to be

absorbed. From the partial transparency of the capsule, we seldom effectually accomplish its separation at the first attempt, so that it is generally necessary to repeat the operation.

After the performance of these operations, we must carefully watch that much inflammatory action be not produced ; should there be much pain, or any symptoms of iritis, we should bleed freely, and have recourse to the means recommended in the treatment of that disease.

In that variety of cataract which commences in the lens itself, we may, if we see the disease at a very early stage, when it has a bluish yellow appearance, and the opacity is not very dense, have recourse to the division with advantage, or if we should prefer it, employ the operation of reclination ; but to attempt this we should previously endeavour to form a correct judgment of the density of the lens, which, if very hard, might long remain unabsorbed, proving a source of constant irritation to the retina, and in the end cause total blindness. Reclination or depression has been performed both anteriorly and posteriorly to the iris : of the two, the posterior is the most preferable, and is the one now generally employed. It is to be performed in the following manner :—The eyelids being fixed by an assistant, and the pupil having been previously dilated, we must take a spear-pointed needle, holding it as a writing pen, and resting the little finger on the side of the orbit, so as to fix the hand, and prevent our piercing the sclerotic coat too quickly. The point at which it enters this texture should be about a line and a half from the margin of the cornea and a little below the horizontal level. The point of the needle should now pass directly in the centre of the eye, so as to avoid splitting the lens, its flat surface being still upwards and downwards, precisely in the same manner in which it entered the eye ; now the point of the needle must be changed, and so likewise must the flat surface : to accomplish this, we must carry the handle a little backwards towards the temple, slightly depressing it, and at the same time making a quarter turn, that will bring the flat surfaces of the needle opposite to the operator, and the point at the upper surface of the lens. Now making a second quarter turn, and so that we may place the broad surface of the instrument upon the superior margin of the lens ; then carrying it into the posterior chamber of the aqueous humour, we must make a third turn, so as to place the flat portion of the needle upon the anterior surface of the cataract. The needle is now visible behind the pupil ; we should gently bring forward and slightly raise the handle of the instrument, which will carry the opaque lens backwards, and downwards, below the level of the iris, and out of the axis of vision. It should be retained in this position for a short time,

so as to prevent the cataract rising again: if this is successful, the operation is finished by withdrawing the instrument in the same direction we entered it; should not, however, the first attempt succeed, we must repeat the last stage of the operation until we accomplish its depression. The after-treatment must tend to prevent the accession of inflammatory action, and remove it if it has already appeared. Should the patient be much advanced in years, the cataract have existed a considerable period, and be evidently of considerable density, as is shewn by the amber colour its centre particularly evinces, we should invariably have recourse to extraction; for if in this instance we employ the needle, we shall certainly be foiled in our attempts at division; and if we should depress it, the irritation which it causes to the retina may be the source of Amaurosis or Glaucoma; while in some instances, from the loose texture of the vitrious humour, it has been known to move about in the eye for many years, unabsorbed, and to present itself at the pupil whenever the head was inclined forwards, proving a source of great annoyance to the patient.

The operation of extraction should be performed in the following manner: the patient, when the left eye is to be operated upon, should be seated on a low stool, or chair, the back of which should not prevent the assistant moving the head in every necessary direction, and being seated directly before a bright light, the surgeon is placed on a stool before, and raised at such a height, that his breast is parallel with his patient's head: this gives to his arms great facility of motion, without inducing fatigue. The foot of the surgeon now being placed upon a stool, raised to such a height as to enable the right elbow to rest upon his knee: the assistant then gently pressing the patient's head back upon his breast, where he fixes it firmly. The right eye being previously covered with a pad, and fixed by a roller, the upper lid of the left is to be gently elevated, and firmly pressed upon the margin of the orbit, taking care not to make the least pressure upon the ball. The surgeon now depressing the lower lid with the fore-finger of the left hand, while the second is gently placed upon the ball, to steady the eye, and prevent the rolling motion; now taking the knife in the right hand, as a writing pen, and resting the little finger upon the orbit, so as to cause a simultaneous contraction of the recti muscles, hereby fixing the eye. The point of the knife being then directed perpendicular to the layers of the cornea, is to penetrate its surface about a line from the sclerotic coat, and rather above the horizontal diameter: the handle of the instrument then being pressed towards the temple, must, at the same time, be forced steadily across the anterior chamber, and

yet quickly, so as to prevent the escape of the aqueous humour. The posterior surface of the blade is now near to, and parallel with the iris, and when it arrives at the point of the cornea, exactly opposite to where it entered, and about the same distance from the sclerotic coat, this must now be transfixed, and passed to a short distance, taking care not to wound the inner angle of the eye; then, with a gentle sawing motion, we must make the knife cut itself out, keeping exactly the same distance at the margin throughout. The assistant now instantly permits the upper lid to fall; and the eye must be left quiet for a short time, until it recovers the shock. The surgeon now gently elevating the lid, introduces the hook for the division of the capsule; this should be passed towards the centre, with its point turned from the capsule, until it touches it, when the hook is to be turned to it, and he is to make several slight tears or cuts, in different directions. When this is withdrawn, the cataract generally escapes; but should it not, the operator must endeavour to discover the cause; he must see if the opening in the cornea be of sufficient size, and should it not, he must increase it with the blunt-pointed knife, and he may again introduce the hook, and see that the capsule be sufficiently divided: if both these objects are thoroughly accomplished, we may sometimes assist the expulsion of the lens, by gentle pressure, or with the scoop we may remove it. When this is accomplished, we should take particular care that no part of the iris be prolapsed, nor that any portion of the vitreous humour is between the layers of the cornea, preventing their due apposition; after which, a light compress and bandage should secure the eye, and help to defend it from external injury.

The extraction of the lens in itself is a neat and delicate operation, requiring considerable care and attention; but, when properly performed, is the most effectual in the complete removal of the cataract, and most cheering in the almost instantaneous cure which it accomplishes. The due performance of this operation, however, requires considerable attention; for, as I have shewn, a number of accidents may happen, of which it behoves us to have a just conception, to avoid, or relieve them, when they have occurred. If, on the first puncture of the cornea, the knife be not well tempered, the point may break within its horny lamina; or if we do not attend to the perpendicular direction, and turn it too suddenly parallel with the iris, we may pass it between the layers of the cornea, and so imagine that we have performed the first part of the operation, before we have entered into the anterior chamber: we must take care not to keep the point too long in the perpendicular direction with the corneal layers, or we may wound t^e

