THE

MORBID ANATOMY

OF THE

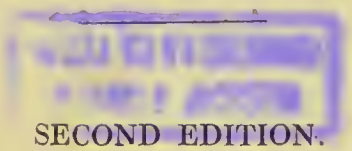
HUMAN EYE.

BY

JAMES WARDROP,

SURGEON TO THE LATE KING.

ILLUSTRATED BY COLOURED PLATES.



SECOND EDITION.

VOL. I.

LONDON:

JOHN CHURCHILL, PRINCES STREET, SOHO.

1834.

ADVERTISEMENT.

NOTHING would have prevented the Author from supplying the demand which has for some years past been made for this Work, but difficulties in getting the plates as accurately coloured as in the former edition, and he embraces this opportunity of remarking, that, although twenty-six years have elapsed since the Morbid Anatomy of the Eye was first published, the care with which he selected the materials is satisfactorily proved by the circumstance, that subsequent researches in this interesting department of Pathology have not contributed any additional facts to render any alteration in the work desirable.

Charles Street,
St. James's Square,
July, 1834.

WORKS PUBLISHED BY THE SAME AUTHOR.

ON ANEURISM AND ITS CURE,

BY A NEW OPERATION.

THE WORKS OF MATTHEW BAILLIE, M. D.

To which is prefixed an Account of his Life,
collected from Authentic sources.

IN THE PRESS.

PART I. ON SURGICAL OPERATIONS.

PART II. ON BLOOD-LETTING.

Each Part, of which these are the commencement of a Series, will be published separately.

PREFACE

TO THE

FIRST EDITION.

THE object of the following Essays is to describe the various morbid alterations in the structure of the Human Eye, and to illustrate, by Engravings, those which are most remarkable.

In the accurate and detailed view which Dr BAILLIE has given of the morbid anatomy of some of the most important parts of the body, the diseases of the Eye are not described; and, as no attempt has yet

been made in this country to treat of the pathology of this organ, little apology seems necessary for the present undertaking. Several excellent practical treatises and detached essays have, indeed, been at different times published; but, during the last thirty years, the diseases of the Eye do not appear to have excited the same attention in this country as on the continent of Europe.

Richter, of Gottingen, has, perhaps, given the best description of these diseases, and laid down the most judicious practical rules that have yet been suggested. Beer and Schmidt, of Vienna, have contributed many useful hints; Voigtel and Sybel have collected a great store of facts connected with

the morbid anatomy of the eye; and SCARPA, CONRADI, and others, have likewise enlarged our knowledge of the treatment of the diseases of this organ. None of these authors, however, have delineated the morbid changes of structure which they have described: A few drawings only are to be found in the works of BEER and SCARPA, and in some periodical publications. The importance of a work, the object of which is to supply these defects, is sufficiently obvious.

The opportunities which the Eye affords to the pathologist, from the variety in its structure and situation, of discriminating all its morbid changes, and observing their progress, render its diseases peculiar-

ly interesting; and as there is no organ, the loss of which can be productive of so many disadvantages, and so various and bitter calamities, without entirely destroying the existence of the individual, its diseases claim the most patient investigation, and deserve the most minute attention of medical men.

Although the following pages are devoted exclusively to the investigation of the diseases of one organ, the author is fully sensible that the task which he has undertaken is attended with considerable difficulty and labour; but if they shall, in any degree, contribute to the attainment of the end proposed, or if they even excite the attention of medical men to so interesting a subject, he will

deem his labours well rewarded. It is by continued attention alone, and by the patient investigation of changes produced by disease in all the organs which compose the human body, that we can expect to extend the knowledge of the morbid anatomy of each; whilst, at the same time, it is by a detailed account of the diseases of each separate organ that we can arrive at any general conclusions. But the field of medical science is very extensive, and to explore it with success, requires the co-operative efforts of many individuals; for it is only in proportion as facts are accumulated, and the various morbid appearances investigated, that the phenomena of disease can be understood,

the morbid actions explained, the science of medicine freed from erroneous theories and hypotheses, and its practice liberated from the rash and unskilful hand of empiricism.

The progress which has lately been made in pathological science, is a sufficient stimulus to exertion, and affords every reason to expect ultimate success. To use the words of Dr Reid, "We may, by caution and humility, avoid error and confusion. The labyrinth may be too intricate, and the thread too fine to be traced through all its windings; but if we stop where we can trace it no further, and secure the ground we have gained, there is no harm

done; a quicker eye may, in time, trace it further."

In the following Essays, the author has not only stated what he has had an opportunity of observing himself, but he has endeavoured to collect information from the works of the respectable authors whose names he has already mentioned, and from every other source to which he could find access. He ought also to acknowledge himself indebted to the liberality of many of his medical friends, from whom he has derived many useful hints, and who have afforded him opportunities of examining diseases which were either uncommon, or particularly worthy of notice.

For the Drawings which accom-

pany this work, the author is, in a particular manner, indebted to Mr Syme, an ingenious artist of this city. He has combined the art of the painter with the skill of the anatomist; and as he has retouched all the impressions of the Plates, there is a truth and accuracy preserved in the colouring, which are seldom met with in works of this kind.

In some of the Drawings, several diseases are represented; for every opportunity was embraced of delineating an eye affected with more than one complaint, in order to avoid multiplying the number of Engravings.

Those who are not much accustomed to examine the morbid ap-

pearances of the Eye, may begin with consulting the Plates, as they will thence be enabled to form a general idea of the disease represented, and the subsequent account will thus become more clear and intelligible.