iris, which, bleeding, will obscure the further steps of the operation. The next point is to pass the knife, (which should always be spear-pointed, gradually increasing in size from the extremity of the blade,) quickly and steadily, so that none of the aqueous humour escape; for if the natural and uniform pressure which this fluid maintains upon the iris be removed, that membrane will fall forward upon the edge of the knife, and may be wounded. Should this accident occur, we are not instantly to withdraw the knife, but gently letting fall the upper lid, and slightly rubbing it, we may induce the iris to contract, when it may be removed from its present dangerous situation; but should we be so unfortunate as to cut it, the blood which will be effused, may obscure the remainder of the operation: also, at the moment of cutting out the knife, we must be cautious not to turn it too suddenly outwards, or we may cut across the cornea, exactly opposite to the pupil, a circumstance that ever after leaves an indelible scar. If, after we have made the proper opening, and the lens does not readily escape, we make pressure upon the ball (should the capsule be much affected, or very tough), we may often observe the edge of the cataract to rise, and may see a black line between it and the iris: this is the vitrious humour, which would be evacuated, even leaving the cataract behind it, so that no time must be lost; we must introduce the sharp hook, or Daviel's spoon, and immediately extract the lens, being particularly careful in the direction of the pressure which we may make. In neglect of this timely operation, I have known the whole of the vitrious humour escape, and a collapse of the eye take place as a consequence. Should the lens by any chance be broken into pieces, either from the softness of its texture, or in consequence of employing the hook, we must endeavour to remove the pieces with the scoop. Besides these accidents, the operation may fail, from prolapsus of the iris, and consequent closure of the pupil: it may also be unsuccessful from the degree of inflammatory action that may supervene. As a necessary consequence, a degree of inflammatory action must take place in the cornea, to accomplish its re-union by the first intention; if this, however, becomes excessive from any cause, ulceration may take place; even sloughing of the whole cornea may occur. The causes of this unhealthy action may be in the constitution; or it may be the manner in which we have made the opening in the cornea. The direction the knife should take, when we cut it out, has often been a matter of dispute; some recommend us to make the wound downwards, others to one side; but I think that the upper direction is most to be preferred: here the wound is not so likely to be torn up upon the motion of the lids,

so as to induce and maintain the inflammatory action, while the scar is further removed from the axis of vision. Here, also, we must be careful that no portion of the vitrious humour intervene between the cut surfaces, or this may prove a source of the subsequent irritation, and prevent union. Should inflammation, however, unfortunately occur, we must endeavour to remove the cause, while, by local or general bleeding, active purgatives, and the employment of antiphlogistic remedies, we endeavour to relieve the urgent symptoms, and stop the progress of the disease. As I before mentioned, the iris may become inflamed in consequence of some injury sustained during the operation, and a consequent closure of the pupil may occur, if we do not speedily employ the means recommended in the cure of iritis, such as mercury and the belladonna.

Mr. Guthrie, in the last edition of his work on the operative surgery of the eye, has described a new knife, which he has invented for the section of the cornea in this operation, and which, he considers, will remove every difficulty and danger which is likely to occur in its performance. He appears originally to have taken the idea from Dr. F. Jager, of Vienna. It is a double knife, one part being a cataract knife, of the shape of Wenzel's; the other, a silver blade of the same form, but larger, and blunt. The steel knife is sharp: it is attached to the silver one by a button screw on the handle, which permits the knife being pressed forwards, while it is closely and nicely fitted to the silver blade, so as to form but one instrument. When we intend to use it, Mr. Guthrie recommends us to make an opening in the cornea with one of Wenzel's large knives, and of such a size as to admit this instrument: as soon as the opening is made, this knife is to be withdrawn; the aqueous humour now flows out, the iris is pressed forwards against the cornea; perhaps a portion of it will protrude through the opening, when, by rubbing the lids with a silk handkerchief, or the finger, it may return again. The eyelids should now be gently raised, and the new instrument is to be introduced through the wound, the silver blade being next the iris. The silver point being larger than the steel one, we easily raise the cornea, and press back the iris, when, by alternately raising and depressing the point of the instrument, it is readily carried across the anterior chamber, until it touches the inside of the cornea, either immediately opposite the point of entrance, or as much above or below as we may think fit. The thumb, which has hitherto been rested on or near the bottom of the screw, is now made to press it forwards, and to protrude in consequence the sharp steel blade through the layers of the cornea. Now we shall find that the instrument will readily cut its way out; and the

operation is to be finished in a manner similar to that previously recommended. Mr. Guthrie considers that the evacuation of the aqueous humour is an advantage, and states, that this previous step in the operation permits the spasm of the muscles of the globe to subside, while, after the evacuation of the aqueous humour, there is but very little tendency in the iris to fall forwards and be prolapsed in the incision. Indeed, he considers that the instrument renders this operation (one of the most difficult and dangerous in surgery) of very easy performance. No doubt, great advantages may be gained by this instrument, when we have made an unsuccessful puncture of the cornea, and when the aqueous humour has escaped, and we cannot continue the section of the cornea for fear of wounding the iris; here it would be of inestimable value; but that the simple operation for the extraction of cataract should be modified, to suit this instrument, is a proposition I cannot subscribe to. I have no doubt that, in the skilful hands of Mr. Guthrie, either manner would be successful; but, I think, that the old, simple, and expeditious section of the cornea, as made by the common knife, ought in the first instance to be preferred; but when rendered dangerous by accident, we should have recourse to the new instrument.

The operation for congenital cataract, which was first recommended in this country by Mr. Saunders, formed quite an era in ophthalmic surgery, in so much that it clearly evinced that we may trust to nature, for the absorption of parts which before were scarcely believed to be within the range of absorbent vessels. It has been a disputed point, which is the best period to operate on the subjects of this disease; some recommend the age of three, others six and twelve months. It certainly should not be confined to any fixed period, but may be performed at any time, provided the child is in perfect health, and no sources of irritation are present. Indeed I would say, that it should not be long delayed, for if the age of the child exceed six months, the constant rolling of the eye, a consequence of the imperfect perception, will become so permanent, as to require a very considerable period to remove it; or if we should stop until the child is twelve or thirteen years old, as has been recommended, it will obviously lose a considerable time in point of education and general knowledge: indeed I consider the operation as easily and as successfully performed at the age of three months as thirteen years. The operation here to be performed, is the division or breaking up of the lens and its capsule: it should be attempted in the manner I have before described, save that it requires somewhat more care and dexterity of management in the child. Before proceeding to the operation, the pupil should

be fully dilated by the belladonna, while the child is laid upon its back on a table, with a pillow under its head, and a folded sheet passed under the table and across the child's body, so as to confine its legs and arms, and to afford a firm hold, to prevent its moving, and this should be held by assistants, who should keep it as steady as possible. An assistant should now hold the head, and, if we propose to operate on the right eye, depress the lower lid, while the upper is raised by means of the speculum, which the surgeon, standing behind the head, may hold in his left hand, while with the right he introduces the needle: for this purpose Scarpa's, or the curved instrument, is to be preferred; it gives a greater facility in breaking up the tough capsule. In the introduction of it we must recollect gradually to carry the point in a perpendicular direction, entering about the distance from the sclerotic coat previously recommended: he must now move the instrument upon its axis in the centre of the eye, so as to take hold of, and tear up every portion of the capsule; and should the lens still remain, break it into as many pieces as he is able, so that, separated from their connexions within the eye, they may be speedily absorbed. Should the cataract be in the right eye, we have but to change the position of the surgeon, and employ a steady assistant to hold the speculum. Very little preparation is necessary, perhaps a dose or two of castor oil before the operation; but after it has been performed, should symptoms of much inflammatory action evince themselves, the application of a leech or two to the lids, and some slight purgative, may be necessary; but it is a curious fact, that very intense inflammatory action but seldom follows this operation in children.

Should the same disease occur in adults, from a blow of the forehead or wound of the eye, the same means must be had recourse to, and will generally be found as successful as when performed on the infantile variety; but if, in consequence of a wound in the capsule, the lens should be separated from its connexions, and pass into the anterior chamber, it should be at once removed by an opening in the cornea, for if permitted to remain, it is apt to cause considerable irritation to the iris, while at the same time we may introduce a needle through this opening, and cut up the capsule, not yet become opaque; for should this be successful, it will prevent the necessity of a second operation.