If the public shall approve of this Essay, it is the author's intention to prosecute his plan, by considering the remaining Diseases of the Eye and its Appendages, and the Treatment which such diseases require.

Edinburgh,
April 1808.

CONTENTS.

PRELIMINARY OBSERVATIONS.

All animals are composed of a certain number of organs, which, under the influence of the vital principle, produce those wonderful phenomena that distinguish living organized bodies. An acquaintance with the relative position, magnitude, and direction of these organs, is one of the objects of anatomical researches: On this the surgeon builds all his theories, and it guides his hand in every operation. But, for the advancement of physiological and pathological science, something more than this

species of anatomy is necessary. It can only be considered as the first step towards a knowledge of the functions, but it does not even serve this purpose except under particular circumstances. When the anatomist divided the body into regions and districts, and shaped his inquiries to suit his unnatural divisions, every organ appeared insulated and detached; the most minute parts might have been discovered and described, but their mutual connections and sympathies were unknown. Anatomy and physiology were then disjoined; the former was imperfect, and the latter could scarcely be said to exist.

A more minute and philosophical examination of the structure and properties of the different organs led the way to a knowledge of some of their functions, and pointed out the principles which should regulate the investigations of every rational physiologist. Haller was among the first to avail himself of the advantages of this plan. It conducted him to all his important discove-

ries ; and it has determined the progress of every scientific inquirer since his time. To it we are indebted for almost every improvement that has been made in this branch of science ; and it is the only method by which we can hope still further to augment our knowledge. In pursuing this track, the labours of modern anatomists have been well rewarded. They have freed physiology and pathology from the chimerical conjectures by which they were so long debased, so that they now begin to assume their rank among the sciences, and in some cases to afford a safe guide to the medical practitioner.

No one in our day has exerted himself more successfully in this field than the late celebrated Bichât. His *Anatomie Generale* is one of the most remarkable productions that has ever appeared in medical science. It has unfolded a path of investigation which was scarcely ever trodden before, and laid the foundation of a new anatomy and a new physiology. I cannot pretend here to do justice to the merits of this work,

nor to give a correct view of the facts and reasonings by which his doctrines are supported. They are as numerous and various as are the parts and functions of the living body. But, as I propose, in examining the pathological anatomy of the Eye, to adopt some of the principles which he has established, the following observations are deemed necessary, in order to explain the purport and tendency of the classification which I have followed.

Most of the organs of our body are made up of a variety of elementary parts, or Textures, each of which, in whatever situation it is found, affords uniformly the same physical properties. These are the elementary parts, which, by the diversity of their combinations, produce all the modifications of structure and functions which the different organs of animals exhibit. The study of these elementary parts, independent of the organs which they concur to form, is the object of *general* anatomy.

This method of considering organized

bodies is not an unnatural abstraction, nor a speculative refinement. It arises from the essential nature of their constitution, and it accords with every phenomenon with which we are acquainted. It may be traced in the observations of many of the older anatomists; and considered as the basis of some of the most ingenious physiological theories of the late celebrated Mr John Hunter. Although, therefore, at first sight, it may have the appearance of being arbitrary and artificial, it is nevertheless, I am persuaded, founded on the most approved principles of philosophical investigation. A knowledge of the qualities of the different parts of which our organs are composed, must afford the surest means of acquiring information concerning the functions of these organs, and of becoming acquainted with the changes which they undergo in disease.

On these principles Bichât has founded his anatomical system. To numberless experiments upon living animals, he added all the information which could be acquired by dis-

section. He employed chemical re-agents to supply the deficiencies of the knife, and examined with minuteness all the varieties of morbid structure. By these means he endeavoured to fix the characters of the elementary textures, and then proceeded to investigate their combinations, as they are naturally presented to us in the different organs.

Of these textures, he has enumerated twenty-one, each of which he has shown to be differently organized; and hence the dissimilarity of their properties, both in health and in disease. This is the ground-work of the whole fabric, and to it we must ultimately recur in every attempt, to account either for the natural or morbid appearances which are to be met with among organized beings.

I mean not at present to enter more minutely upon the consideration of the elementary textures, my object being merely to show, in a general manner, the effect of this anatomical arrangement on pathological

theories. In our notions of all local affections, its influence is obvious; but in those diseases where there is no evident change of structure, and where many parts of the body seem to be disordered simultaneously, there is little room for the inquiries of the pathologist. It is, accordingly, in the former class of affections that the utility and advantages of General Anatomy are most apparent.

By this view of the subject we learn that diseases at their commencement are generally confined to one texture, the others of which the organ is composed remaining sound. This important truth is made manifest in many affections of the Eyes; but there is no part of the body, from which illustrations of the same doctrine may not be deduced. At different times we see inflammation attacking the conjunctiva, or the various textures which form the cornea; at others, it is seated in the iris, in the capsule of the crystalline lens, or in the sclerotic coat. The same is true of the different

membranes of the brain; of the mucous, serous, and muscular textures which compose the stomach, and intestinal canal; of the cellular texture of the lungs; of the mucous membrane of the bronchiæ; or the serous membrane of the pleura.

But diseases are not only confined to one individual texture of an organ, as in the cases just mentioned; the symptoms and morbid changes are likewise uniformly the same in textures of a similar structure, in whatever part of the body these textures may happen to be found. Thus the serous membranes, which invest the lungs, the brain, the heart, the abdominal viscera, have one common character, when affected with a specific disease; so also have the mucous membranes, whether in the mouth, the nose, the vagina, urethra, or covering the eye-ball; and the same is observable of every individual texture which enters into the composition of our bodies. Dr Carmichael Smyth, * in this country, and Pinel, †

* Medical Communications and Inquiries, Vol. II.

† Nosographie Philosophique.

in France, did much in pointing out the variety in the phenomena of inflammation, in some of the different textures of the body. It was an attempt highly worthy of the authors; but they did not lay down any system, or draw any general conclusions; nor did they attempt to trace the same analogy in other diseases. Thus, although the morbid changes of some of the textures have been ascertained with tolerable accuracy, we are still ignorant of many of the others. This is a field which has hitherto been little explored. It is of boundless extent, and presents inexhaustible subjects of investigation to the genius and industry of future inquirers.

Besides the symptoms and morbid changes which are common to all textures the structure of which is similar in the natural state, there are others which are determined from the particular functions of the organ in which the diseased texture exists: For example, when any of the Serous membranes are inflamed, the nature of the pain, the de-

gree of fever, and the duration of the symptoms, are the same in whatever one it may have taken place. But to these symptoms are added cough, difficulty of breathing, &c. when it happens to be connected with the organs of respiration, as in the case of *pleuritis*; costiveness, stranguary, delirium, loss of vision, when the intestines, the bladder, the brain, or the eye, are involved in the disease.

This view of the subject naturally suggests a correspondent division of the symptoms. The first class are general, and characterize a whole genus of textures; the second are in a manner accessory, and depend upon the relative situation, or the particular functions of the organ, into the composition of which the affected texture enters.

The foregoing remarks will tend to explain the object of General Anatomy, and the important purposes to which it may be applied, both for illustrating pathology and therapeutics. But here we must set bounds to this theory;—the history and

progress of diseases show, that we ought not to confine our observations within such narrow limits. The principles which I have stated, indeed, account ingeniously for the propagation of some affections, and for some of the sympathies which subsist between different parts of the body; but there are other disorders which advance in a different manner. In some diseases which are termed chronic, for example, every texture of an organ becomes gradually altered, although the primary affection is confined to one of the component textures. This may often be observed in cancer, scrofula, lues venerea, &c. When cancer attacks the mamma, it is, at its commencement, generally confined to a small portion of that organ, but, if allowed to proceed, it ultimately involves the whole glandular, cellular, and cutaneous textures, in one common mass of disease.

The author from whom I have adopted some of the foregoing remarks has, with wonderful ingenuity, illustrated and established the theory which has now been in

part described. In his hands morbid anatomy has assumed a new aspect; and he has pointed out a method of classifying the numerous facts which that science embraces, with a degree of accuracy and precision that was never before known. In prosecuting this science, we ought to examine the symptoms and changes of structure which are to be found in every individual texture, in whatever organ or region they may exist, and, after ascertaining the alterations proper to every system, then we shall be better prepared to investigate the diseases as they take place in different organs of the body, or in different regions.

These general observations will be sufficient to give an outline of the principles of a pathological system, founded on the basis of anatomical knowledge; and when they are applied to the investigation of the morbid anatomy of the Eye, they will be found to afford a happy illustration of the system which I have ventured to adopt. For this beautiful organ is not only composed of a

great variety of textures, but the transparency and ready examination of most of its parts in the living body admit of a great minuteness and accuracy of observation ; and the various morbid changes can be much more distinctly observed than in any other part of the body.

The parts which form the Eye-ball, and which are immediately connected and subservient to the performance of its functions, as they present a great variety in structure, they are necessarily liable to a proportionate variety in their morbid changes. The external covering of the eye-ball, eye-lids, and lacrymal passages, or Conjunctiva, being a mucous membrane, we shall find that it is subject to all the diseases of mucous membranes in other parts of the body. The diseases of the Cellular membrane, which lies underneath the conjunctiva, are analogous to those of the cellular membrane in other organs. The Sclerotic coat, the Iris, the Choroid coat, the Crystalline lens, the Optic nerve, the Retina, and the different

parts which compose the Cornea, are also liable to morbid changes similar to those textures in other organs to which they are analogous; the various phenomena being more or less modified from the peculiarity of the functions of the organ.

In the descriptions of the Diseases of the Eye which are given in the following Essays, I shall divide them into two great classes. The first will contain an account of the morbid changes of each separate structure which enters into the composition of that organ; and the second, an account of those diseases which have a specific character, and have symptoms peculiar to themselves in whatever structure of the body they appear, or which, when they attack the Eye, affect a greater or less number of its different parts at the same time.

Under the first class will be comprehended the diseases of the Cornea, Iris, Aqueous, Vitreous, and Crystalline humours, Optic Nerve and Retina, Choroid coat, Sclerotic coat, Conjunctiva and Cellular membrane,

Tarsi and Palpebræ, Lacrymal Gland and Caruncle.

Under the second class will be included Gout, Rheumatism, Lues Venerea, Exanthematous Ophthalmia, Cancer, Fungus Hæmatodes, and Scrofula.

As to the order of treating these, I shall follow nearly that in which the different parts have now been mentioned, as it appears to me the most simple arrangement to begin with the parts which first present themselves when the organ is examined in its natural state.

CHAP. I.

GENERAL REMARKS ON THE CORNEA.