MUSCÆ VOLITANTES.

This is a term applied to a number of appearances which move before the eyes: some of these assume the form of worms, others are zigzag, while many are spots of greater or less di-

mensions. In an eye troubled with this affection they may readily be observed by raising it quickly from the ground towards the sky, but when the eye is stationary they subside again, as though they were moved from the inferior part by each motion of the eye, and again sunk below the axis of vision as soon as it became quiet. The filamentous particles, turning and twisting in various directions, are the most common: some of these are generally more conspicuous than the rest, although they are sometimes accompanied by an infinite number, much smaller, and not so obvious, which often fall like small mist, when the eye is gently raised and fixed on a white wall, or if they are turned towards the sky on a clear day. They are not so distinct by candle light, nor are they so obvious in a dark room, or in the evening. They are most brilliant in a bright clear day, when the lids are half closed, or on a misty day, when, if they be attended to, they have been thought to appear like flakes of snow. That they are particles moving about, and gravitating to the most depending part, is almost proved by the following facts connected with this curious complaint: if a patient troubled with it will lay down in the open air, with his eyes turned directly upwards, these substances may be observed to become stationary, that is, they lodge themselves on what is then the most depending point, which is now exactly in the axis of vision, but as soon as the head is raised they again subside: so also if we lay down and look at the sandy shore, they are observed to become motionless. They are perfectly white, and if this circumstance is combined with their great mobility, they will form a certain diagnosis of the disease, and cannot be confounded with the luminous appearances which occur in certain affections of the choroid coat and retina.

These *muscæ volitantes* are sometimes a great annoyance to the patient, especially from exciting fears of an affection of the nervous tissue; in every instance, however, I think they may be easily distinguished by the peculiar symptoms I have described; indeed, as I have elsewhere attempted to establish, the disease of the retina gives a sensation of darkness or coloured light, which darts across the eye in every direction, without any reference to the most depending part. We should here certainly be very particular in our diagnosis, for we might not only greatly disturb the mind of our patient, but put him to unnecessary torture, by the application of useless remedies.

Demours was the first who considered the *muscæ volitantes* as depending upon an affection of the liquor morgagni; he imagined that some of the particles of this fluid had become more dense than natural, and hereby intercepted some few of the rays of light that should have passed on to the retina. That

such is sometimes the case, is very probable, but at the same time I see no reason that the aqueous humour is not at times the seat of this complaint, especially when we observe how prone the parts contained in the anterior chamber are to inflammatory action, and the effusion of lymph, which being easily detached, would readily produce the disease.

The appearances are always a source of annoyance rather than of real danger; for they seldom increase, and unless the attention be directed to them, give no inconvenience; and as we find that they are seldom or never followed by Amaurosis or Glaucoma, it is a great satisfaction to assure the patient of the fact. I know no remedy which can effect a cure, but I apprehend that the only possible chance would be given by the application of stimulants, such as the Spiritus Rosmarini, or Sulphuric Æther, to cause their absorption.

GENERAL DISEASES OF THE BALL.

The diseases that I would include under this head, are those only which commence indiscriminately in any part of the globe, and spreading to every texture, involve each distinct tissue in the same complaint. Although not numerous, they are some of the most destructive and intractable which attack this organ.

GLAUCOMA.

Glaucoma essentially consists in a low unhealthy action, which may commence in any tissue of the globe, and which in the end proceeds to complete disorganization of every texture. In some instances it has been said to commence in the vitreous humour, and to follow arthritic or rheumatic inflammation; that this is often a sequel of those diseases I believe to be correct, but that it may also have an origin in the other texture of the globe, is more than probable. Among the first symptoms of this disease the patient is generally troubled with pain in the temple, which is occasionally of a very intense nature; he observes flashes and circles of different coloured light to dart through the eye, and at the same time will complain of some obscurity of vision. If we now examine the pupil, we may observe it irregularly dilated, and the iris slightly changed in colour; indeed, in process of time it may be observed to be driven forward, sometimes even in connexion with cornea, by the enlargement of the vitreous humour. The pupil also is not of the jet black colour of the healthy eye, but has begun to take on a greenish tinge, in all

probability consequent upon a thickening of the sepimenta of the vitrious humour, which now being partially opaque, from the depth of situation, takes on the appearance above mentioned. This by degrees advancing, the lens may also begin to be opaque, taking on a similar appearance: the cornea now also becomes of a muddy or dull colour, and soon a number of enlarged, varicose, and irregular veins, may be observed to come through the sclerotic coat, at a short distance from its union with the cornea: these take a course backwards, within the orbit; they lead us to conclude, that a similar condition of the choroid is present, while they form the most certain and obvious diagnostic mark of the disease; indeed the bluish tint of the sclerotic coat, and evident enlargement of the choroid veins, positively confirm our suspicions of their varicose condition. At the present period total blindness is a consequence of the disease, although the patient may sometimes be deceived by the flashes of light, which, like an *ignis fatuus*, will often lead him to hope assistance within his reach, when there is not the most distant chance of his recovering vision. Should the disease commence in the iris, that membrane may be more implicated than in the last variety; there will be greater irregularity of the pupil, and much more discolouration of its tissue. Should it begin in the lens, that body will be found much more opaque, and sometimes of a very dark brown colour; but even in these varieties the frequent pain in the temples, the discolouration of the cornea, and the varicose veins external to the sclerotic coat, will form obvious marks by which we cannot be mistaken in our diagnosis; indeed these should be familiar to every surgeon; for if he is not aware of the nature of the disease, he may possibly attempt a useless operation for the cure of cataract, and instead of meeting with success, may very considerably increase the activity of the complaint. This disease may come on quickly, and may be attended with a considerable degree of internal inflammation, or it may take its course slowly, evincing the symptoms of chronic derangement; it may arise spontaneous, without any obvious exciting cause, or it may be a consequence of preceding disease. It commonly is, however, very slow and gradual in its progress, evincing its various symptoms in regular succession, until complete disorganization is produced.

When attended with the symptoms of acute inflammatory action, general and topical blood-letting, blisters, and the antiphlogistic regimen, must be had recourse to, if possible, to check its progress; but if its course is more tardy, topical bleeding, an issue or seton, assisted by the moderate employment of mercury, will give the best chance of relief; while by attention to diet, air, and exercise, we improve the general health.

When, however, the complaint has arrived at any considerable extent, palliatives are all that we need employ, for although we may relieve the pain, we cannot expect to benefit vision.

FUNGUS HÆMATODES.