The cornea, in its natural state, possesses properties different from any of those classes of simple textures or membranes, into which anatomists have divided the component parts of the human body.

Some have conceived, that, in structure, the Cornea much resembles the Nails; but a superficial examination will be sufficient to shew, that there is little similarity between these two textures. The nails are not, like the cornea, separated by a particular fluid into distinct layers. They are not endowed with an equal degree of sensibility, nor are they liable to those diseases which affect the cornea. They are

not subject to inflammation; tumours are not observed to grow from their surface; neither are they capable of adhesion or cicatrization.

Others have attempted to demonstrate, that the Cornea is merely a continuation of the sclerotic coat; but the functions and diseases of these two membranes differ so much from each other, that they clearly indicate a difference of structure and qualities. The Sclerotic coat exhibits all the properties which the fibrous membranes possess. It has a shining, opaque, white, colour. It is composed of numerous filaments, running in every direction, which are closely interwoven with one another, and it cannot be divided into layers. The Cornea is organized in a manner totally different. It is formed of an indeterminate number of laminæ, which are easily separable from one another, either by the knife or maceration. They are also occasionally separated, in diseases, by the effusion of blood or pus. From

these circumstances, the cornea may be considered as a membrane *sui generis.*

But, though the Cornea possesses properties peculiar to itself, it will be found, that the structure, functions, and morbid changes, of some parts of this membrane, have a striking analogy to those of other textures in the animal economy.

Anatomists have shewn, that the external surface of the Cornea is a continuation of the conjunctiva. This covering seems referable to that class of membranes which have been denominated *mucous.* It can be separated from the subjacent parts by dissection ; it is of a softer texture, and tends more rapidly to putrefaction than the substance of the cornea. It is also nourished by the same vessels which supply the conjunctiva, covering the sclerotic coat, as may be seen when it becomes inflamed ; and it will also be shewn, that the diseases to which it is subject are those of mucous membranes.

The internal surface of the cornea is lined by the membrane that forms part of the

cavity which contains the aqueous humour, and perhaps it assists in the exhalation of that fluid. * According to the arrangement which I have adopted, it may, with propriety, be considered as a membrane of the *serous* class. This membrane may not only be demonstrated by dissection, but, as shall afterwards be shewn, it is subject to all the morbid changes of the serous textures. †

The substance of the Cornea, which is situated between these two membranes, is composed of concentric cellular laminæ, in the cells of which a peculiar fluid is deposited by the exhalents.

In the Fœtus, the cornea is usually tinged of a rosy colour, and is much thicker, but less convex and pellucid than in the adult. In old age, the cornea becomes horny, and sometimes as hard and gristly as a piece of cartilage. ‡

* *Tunica Humoris Aquei.*

† See Chap. XV. Vol. II.

‡ Angely. Comment. de Oculo Organisque Lacrymalibus.

In the description of the Diseases of the cornea, I shall begin with Inflammation, as it is the morbid affection which occurs most frequently, and as many of the other diseases to which the cornea is liable, are either preceded or accompanied by one of the various modifications of that state.

CHAP. II.

OF INFLAMMATION OF THE CORNEA.

The cornea in the sound eye is perfectly transparent, and none of its vessels admit the red particles of the blood; but, when Inflammation takes place, vessels carrying red blood may be distinctly seen ramifying through it, and every change which takes place in the number, in the mode of distribution, or in the colour of the contents of these vessels, may be accurately examined. Besides an increase in the vascularity, inflammation of the cornea is attended with more or less dimness, pain in the eye, intolerance of light, and those symptoms which usually take place when any other part of the organ of vision is inflamed.

The inflammation, however, does not usually affect all the textures of which the cornea is composed at the same time ; and though, in many instances, it may be difficult to discriminate the precise extent of the disease, yet, in others, it may clearly be shewn, that the inflammation is entirely confined to one of the textures.

As this distinction involves very important consequences, both in a pathological and practical point of view, I shall consider inflammation of the cornea under three separate heads :—

First, As affecting the conjunctiva, which covers the cornea.

Secondly, As confined to the proper substance of the cornea ; and,

Thirdly, As affecting the membrane which lines the internal surface of the cornea, or Capsule of the Aqueous Humour.

1. *Of Inflammation of the Conjunctiva of the Cornea.*

It is by no means unusual to observe, in those who have had long or repeated attacks of inflammation of the conjunctiva covering the sclerotic coat, a considerable degree of obscurity and vascularity extending over the cornea. This took place in many of our troops who suffered from the puriform ophthalmia in Egypt, and who have, since their return home, been subject to frequent inflammatory attacks in their eyes. Many cases have also occurred where the same effect was produced by the ophthalmia which has since been so frequent in this country. The obscurity of the cornea, in the cases to which I allude, appeared to be confined to its external surface. Red vessels became ramified upon it, and they were much more numerous, in proportion to the degree of opacity, than they ever are in

speck of the cornea. I have observed, in a variety of cases of ophthalmia in this country, where the conjunctiva covering the sclerotic coat was attacked with inflammation, that red vessels branched out from a particular portion of the affected part, and extended a little way over the edge of the cornea; but these vessels generally disappeared when the more violent inflammatory symptoms were subdued. In all these cases, however, the inflammation commenced and extended from the sclerotic conjunctiva to that part of it which covers the cornea.

But, in other instances, the inflammation first appears in the conjunctiva covering the cornea, and is almost entirely confined to it alone. When this takes place, it very much resembles a *Speck*, on a superficial examination; but the commencement, progress, and final termination of the two diseases are very different.

Inflammation of the Conjunctiva of the Cornea begins at the circumference, and

gradually extends over the surface of the cornea, whereas a Speck commonly commences at the centre of the cornea, or at some distance from its circumference, spreading in every direction from that point. In the inflammation of the conjunctiva covering the cornea, the opaque part becomes elevated above the natural surface of the cornea, and is highly vascular; whereas, in speck, the form of the cornea remains unaltered; and, although one or more vascular trunks advance to the speck, yet the distribution of their branches becomes in general imperceptible.

Inflammation of the conjunctiva of the cornea may also be mistaken for a *Pustule* of that membrane; for, in the latter disease, the conjunctiva adjacent to the pustule is sometimes distinctly vascular, and elevated above its natural surface. But if the progress of the two affections be attentively observed, they will be found to differ, for a pustule of the cornea, like a speck, begins at one point,

extends from it as a centre, and very frequently terminates in an ulcer. *

The most remarkable symptom of Inflammation of the external lamina of the cornea, is the appearance of an elevated and whitish coloured spot or streak, at some point near the union of the cornea with the sclerotic coat; accompanied by a greater or less degree of inflammation of the adjacent conjunctiva. The blood-vessels in the inflamed part are of a bright scarlet colour, run in a straight direction, and are most numerous towards the diseased spot, some of them being ramified through it. This opaque spot gradually extends across the cornea, acquiring, as it proceeds, an oblong form, with a rounded obtuse point. It continues elevated above the natural surface, is distinctly defined, and remains nearly of the same breadth till it reaches the centre of the cornea. If it passes beyond this, it becomes broader, and the breadth increases as it extends, but

* See Ulcer of the Cornea.

I have never, in any instance, observed it pass as far as the opposite edge of the cornea. The degree of vascularity also increases in proportion as this spot becomes larger; and if a magnifying glass be used, the whole of the diseased part will be seen crowded with red vessels. *

When the inflammatory symptoms abate, and the progress of the complaint is checked, the vessels distributed on the diseased portion of conjunctiva acquire a purplish colour, gradually diminish both in size and number, and run in a tortuous direction. The elevation of the membrane subsides, and if the inflammation has neither been very violent, nor of long duration, its transparency is completely restored. But this is not always the manner in which it terminates, as a degree of obscurity sometimes remains after all the inflammatory symptoms and appearances of vascularity have abated. In other instances there is both a slight degree of obscurity, and

* Compare fig. 2. Plate I. and fig. 1. Plate II.

some red vessels. In one case, where the accompanying inflammation was very violent, the diseased portion of conjunctiva separated completely from the subjacent cornea, and came off in the form of an opaque slough, leaving a slight degree of obscurity in that part of the cornea on which it had been situated.

After the eye has been once affected with this disease, it is very liable to subsequent attacks; and although the cornea regains its transparency, and the red vessels disappear, yet every fresh inflammation is more obstinate than the former, a larger portion of conjunctiva becomes inflamed, and even after the inflammatory symptoms disappear, the conjunctiva remains interwoven with varicose vessels, flaccid and opaque, having the appearance of a new formed membrane. *

Most of the cases of this disease which I have had an opportunity of observing have been in children. In one instance, however, it occurred in a lady nineteen years

* Vide Pterygium, Chap. III.

old. I have seen another remarkable example of this disease in a strong healthy man, about thirty-five years of age. In this instance it was accompanied with very violent inflammatory symptoms; and although the whole of the corneal substance had, from the commencement of the disease, become cloudy, yet the patient himself, by examining daily his eye at a glass, gave a very accurate account of the progress of the opacity of the conjunctiva covering the cornea, describing it as beginning at the edge of the cornea, and extending gradually to past its centre. When I saw him, all the inflammatory symptoms had disappeared, the substance of the cornea had regained its transparency, and the affected portion of the corneal conjunctiva remained thickened, of a brownish colour, and interwoven with blood-vessels, the trunks of which were formed into a cluster, at the union of the cornea with the sclerotic coat.

2. *Of Inflammation of the Proper Substance of the Cornea.*

If the whole of the proper substance of the cornea be inflamed, the red vessels enter at every part of its circumference. They are always most numerous at the margin, and few of them advance to the centre. I have seen them so numerous, as to form a red band or ring round the outer edge, leaving the central part transparent. If the inflammation be confined to one spot, the red vessels appear in clusters on the adjacent portions, both of the cornea and sclerotic coat.

From the commencement of the inflammation, the cornea loses its transparency and lustre, and becomes so dim and clouded, as greatly to interrupt vision. There is either an equal degree of obscurity over the whole cornea, or one part is more opaque than another; but the degree is, in general, proportioned to the severity of the other symptoms.

When the inflammation is extremely violent, I have seen small vesicles, filled with red blood, formed between the layers of the cornea; and in some cases blood effused into the aqueous humour, tinging it of a red colour.

In the first, or active stage of the inflammation, the blood-vessels on the sclerotic coat are of a bright scarlet colour. They run in a very straight direction, and pass over the edge of the cornea. Each trunk can be readily distinguished, and the branches into which it is divided come off at very acute angles, and not until the trunk reaches the circumference of the cornea.

Inflammation of the cornea is accompanied by more or less general fever, pain in the eye, extending to the head, intolerance of light, increased secretion of tears, and impaired vision.