This disease, most important in its progress and termination, was long confounded by authors with other denominations of cancer, until its course was clearly and distinctly detailed by Mr. Wardrop, who has done very much to remove the obscurity that formerly hung over it. Fungus hæmatodes may commence in the eye, or extend from the brain, and subsequently implicate this organ. When it commences in the eye a whitish or silvery appearance, compared to polished iron, is always to be observed at the bottom of the pupil; on it may also be observed the shadow of the iris, evincing the depth of the situation of this appearance. The disease is generally said to commence around the entrance of the optic nerve, and to have its seat in the retina, gradually extending to every portion of the membrane; no doubt, however, it very soon implicates the choroid coat. In process of time this silvery appearance takes on a yellowish tinge, and now a solid substance may be observed proceeding from its surface, which by degrees rises towards the iris; its surface is ragged and irregular, while the ramifications of the central artery of the retina may sometimes be seen upon it. From the first, blindness is a consequence of the disease, which, however, is not always observed in the infant eye. Now the iris becomes irregular, and matter may be observed to be effused into the anterior chamber. Soon the sclerotic coat becomes of a bluish tinge, or assumes a livid hue, while the whole eyeball becomes knobby, and of an irregular appearance. Now also an agonizing nocturnal headache is commonly an attendant upon the disease. After a time the cornea or sclerotic coat ulcerates, and a dark-coloured fungus shoots out; this is sometimes covered by the conjunctiva; but this also by and by gives way, and its irregular surface bleeds upon the slightest touch, being generally covered by coagulated blood. As the projection increases, the most prominent part may slough away, leaving a surface which discharges a very fetid serous matter, a source of very great annoyance to the patient; the lymphatic glands speedily become affected, those situated within the parotid, or under the angle of the jaw, are first contaminated, while the disease also gradually extends to the neighbouring parts, and in process of time will terminate an existence loathsome in the extreme.

The causes of this disease are enveloped in very considerable obscurity: sometimes it has been observed to follow an attack

of acute inflammation, but far more commonly it comes on gradually without any evident exciting cause, while from the experience of Mr. Wardrop and others, it would appear that children under the age of twelve years are by far the most subject to this disease.

The treatment of this complaint consists in the immediate extirpation of the whole contents of the orbit; an operation which, although it affords us but a chance of removing this malignant disease, should always be attempted, and that in an early stage, for if we permit the opportunity to escape, no means, which human knowledge or ingenuity can contrive, will have the slightest effect upon its progress; indeed the operation is seldom performed in time; perhaps that is a reason why so few successful cases are on record. This want of success, however, should not intimidate us, but rather urge us on to afford the only chance which remains to the unfortunate being affected with the disease. The best manner of performing the operation is the following: should the patient be an infant, it should be placed upon its back on the table, and properly secured by a sheet passed over its body, hands, and legs, and fixed by several assistants, to prevent its struggling. The head, being placed upon a pillow, is to be firmly held by an assistant; the surgeon should now pass a ligature, by means of an armed needle, through the cornea, so as to afford him a firm hold upon the globe: now the lids being separated, the external commissure of the palpebræ should be divided with a scalpel, so as to afford greater facility to our future operations. The lids being held apart by assistants, the surgeon takes hold of the ligature, while he divides the conjunctiva and fat around the ball; then gently drawing the eye forwards and outwards, he is to cut through the origin of the obliquus inferior muscle, and the attachment of the obliquus superior, while still continuing it in the same direction, which will permit him to come by the nearest course to the optic nerve surrounded by the several muscles. The division of these parts must now be accomplished by a pair of curved scissors, which taking a turn around the ball, should separate them as near to its posterior surface as can conveniently be done, and before they are much removed from their natural situation. Indeed, at this part of the operation we should be particularly careful not to pull strongly on the ball, for we may do incalculable mischief to the brain; and moreover, we should be very circumspect where we thrust the point of our scissors, for we might even force it through the foramen lacerum, and wound that organ. Thus far accomplished, we are carefully to cut through any cellular tissue or vessels that may remain, when

we shall be able to remove the ball with ease. The hæmorrhage which succeeds is sometimes very difficult to suppress; it should always be accomplished by the application of cold cloths, but the orbit should never be crammed with lint or sponge, neither of which are of any use, but may be exceedingly detrimental. The division made in the external commissure of the lids is now to be supported with sticking plaster, while a light dressing, with a compress and bandage, should be placed over the orbit. Should the patient be an adult, he may be seated in a chair, supported and held firm by assistants, when the succeeding steps of the operation must be performed precisely in the same manner. From the proximity and connexion of these parts with the brain, inflammation of that organ is very often excited, and in our after treatment we should particularly watch its approach, and when it appears, speedily take the necessary means to arrest its progress in the very onset: indeed I consider a degree of cerebral inflammation almost a necessary consequence of the operation. As soon as any symptoms of the disease evince themselves, we must have recourse to blood-letting, and this must be repeated according to the severity of the symptoms, and the strength and habit of the patient. In very young children the application of leeches, with the administration of calomel, and the employment of cold, appear to be the most likely means to relieve the disease; indeed in every instance we must be guided by the principles that should regulate our treatment of intense inflammation of this organ, proceeding from other causes. When we meet with fungus hæmatodes, but in an advanced stage, where a fungus has sprung out from the ball, and that is firmly fixed in the orbit, we should not attempt the operation, but here must have recourse to palliatives; even these will afford but very temporary and inconsiderable relief to the pain and unfortunate condition of our patient.

On the dissection (after its removal) of an eye affected with this disease, the sclerotic coat has been found filled with a sort of medullary matter, somewhat resembling brain in its appearance; this seemed to extend from the entrance of the optic nerve; its gradual increase had caused the absorption of the vitrious, the crystalline, and aqueous humours. The retina and choroid coat appeared entirely confounded in the diseased mass, so that very little trace of either was to be seen. In this instance the optic nerve was also found changed in colour, assuming a brownish tint; it had become much harder and thicker than natural, while it had lost its tubular form, and appeared split in two or more pieces by a morbid growth.

MELANOSIS.

Melanosia is a morbid affection, to which physiologists have till lately paid but very little attention: that it is, however, a distinct and uncombined disease, is now, I believe, placed beyond a doubt. Like fungus hæmatodes, it may sometimes affect the eye; but it is a much less frequent disease: indeed, the rarity of its appearance will in some degree account for the paucity of our knowledge concerning it. Its commencement is marked with violent pain in the ball, attended with a sense of fullness; vision now becomes impaired, and, as the disease increases, total blindness is the result. The vessels of the conjunctiva often become enlarged and tortuous; the sclerotic coat by degrees is much attenuated, often more vascular than natural; while in the end the dark tint of the contents of the ball may be seen shining through it. The iris is now dilated and immoveable; while, if we examine the pupil, a slate-coloured opacity may be observed: this increasing, enters the anterior chamber, while the eye becomes knobby and irregular: at last ulceration takes place, and a black fuliginous matter is protruded. The disease now soon spreads to the neighbouring parts, and may, in the end, produce a termination equally fatal with the preceding disease.

Here, also, as in fungus hæmatodes, the complete removal of the whole contents of the orbit would appear to afford the only chance of relief: indeed, even this, from the extent to which the complaint must proceed before we can form a positive diagnosis, is very problematical.

CANCER.