Although inflammation may originate in the cornea, it is always accompanied with a preternatural degree of redness of the sclerotic coat; and it is often impossible to determine whether the cornea or sclerotic coat is pri-

marily affected. In cases where the cornea is wounded, it cannot be doubted, that the inflammation originates in the wounded part, however far it may afterwards extend; but, in many instances, both the cornea and sclerotic coat seem to have an equal share in the disease. It is probable that this ready communication of diseased action between these two coats, depends chiefly on their vascular connection; for the vessels of the substance of the cornea are all derived from the sclerotic coat, and, as has been before mentioned, those of the conjunctiva covering the cornea, are continuations of the vessels of the conjunctiva covering the sclerotic coat.

The symptoms of Inflammation of the Cornea generally suffer, whether by the application of remedies, or from the progress of the disease, a very remarkable change after a certain period. The red vessels of the sclerotic coat and cornea increase in size and in number, change in colour, and are distributed in a different manner. Instead of run-

ning in straight lines, and sending off their branches at acute angles, they become tortuous, anastomose, and form net-works. The bright colour changes into a darker and more purple hue, and the eye appears as if glazed, losing all its lustre and expression. The pain, too, and general fever, which were severe, are now alleviated, or cease altogether, and the free admission of light is not attended with much uneasiness. If the inflammation has been occasioned by an wound, such as that which is made for the extraction of a cataract, this change generally takes place in twelve or fourteen days after the operation. The change approaches more slowly in those cases where inflammation arises from other causes, and rarely happens till after a period of some weeks, or even months, from its commencement. In many cases, indeed, no such distinction can be made, as, throughout the whole progress of the disease, there is a constant change taking place in the abatement or increase of all the symptoms.

I have seen a few cases where there were a number of varicose vessels in the cornea, in consequence of previous inflammation; and the patients, in describing the state of their vision, said they saw small lines, or streaks, passing across the eye, which they sometimes observed to vary in their size, and to have a kind of irregular vermicular motion, such as the blood-vessels in the cornea may be supposed to have.

If an attempt be made to divide the enlarged vessels as they pass over the cornea, a dangerous practice sometimes employed in the treatment of the disease, they are found to lie deep, and they cannot be so easily raised from the cornea or sclerotic coat with the forceps, or elevated by a pointed instrument, as may be done when the corneal conjunctiva has been inflamed. In order to complete the division of one of these vessels, it becomes necessary to remove a considerable portion of the substance of the cornea, or sclerotic coat. Soon after such an operation has been performed, lymph is effused

on the surface of the wound; and it often happens, that vessels shoot through this lymph, forming a medium of communication between the divided extremities; so that after the effects of the operation seem to have abated, the vessel remains in one continued trunk, and appears as if no division had been made. In other cases, the minute ramifications of the divided vessel which remain, anastomose on the cornea, so that red blood continues to be circulated through the trunk.

Inflammation of the cornea occurs at every period of life, and, like other inflammatory affections, is most frequent among the young and plethoric. It most frequently arises from wounds and other external causes; as when pieces of stone or melted iron are imbedded in it. But the cornea is also often inflamed in cases of ophthalmia arising from small-pox, scrofula, and various eruptive diseases; the inflammation being, in all those cases, modified according to the specific cause from which it originated.

Inflammation of the cornea, when proper means are employed for its removal, most frequently terminates by the disappearance of all its symptoms. Sometimes, however, during the progress of violent inflammation, purulent matter is formed between the lamellæ of the cornea, which, by ulceration, either discharges itself internally into the anterior chamber, or externally, leaving an ulcer of the cornea. More frequently, after all the inflammatory symptoms have disappeared, a part of the cornea does not regain its natural transparency, so that a *Speck* remains, nourished by one or more red vessels.

3. *Of Inflammation of the Membrane which lines the Internal Surface of the Cornea.*

Although, from analogy, it is highly probable that the portion of the capsule of the aqueous humour which lines the internal surface of the cornea may be inflamed, and the inflammation neither affect the proper

substance of the cornea, nor its external covering; yet I have never been able to observe an instance with sufficient accuracy where this took place. In cases of venereal ophthalmia, there is often a peculiar muddiness of the cornea, apparently deep-seated, followed by the effusion of lymph between the cornea and iris; and it is by no means improbable that, in these cases, the lymph has been effused, and the opacity of the cornea produced by the inflammation of its internal membrane. I have also frequently observed cases where the iris and internal surface of the cornea had formed adhesions, in which the substance of the cornea did not appear to have been inflamed. The inflammation, or at least some of the morbid changes of the internal lamina, may also be concerned in the cases where the quantity of the aqueous humour is either increased or diminished; and it must often participate in the inflammation which originates in the proper substance, or in the external covering of the cornea.*

* The inflammation of the Capsule of the Aqueous Humour is fully described in Chap. XV. Vol. II.

CHAP. III.

OF THE PTERYGIUM.

THE word *Pterygium** is employed to denote all those morbid changes, in which that portion of the conjunctiva covering any part of the cornea or sclerotic coat becomes thickened, vascular, and opaque; and some authors have attempted to introduce a number of terms to characterize the different varieties of the disease, considering each as a distinct species.†

* Eye-wing,—Das Augenfell of the Germans,—L'Ongle of the French.

† Traité sur les Maladies de l'Oeil, par Antoine Maitre-Jan. —Also Anfangsgründe der Wundarzneykunst, von August Gottlieb Richter. Dritter Band.