The two preceding diseases were long included under the denomination of cancer, but they have been fully proved by modern pathologists to differ very materially from that kind of altered structure, which is so frequently seen in the female breast, and is described by authors as cancer. The eye is liable to a disease which bears a very near resemblance to that morbid change: in all probability, it is the same malignant affection; it may evince itself either in the globe or appendages of the eye. Should this disease commence in the globe, the patient, long before any symptom is apparent, is troubled with a sense of distention of the part, sometimes amounting to a lancinating pain; should it increase, a state of chronic inflammation supervenes in the internal tunics, blindness is the consequence, while the pain becomes more marked, darting through the eye into the temple, and sometimes round to the back of the head: indeed, the disease may put on all the characters of glaucoma. As the disease proceeds we shall find that the ball is converted into a schirrous

substance, by degrees, having lost all appearance of its healthy structure, it has assumed a greyish, brownish, or yellowish tint, and has a firm inelastic feel, its surface is knotted and irregular, with many varicose veins running over it. In consequence of the enlargement of the globe, the lids cannot be perfectly closed, while, from the irregularity of surface, it causes considerable irritation. After a time ulceration of the knotted projections occur: this is attended with a sanious, often fetid, ichorous discharge, while the pain is now often extreme; the constitutional irritation, and debility are very marked; the countenance has assumed a sallow leaden hue, and the constitution seems completely broken up; by this time the neighbouring parts have become implicated by the complaint, which may even extend to the brain, and cause death; or the excessive constitutional irritation may gradually exhaust the patient, so that at last he sinks a victim to this intractable and malignant disease.

Cancer may primarily show itself in the appendages of the eye, and extend to the globe. It generally commences as an unhealthy tubercle, which eventually puts on a similar character and appearance with the foregoing description, and is in the end attended with similar consequences.

Cancer of the eye is the same intractable disease that evinces itself in other parts of the body, generally in the end causing the death of the unfortunate person that comes within its influence. As, in the two preceding varieties of these malignant diseases, the only hope left for the patient is the entire removal of all the affected parts, and this must be accomplished before the disease has become very extensive, or the constitution of the patient much affected by its morbid influence: indeed, (in the very case in which these indications have been attended to), as we do not know the cause of the disease, we cannot avoid it, so that it must be liable to return. I think, however, all things considered, we are bound to give our patient the benefit of the only chance which remains to him; at the same time, however, we must recollect, that we should not undertake the operation when the disease has become so extensive that we cannot easily remove every portion of the morbid structure; for in this case it would be sure to return, and certainly throw a discredit over the operation, that might prevent its employment in cases where benefit might be derived. The operation is to be performed precisely in the same manner that has been recommended in a preceding chapter.

When this malignant disease has become very extensive, palliatives are the only means we can resort to; these may mitigate the distress and pain of the patient, and tend in some degree to make his life more bearable than it otherwise would be. Nar-

cotics are the medicines we must employ to accomplish this indication; opium, hyocimus, or conium, will sometimes be found to give relief, but it is often necessary to stupify the patient before we can give the wished-for benefit. Constant cleanliness of the diseased part, with the application of an ointment, composed of some of those remedies above-mentioned, may be used with advantage.

INJURIES OF THE EYE AND ITS APPENDAGES.

The very prominent situation of the eye makes it extremely liable to accidents: these may produce more or less imperfection of the organ, according to the nature and violence of the offending cause, or the character of the structure that is implicated. The causes by which these may be produced have been divided into mechanical and chemical—that is, they may be in consequence of a contusion or wound, or be produced by the application of fire, quicklime, caustics, or any of the mineral acids, in all which cases we shall find the effects to vary very considerably, often from the slightest causes producing the most serious injuries. Among the consequences produced by these accidents we shall find that inflammation is generally a very marked and prominent symptom; it must greatly regulate our practice, and will generally be one of the chief symptoms we have to guard against and contend with. Having in the former part of this work recorded all the symptoms which are produced by this disease in the individual textures of this organ, and also considered their consequences and treatment, it remains for me here, but briefly to notice it as an effect of the various accidents to which the eye is liable.

EXTRANEIOUS BODIES BETWEEN THE LIDS.

The insinuation of foreign bodies between the eyelids and the globe, is a very common accident: it always produces more or less pain and irritation, according to the nature of the extraneous matter, or the position it occupies between the lids. Should a particle of dirt, or small fly be the cause, immediately on its admission it produces considerable pain, it is a source of irritation to the mucous membrane which may eventually terminate in inflammation, unless its cause is removed. The presence of the body causes a constant winking motion of the eyelids and a profuse lachrymal discharge, which will sometimes wash away the offending matter, or remove it from between the lid and the

globe to the inner canthus of the eye, when all the symptoms of irritation generally soon cease. When, however, the extraneous matter is lodged in that part of the conjunctiva which lines the tarsal cartilage, the sensation is more acute, in consequence of the latitude of motion with which the lid is endowed, causing it to rub against and irritate a larger portion of the surface of the eye; so that should it not speedily be moved, we must attempt its removal; this is easily accomplished when the matter is under the lower lid, by merely everting the lid and wiping it off; should it be placed within the upper, a similar operation is to be performed; but here, from the nature of the part, it is rather more difficult. It must be accomplished in the following manner:—The patient is to be seated in a chair before a window, the surgeon is to take hold of some of the centre eyelashes with the right hand, gently pull upon them, and depress the lid, then a probe or other instrument is to be placed transversely, and firmly held immediately above the tarsal cartilage; the cilia are then to be raised, and the lower margin of the lid turned over the probe, so as to evert the conjunctival surface. By this simple operation the extraneous matter generally comes into view, and can easily be removed; should it stick in the conjunctiva, it must be picked out with some sharp-pointed instrument; should it have remained a considerable time within the substance of this membrane, it may have caused a fungus growth; this may be cut off with a pair of scissors: the foreign body will then easily be discovered. If the substance is permitted to remain between the lids, all the symptoms of conjunctival inflammation evince themselves, and many of the consequences of this disease, such as opacity and thickening of the membrane, may be the results. I have, however, known some instances in which the eye would appear to have become accustomed to the presence of the extraneous body; for although it remained, most of the symptoms of irritation subsided; this appeared to be in consequence of the substance becoming fixed in the most superior part of the upper lid, in the fold or reflection of the conjunctiva, where but little motion occurs.

Should the foreign body happen to be a portion of caustic, or likely, by its chemical action, to produce speedy disorganization of the texture, we must provide for its removal. To accomplish this the eye may be washed with water, forced between the lids with a syringe, which must be continued until every particle is removed. When it is quick-lime, oil has been recommended as a substitute for water, in consequence of its action being rendered more active by the latter fluid; when, however, oil is not to be obtained, water should be used with no unsparing hand. After the removal of the exciting cause, the treatment must

consist in the application of those means and remedies which will cure the inflammatory action, and must be conducted on precisely the same principles as were recommended in the treatment of acute conjunctival inflammation.

CONTUSION OF THE LIDS.

A blow upon the lids may cause considerable effusion of blood both into the lax cellular tissue of the palpebræ and under the conjunctiva covering the globe. In the first case the swelling of the lids may become so considerable as to prevent their motion, so that the patient cannot uncover the globe; the swelled lids look tense, and are of a dark colour; the effused blood seldom, however, gives much pain, and is after a time removed by the absorbents: in some instances, however, inflammation and supuration may be the consequence. When effusion of blood happens in the cellular tissue under the conjunctiva covering the globe, a shining elevation may be observed between the lids, it may be so considerable as to project over the cornea, and cause this tunic to appear sunk in the eye, some pain and inflammation may be the consequence, but this seldom proceeds to any considerable extent, while the dark swelling is gradually removed as the blood is absorbed. It may, however, be worthy of remark, that blood is never effused under the conjunctiva covering the surface of the cornea, in consequence of the close adhesion of these parts, and the vessels that nourish them in a healthy condition, carrying but a transparent fluid.

The application of some slight stimulants to excite the action of the absorbent vessels would generally appear to be all that was necessary in the treatment, but should inflammation be produced, the usual means must be had recourse to.

WOUNDS OF THE LIDS.

A solution of continuity may occur either from a mechanical or chemical cause: when produced by a cutting instrument it may be superficial, merely dividing the skin and orbicular muscle; such a wound is seldom of any consequence, and may generally be readily healed by sticking-plaster and bandage: it always, however, leaves some scar. When it is more complete, going entirely through the lids, it must, of course, cause more or less deformity, according to the extent and direction of the wound; it, therefore, makes it particularly necessary to bring the separated parts into the nicest apposition, and effectually to maintain them so until union has taken place. To accomplish this indication we have recourse to sutures of a single silk thread, and these must be of sufficient number, and in such positions, that when supported with plaster and bandage, the whole may be effectually

retained in apposition until a cure is accomplished. Sometimes it is of advantage to cut through the sutures on the third or fourth day, so as to prevent their making their way out by ulceration. When this is attempted it must be done with caution, and not before some degree of union has taken place; after which the judicious application of sticking-plaster will generally suffice. When the wound is a consequence of the separation of a slough, such as that caused by fire, caustic, or any of the mineral acids, the healing of the ulcer will always cause more or less contraction of the parts, and consequently a deformity. This, by careful attention, we may often diminish, if we cannot entirely prevent it.

It seldom happens that wounds of the lids implicate the lacrymal canals; these are so well defended by the surrounding bones; but if they should, we must endeavour to keep the parts in strict apposition, so that union may occur. Here sutures will be particularly required, in consequence of the motion of the lids having a tendency to separate the edges of the wound. The canals are always rendered impervious by this injury; but I have seen the function performed by one, after the other has been obliterated by such an injury.

BLOWS UPON THE FOREHEAD.

These may cause more or less contusion of the soft parts; may injure the super-orbital nerves, or be productive of fracture of the frontal bone. Simple contusions of the soft parts may be attended with some degree of inflammation, but this, by the application of common remedies, is generally soon removed. When the blow is attended with an injury of the nerves, all the symptoms of *tic-doloureux* may occur; another curious and somewhat inexplicable consequence of such an injury is, the total loss of vision in the eye. This may be simultaneous with the blow; come on gradually; or, should there have been a solution of continuity, it may appear as soon as the wound has healed. When blindness is simultaneous with the accident, I think it is more likely to depend upon concussion and injury of the retina, than any positive affection of this nerve. Should the amaurotic affection come on gradually, after such an accident, while no derangement of structure is observable in the eye, the iris preserves its natural motions, and the loss of sight is unaccompanied with any pain: then we may suspect that the blindness is consequent upon the injury of the nerve. Such, I believe, is the opinion of Mr. Guthrie; while Mr. Laurance states, that he never has witnessed such a circumstance. The treatment in such cases should consist in the application of leeches to the part, the employment of a cold evaporating lotion, with atten-

tion to the general health; these means will commonly remove all the active symptoms, and, by the subsequent use of the moxa, or other counter-irritants, we may attempt to relieve the amaurotic affection. When the disease follows the cicatrization of a wound, Beer recommends an incision down to the bone, close to the superciliary foramen, so as to divide all the branches of the nerve. By these means, he affirms, that he has completely restored patients to sight, who have been blind from this injury. When fracture of the frontal bone is caused by the blow, the injury may be fatal in consequence of an affection of the brain; or the fracture may run across the orbital plate, may implicate the optic foramen, or foramen lacerum, causing compression, or injury of the nerves or blood-vessels that pass through these, so that blindness or paralysis of some part of the apparatus may occur as a consequence. A simple fracture of the cranium is not always attended with fatal consequences; but when it is complicated with injury of the brain, the affection of that organ is of primary importance, and will demand prompt and decided treatment: should any of the nerves be injured in their passage through the orbit, all we can do is to remove the primary excitement, and afterwards trust to nature for the removal of the consequences, which, however, is seldom effectual.

WOUNDS, &c. OF THE ORBIT.

A blow on the temple, or margin of the orbit, may, by concussion, rupture some small vessel in the cellular tissue of the orbit; blood may be effused, and consequent compression of some of the nerves be produced. The amount of the paralytic affection must of course depend upon the situation and amount of the injury: the quantity of blood may be so considerable as to compress the optic nerve, and cause one variety of Amaurosis; or it may affect some of the ciliary nerves, as will be proved by a proportioned paralytic affection of the iris. In some cases I have seen it complete; in others, a part only of the iris had lost the power of motion. This must cause more or less irregularity of the pupil, while a vacillating motion, or flaccidity of the part is observable. Paralysis, also, of some of the muscles of the ball may happen from a similar cause. When pressure only of the effused blood causes the paralytic symptoms, these may often subside on its absorption: in some cases, however, it will occasionally happen that slight inflammatory action shall be produced by its presence, which is often enough to render the disease confirmed.

Punctured wounds of the orbit sometimes occur. They will always be attended with more or less effusion of blood and

inflammatory action, according to their depth and direction: they may wound the lachrymal gland, and cause a true lachrymal fistula, or produce direct injury of some of the nervous textures. In some instances a foreign body may be forced into the orbit, when it will cause more or less displacement of the globe, according to its size. The globe may be forced out of its situation, so as to protrude between the lids: the retina is rendered insensible in consequence of the forcible extension of the optic nerve, while the foreign body may wound any of the muscular or nervous textures, causing paralysis, or squinting.

When blood is effused into the cellular texture of the orbit, we must endeavour to prevent the accession of inflammation, at the same time that we encourage its absorption. When we are called to a punctured wound, we must strictly employ all those means which would be likely to moderate the extent and intensity of the inflammatory action: among these, general and local bleeding should be the principal; especially if there is any tendency in the disease to spread to the brain. Should a foreign body be lodged within the orbit, causing protrusion of the ball, we must carefully remove it, when the eye gradually returns to its situation, and vision may be restored: sometimes, however, blindness is the consequence of such an injury. Having removed the cause, the next indication is to guard against the excitement produced by it.

INJURIES OF THE CORNEA.

The cornea may be simultaneously affected by any injury that may happen to the membrana conjunctiva: these generally excite inflammation, so that a deposition of lymph occurs in this previously transparent tissue, causing, according to its extent, more or less blindness. Indeed, all the consequences of corneal inflammation, which have been fully explained in the preceding pages, may evince themselves, and will require the means there laid down for their cure. Wounds may be made in the cornea with a sharp-cutting instrument: when of small extent, and not accompanied by much laceration or contusion, they will generally heal, leaving but a small scar: when there is much contusion, or laceration, inflammation, and all its consequences, will attend the injury.