It has already been mentioned, that inflammation may be confined to the conjunctiva covering the cornea. If this inflammation continues for a long time, or if there are repeated attacks of it, the affected portion of conjunctiva assumes the appearances of a new formed membrane, even after all the inflammatory symptoms have abated. This new formed membrane constitutes what has commonly been denominated the Membranous Pterygium, or *Pannus*.*

It also sometimes happens, that the portion of conjunctiva which covers the sclerotic coat becomes preternaturally thick, and the cellular membrane which connects the thickened part with the sclerotic coat, is so much relaxed, that it may very easily be moved backwards and forwards; and when the eye-ball is placed in particular positions, it forms itself into folds, and becomes as if wrinkled. This thickening and relaxation of the conjunctiva extends, in some cases,

* Pterygium tenue, Ungula, l'Onglet, see Plate III. fig. 1.

round the whole circumference of the white of the eye,* in others, it is confined to a small part of it.

In the first case, the disease has the appearance of a dull white-coloured fold, all round the edge of the cornea, and the eye loses its shining appearance and lustre, and becomes of a yellowish colour. When the disease increases, the fold gradually extends over the cornea, approaching towards the centre.

If the disease be confined to a particular part of the conjunctiva, it is observed, at its commencement, like a small globule of fat,† or condensed cellular substance, situated, most frequently, near the junction of the cornea and sclerotic coat; and this spot, extending imperceptibly along the surface of the conjunctiva, at length passes over the cornea. After it has extended a little way, the conjunctiva on the adjoining part of the sclerotic coat becomes puckered, and ap-

* Richter's Anfangsgründe.

† Das Fettfell of the Germans,—Pterygium pingue.

pears as if it were forcibly drawn over the cornea. The portion of it which lies on the sclerotic coat is commonly loose, and can be easily elevated; but that which is on the cornea adheres more firmly. This species of pterygium has generally a triangular form, * one of the angles of the triangle either advancing towards the cornea, or covering a portion of it, and the base lying on the sclerotic coat. Sometimes the thickening of the conjunctiva is first perceived on the cornea, the conjunctiva covering the sclerotic coat remaining quite sound. †

A pterygium is always considerably elevated above the surface of the adjacent cornea, but the degree of its thickness varies from that of a thin membranous film to a thick fleshy mass. ‡ In some cases it has been found thick and coriaceous, and in others as hard as parchment, and even cartilaginous. §

* See Plate III. fig. 2.
† Richter's Anfangsgründe.
‡ See Plate III. fig. 1, 2, and 3.
§ Richter's Anfangsgründe.

The cellular substance under the conjunctiva sometimes participates in this disease; in other instances it does not seem to be affected.

In one case, a small bladder, containing a pellucid fluid, was observed in the middle part of a pterygium.

In those Pterygia which have a membranous-like appearance, the red vessels are generally few in number, and run in straight lines from the sclerotic coat towards the centre of the cornea. In those which are thicker, and which have a fleshy appearance, there is a general red tinge given, from the vessels being very numerous.

Pterygia arise commonly at the great or nasal angle of the eye-ball; they are also formed at the temporal angle, and they sometimes occur at both places, in the same eye. * I have seen one case in which there were two pterygia on each eye. They are formed very rarely on the upper and under parts of the eye-ball.

This disease seldom extends farther than

* Traité Pratique des Maladies des Yeux, par A. Scarpa.

the centre of the cornea, when it begins in a single point. But when two Pterygia arise from opposite points of the same eye, they sometimes spread over the cornea till they nearly meet, and then form a complete obstruction to vision; the imperfection of vision in this disease being in proportion to the thickness of the pterygium, and to its approximation to the pupil.

When a Pterygium arises in the nasal angle of the eye, it seems almost always to attach itself to the semilunar membrane, and in many cases it also adheres to, and involves the lacrymal caruncle.

Pterygia occur most frequently in people advanced in life. They are, however, also met with in children: And I have seen one instance in which the disease was observed immediately after birth.

Many have supposed that the Pterygium was a particular kind of expansion or growth from the lacrymal caruncle, or from the semilunar membrane; but from the variety in its appearances, and from observations

on the progress of the disease, it would seem that its connection with these parts is accidental; and that pterygia arise from a variety of causes, some of which we are, perhaps, not able satisfactorily to explain.

It has already been mentioned, that the thin Membranous Pterygium is the consequence of repeated attacks of inflammation of the conjunctiva covering the cornea.

The manner in which the common Triangular-shaped Pterygium is formed is much more singular, and appears to have no analogy to any morbid change in other organs which have a similar structure. The constancy in the regularity of its triangular form ought to be referred, says Scarpa, the celebrated Professor of Pavia, to the adhesion of the lamina of the conjunctiva covering the cornea becoming stronger, in proportion as it advances from the circumference to the centre of the cornea; for, in consequence of such structure, and different degree of cohesion which exists in the sound eye, it should necessarily follow, that the progress of the

pterygium ought to be, in every case of the disease, much slower upon the cornea than upon the white of the eye; and that, from the greater resistance which the pterygium always meets with in proportion as it extends towards the centre of the cornea, it ought, from mechanical necessity, to assume a triangular form, the base of the triangle corresponding to the white of the eye, and the apex to the centre of the cornea.

The progress of a Pterygium is, in almost every case, very slow; it arises without any evident cause, and gradually increases, without pain or inconvenience, until it acquires a considerable bulk, and encroaches on the sphere of the pupil. In many instances, it remains for years without undergoing any perceptible alteration.