In some cases the wound is so small, that the elasticity of the cornea prevents the escape of the aqueous humour, so that the opening soon heals, and but a small scar or indentation remains. When the wound is larger, the aqueous humour flows out, the iris falls forward, and may serve as a plug to stop up the opening; coagulable lymph is thrown out; but the aqueous humour may be again secreted; the wound closes, and

the lymph that united the iris to the cornea is absorbed, when the iris may return to its proper position, and the pupil assume its natural shape; or the iris still adhering to the cornea, must cause more or less derangement of the pupil, sometimes producing a total loss of vision. Should the wound be still more extensive, prolapsus of the iris, and all its consequences, may result, and will require the treatment specified under that head: sometimes, when very extensive, union by the first intention does not take place in these wounds, so that the process of suppuration naturally ensues; an opening remains in the cornea, the aqueous humour escapes as fast as it is secreted, the cornea remains flattened, and, of course, is more or less opaque; soon we observe portions of coagulable lymph to be deposited; and, as the process of cicatrization advances, the edges of the wound are brought into contact, and, uniting, close the passage through which the aqueous humour percolated. The cornea may now sometimes assume its natural shape; but when this extent of disease has prevailed, it generally remains flattened; the iris adheres to the wound, causing more or less derangement of the pupil, while very considerable opacity of the cornea is often the result. We must bear in mind that the wound of the cornea may be so extensive, and attended with so much violence, as to injure the other internal structures of the eye; indeed, it may sometimes be so large, as to permit the total escape of all the contents of the globe, when the eye collapses, and vision is totally and irretrievably lost. In all these cases, inflammation is the principal result, and must be strictly guarded against. All the means specified in the cure of corneal inflammation should be freely and effectually employed, and, if these are persevered in, we shall often have the satisfaction of saving the eye, or remedying the evil to a great extent.

Projectile substances may be driven with violence into the texture of the cornea; they may even pass through it. When the little body is completely imbedded in the layers of the cornea, it must cause a certain degree of inflammation: this may in time subside; it is encysted, and the cornea becomes used to its presence. While in this condition it may remain an indefinite time: not so, however, if the body projects, so as to be irritated by each motion of the lid; inflammation very speedily supervenes, and may rise to a destructive height. In some cases the presence of the foreign body soon excites suppuration, which favours its discharge.

When called at the time of the accident, our first attempt must be to remove the foreign body. There is never any difficulty in distinguishing it. It should be removed in the following manner: the operator, standing behind the patient, supports

the head against his breast, while he elevates the upper eyelid with the fore and middle fingers of the left hand, fixing the eyeball with their extremities. An assistant now should depress the lower lid, while, with a sharp cataract needle, we endeavour to pick out the foreign body, first touching the surface of the cornea, to warn the patient, and make the muscles fix the globe. We should introduce the point of the instrument below the body, and, by depressing the handle, raise the point, making the instrument act as a lever : this must be repeated until we have removed the body from its seat in the texture of the cornea : sometimes this will require repeated attempts before we can succeed ; but we have the satisfaction of knowing, that we seldom cause much mischief, although it is absolutely necessary to dig the body out of the substance of the cornea. When its removal is accomplished, the employment of the means adopted in the treatment of inflammation must be had recourse to, and it seldom happens, that if these are efficiently employed, that any very considerable scar remains.

WOUNDS OF THE SCLEROTIC COAT.

These are principally important, from the violence which is necessary to affect them causing other and more important injury to the globe. In their treatment we must follow the indications above specified in wounds of the cornea.

INJURIES OF THE IRIS.

A blow on the eye may cause a rupture of some of the minute blood-vessels which supply the iris, when there will be more or less effusion of blood into the anterior chambers of the eye ; this at first tinges the aqueous humour, and gives a yellowish colour to the iris ; sometimes a small quantity will subside to the bottom of the anterior chamber, and will change its position upon every motion of the globe ; after a short time, if the vessel be considerable, the red blood will become sufficiently obvious, obscuring the iris, and making the patient perfectly blind. Considerable pain often comes on, and inflammation may supervene, amounting even to suppuration within the eye. The same blow may detach the iris from the ciliary ligament, and thus form one of the varieties of artificial pupil : this accident is always attended with some effusion of blood into the chambers. Inflammation of this texture will sometimes occur when the natural pupil may become closed, and while the opening caused by the separation of the iris may remain open : indeed, when this accident occurs, reunion of the parts seldom happens.

The indication in this case, is to prevent the excess of inflammation : should the separation be so formed, and of such extent

as to admit the rays of light freely to the retina, and, at the same time, the original opening also exist, the closure of the natural pupil, by inflammation, would be an advantage; but should the inflammatory excitement become excessive, it will be necessary to employ active blood-letting, followed by the free exhibition of mercury, so as to stop its progress.

An incised wound of the iris seldom occurs, for the membrane generally yields upon the least pressure, and so escapes being wounded; but when a cut is made in it, the attendant injury is always more to be feared, for before such an accident could happen, it is necessary that an opening be made in the cornea: the aqueous humour may escape, and prolapsus of the iris occur, which would, in all probability, cause much more injury to vision (if it did not altogether prevent it), than a simple wound in the iris. Here, as in most other cases, we must guard against the attendant inflammatory action; and as in all probability this will be found to be rather a complicated injury, it must be treated according to the indications it presents, which have been fully explained under the head of "Prolapsus, Iridis, and Wounds of the Cornea."

WOUNDS OF THE CHOROID COAT.

Wounds that can implicate this tunic must have previously lacerated the hard sclerotic coat, and may have caused a greater degree of injury to the eye than the mere solution of continuity. When such, however, occurs, there is always more or less extravasation of blood either within the eye, or under the membrana conjunctiva: a frequent consequence also of this injury is a wound of some of the ciliary nerves, so that the iris becomes partially paralytic. If the injury is not very extensive, or attended with much contusion or laceration, the inflammatory action may not be very severe, the effused blood may be soon absorbed, and but partial paralysis of the iris remain; should the injury be more extensive and severe, an escape of the several humours may occur, or the excess of inflammatory action may spread to the whole eye, causing suppuration of the ball, and irretrievable blindness. In this, as in most other injuries of the eye, the treatment consists in guarding against the intensity of inflammatory action, or in removing it when it has developed itself: to accomplish this, all the means which have been so frequently mentioned must be had recourse to, and persevered in until the desired effect is produced.

INJURIES OF THE RETINA.

A simple puncture of this membrane does not seem to be attended with much inconvenience; but, if the wound is extensive,

more or less blindness is the result. A blow upon the eye may produce concussion of the retina ; when not very severe, a peculiar kind of dazzling sensation is caused by such an accident, a slight impairment of vision is the consequence : this being followed by some degree of inflammatory action, which, if not judiciously treated, may cause partial insensibility of the nerve. When the blow is more severe, total insensibility of the retina is immediately produced, accompanied with the sensation above described : this insensibility continues for a time, after which a degree of vision returns, but, very soon, symptoms of acute inflammation follow ; these may spread to the neighbouring textures, and in the end will generally cause total and irrecoverable blindness. A very well marked case of concussion of the retina was shown to me by my friend, Dr. Coley, of Cheltenham : it exhibited all the above symptoms in a very remarkable manner, but in this instance there was very considerable dilatation of the pupil, which occurred at the moment of the accident, and has continued ever since. This, I apprehend, is dependant upon some injury of the choroid coat and ciliary nerves, and is not caused by the insensibility of the retina ; for in very many cases we find that texture paralysed, while the iris possesses its natural vivacity. In some cases, besides concussion of the nervous matter, laceration of the retina may occur ; effusion of blood is the consequence, and it is then that the iris becomes dilated. The effusion of blood may depend either upon a rupture of some of the branches of the arteria centralis ; but, I think, it is generally caused by an injury of some of the vessels of the choroid coat ; besides the excessive dilatation of the pupil, we may often observe a degree of muddiness, deep in the vitrious humour. In many cases, however, the refraction of light will produce a similar appearance, and deceive an inattentive observer. In some instances, should the inflammatory action have not been very intense, we shall find that some slight degree of vision may return, the patient being able to see partially in some directions. The indications presenting themselves in such cases are, by active treatment, to remove the attendant inflammation. General and local blood-letting, assisted with calomel and opium, will have the best chance of success ; should but partial insensibility of the retina occur, we may occasionally benefit the sight by the cautious use of stimulants, such as the *vinum opii*, or the spirits of rosemary.

INJURIES OF THE LENS AND ITS CAPSULE.

A wound that has entered the cornea, may penetrate so far as to touch the capsule of the lens ; it will of course produce a degree of inflammatory action around the spot : lymph is effused,

and a partial opacity of the capsule is the consequence ; this may remain stationary, or, in process of time, be partially absorbed : it seldom, however, entirely disappears. This variety of injury I witnessed, in several instances, while I was in the army : some young recruits, who had got tired of the service, caused a partial opacity of the capsule, by introducing a needle through the cornea : this they did to obtain their discharge. In other cases the wound of the capsule may be more extensive, when some of the soft circumference of the lens may be forced through the opening of the capsule in the form of a bluish-white jelly ; this may drop off into the anterior chamber, and fresh portions protrude ; soon after this both the lens and its capsule become entirely opaque : the lens is by degrees absorbed, leaving a thick coriaceous capsular cataract. If the wound in the capsule be still more extensive, the lens escapes into the chamber of the aqueous humour ; it may fall forwards, and press against the iris, or it may be wedged in the pupil, pushing that membrane almost in contact with the cornea, while, in other cases, we find that it passes at once through the pupil, and lies at the bottom of the anterior chamber, changing its position with each motion of the head. If the lens be permitted to remain in these situations, it produces considerable irritation ; inflammation of the iris may arise, and closure of the pupil occur. When the lens first escapes from its capsule, it has a bluish-white, or jelly-like appearance ; soon it becomes opaque ; if permitted to remain, this opacity gradually increases until it becomes completely white ; and, after a time, we find that the lens is gradually absorbed, but that the capsule will remain perfectly opaque, and of a dead white colour. The lens may become opaque in consequence of a blow upon the eye, without being dislocated from the capsule ; of this Mr. Lawrence states, that he has seen many instances, but he does not attempt any explanation. In that chapter which treats of cataract, I have ventured to express my opinion ; which, I trust, will hereafter be found correct. I have said, that in these cases the nutritious vessels of the lens are ruptured ; it now becomes a foreign body ; in process of time both lens and capsule become opaque, while the lens is eventually absorbed, leaving a hard and tough capsule. Both the capsule and lens may be separated from their connexion with the vitrious humour ; they may stick in the opening of the pupil, causing considerable irritation, or they may fall to the bottom of the anterior chamber, and may remain there for a very considerable period, their presence always causing a degree of excitement sometimes amounting to inflammation, when lymph is effused around the capsule, giving it a yellowish appearance : the lens may become absorbed ; but when enclosed in the capsule, this

s e e m s a much slower process ; for I have known this body remain for ten years with but a small apparent diminution of its size. In one instance, in which it had remained for five years, I extracted it, by making an opening in the cornea, when I found the lens almost entirely absorbed ; the capsule was partially ; and the apparent size depended upon coagulable lymph, which the irritation of its presence caused to be deposited around it. Ever since the accident happened, the eye was very liable to attacks of inflammation ; indeed, its membranes were always more vascular and disposed to disease than before. The extraction of the lens removing the cause of irritation, all the unpleasant symptoms soon subsided.

The treatment of all these various accidents consists in the employment of the means recommended in the cure of inflammation generally, and as this is commonly the most prominent symptom, it requires to be strictly guarded against and subdued : of those means blood-letting and mercury form the most efficient, while the use of the belladonna must never be forgotten. In that variety where a puncture of the capsule has occurred, the above means must be first had recourse to ; should the opacity remain, should it interfere with vision, and the patient be blind of the other eye, we must perform the operation for cataract ; that is, the division of the lens and its capsule must be attempted. When the injury is more extensive, and the lens is evidently wounded, exactly the same kind of treatment is demanded ; and, as in this instance, the defect will be much more remarkable, so the removal of the cataract will be absolutely required. Even should the patient see well with one eye, the deformity may make it advisable to remove the hard opaque capsule which remains. When the lens is dislocated from its capsule, and has fallen forwards upon the iris, pushing it towards the cornea, we must endeavour to dilate the pupil by the belladonna, so as to permit its passage into the anterior chamber. When the lens sticks in the pupil, the same means must be had recourse to, and as soon as it is situated between the iris and the cornea, we must make an opening with a cataract knife in the latter, and extract the lens. The opening must be made at a little distance from the margin of the cornea ; it should be of sufficient extent, that we do not irritate its edges by the subsequent steps of the operation, and so prevent union by the first intention. We should now remove the lens with a hook or forceps, being cautious that none of the softer circumference of this body remains in the wound, for it might prevent adhesion. As soon as we have accomplished the extraction of the lens, we may cut up the capsule, by introducing a needle through the wound in the cornea, and so prevent the necessity of any subsequent operation ;

but should this not be perfectly effectual at some subsequent period, we must perform the operation recommended for capsular cataract. When a blow upon the eye has injured the vascular connexions between the lens and its capsule, the treatment and operation recommended in congenital cataract must be had recourse to, and will be found perfectly equal to its removal. When both the lens and its capsule are separated from their connexions in the eye, the indications that present themselves are similar to those which are evinced when the lens is dislocated from its capsule: the treatment also which is required is precisely the same.

INJURY OF THE VITRIOUS HUMOUR.

In some very extensive wounds of the ball, when the sclerotic and choroid coats have been implicated, the vitrious humour may participate in the injury: considerable portions of it may escape, indeed, its opening may be sufficiently capacious to permit the evacuation of the whole contents of the globe, when the eye will necessarily collapse, and vision will be entirely lost. We can do little to relieve the effects of this accident, and must be content to remove the inflammatory excitement by the usual means. Should the collapse of the eye be the consequence, and the deformity be obnoxious to the patient, an artificial eye may be employed, which, if properly adapted, may so perfectly resemble the sound one, that it would require an experienced person to distinguish between them.



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but should this not be perfectly effectual at some subsequent period, we must perform the operation recommended for capsular cataract. When a blow upon the eye has injured the vascular connection between the lens and its capsule, the treatment and operation recommended in capsular cataract must be had recourse to, and will be found perfectly equal to its removal. When both the lens and its capsule are separated from their connections in the eye, the indications that present themselves are similar to those which are evinced when the lens is detached from its capsule: the treatment also which is required is precisely the same.

EXPLANATION OF THE VITRIOUS HUMOUR.

In some very extensive wounds of the ball, when the sclerotic and choroid coats have been ruptured, the vitreous humour

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| Page 2, line 16, | for ride, read ridge. |
| — 15, — 42, | for febrils, read fibres. |
| — 32, — 25, | for permits, read permit. |
| — 42, — 19, | for amonticulus, read monticulus. |
| — 43, — 12, | for retina, read retinæ. |
| — 101, — 29, | for promotions, read proper motions. |
| — 105, — 41, | for fifth, read sixth. |
| — 149, — 13, | for vene, read venæ. |
| — 153, — 7, | for musæ, read muscæ. |
| — 153, — 13, | for musæ, read muscæ. |