CHAP. IV.

OF FLESHY EXCRESCENCES OF THE CORNEA.

Besides pterygia there are excrescences of a different description, which are called *Caruncles*,* or Fleshy Excrescences of the cornea. Of these there are three distinct kinds. One species appears at birth, or soon after it, and resembles the nævi materni so frequent on the skin of various parts of the body. The second species has a greater analogy to the fungi which grow from mucous surfaces; and the third commonly arises after ulceration of the cornea.

* Carunculæ Corneæ,—Excroissances des Chairs, of the French,—Fleishgewächse of the Germans.

I have had an opportunity of examining two very remarkable examples of tumours of the cornea, which appeared at birth. The first was that of a girl, on whose left eye there was a conical-shaped mass, the base of which grew from about two-thirds of the cornea, and a small portion of the adjoining sclerotic coat. It was firm and immoveable, had a rough granulated appearance externally, and, from its brownish colour, did not appear to be very vascular. It was small when first observed, and it increased in size in proportion with the other parts of the body.

The second case was shown to me by Dr Monro. The patient was upwards of fifty years old, and the tumour had been observed from birth. It was about the bulk of a horse bean, only a small portion of it adhered, and seemed to grow from the cornea; the other part was situated on the white of the eye, next the temporal angle of the orbit. Its surface had not the granulated appearance of the tumor in the girl's eye;

it was smooth like a pterygium, and seemed to be covered by the conjunctiva, having the natural colour of that membrane. But the singularity in this case was, that a considerable number of very long and strong hairs, upwards of twelve in number, grew from its middle, passed through between the eye-lids, and hung over the cheek. The patient remarked that these hairs did not appear until he had advanced to his sixteenth year, at which time also his beard grew. *

Dr Barron of Gloucester saw a similar case: "The disease took place in a boy fifteen years of age. It was a flat tumour, about one-third of an inch in diameter, with a circular base. More than one-half of it was situated on the cornea, and the rest on the conjunctiva, adjoining to the temporal angle of the orbit. Its surface was smooth and shining, and from its centre grew two hairs, similar to those of the tarsus. In colour it resembled the white part of the conjunctiva."

* See Plate IV. fig. 1.

De Gazelles saw a case where there was a single hair growing from the cornea.*

I have in my possession a preparation of a disease of this kind in an ox's eye, where a thick tuft of black hair has grown from one-third of the cornea, and some hairs also from the semilunar membrane. A similar excrescence was formed in the other eye of this animal.

Such tumours greatly resemble those spots covered with hair, which are so frequent in different parts of the surface of the body, particularly the face. I remember to have seen the description of a very curious case, where a tumour, covered with hair, appeared in the pharynx of a child.

Tumours of the second species, or those arising from a diseased state of the corneal conjunctiva, are but rarely met with. Two different tumours of this description are represented in the plates. †

In one the growth which covered one-

* See Journal de Medecine, Tom. xxiv,

† See Plate IV. fig. 1 and 2.

half of the corneal surface had an irregular form, and a firm granulated texture; in the other the tumour, which also covered a large portion of cornea, had an unequal surface, was of a peculiar dark brown colour, and of a soft texture.

Voigtel * quotes the case of a boy from Mohrenheim, in whom, after a violent inflammation of the eye, a small white point appeared on the inferior part of the cornea, which gradually grew into a hard cartilaginous tumour, of the bulk of a pea. Its base covered one-half of the cornea, and its surface was interwoven with large blood-vessels.

Beer † describes a fatty and fleshy swelling of the cornea which was as large as a cherry-stone; and Plaichner ‡ relates a case, where "a spongy tumour, the size of a hen's egg, grew from the cornea, after the removal of a fleshy swelling."

* See Handbuch der pathologischen Anatomie, von F. G. Voigtel. Halle, 1804.

† Practische Beobachtungen über den grauen Staar und die Krankheiten der Hornhaut, von Joseph Beer. Vienna, 1791.

‡ Dissertatio de Fungo Oculi, 1780.

A fungous tumour, arising from the surface of an ulcer on the cornea, is a rare disease. It, however, frequently happens, that an ulcer destroys the whole thickness of the cornea, allowing a portion of iris to protrude, and the protruded portion has, in many cases, been the origin of large excrescences. "The largest excrescence I ever saw," says Maitre-Jan,* "arose from an ulcer which occupied partly the opaque, and partly the transparent cornea. It was so large as to advance beyond the eye-lids, like a mushroom, and cover the whole eye-ball." After mentioning the means employed to remove it, he adds, "when the excrescence was consumed to the level of the cornea, I then observed, that its base only occupied one-half of the small angle; that the cornea was ulcerated and broken; and that the roots of the excrescence passed from thence, and had their attachment to the uvea."

* Traité des Maladies des Yeux.

CHAP. V.

OF PUSTULES. *

PUSTULES are small tumours, which are formed on the conjunctiva, both of the cornea and sclerotic coat, but they occur most frequently at the junction of these membranes.

A pustule commonly first appears like a dusky yellow, or reddish spot, a little elevated above the surface of the cornea, and, in a short time, it becomes a distinct conical tumour.

The adjacent part of the cornea is always

* They are called Pustulæ Corneæ,—Eiterbläschen by the Germans, when they contain matter,—Phlyctenæ Corneæ,—Phlyctides,—Wasserbläschen, when they contain water.—Bothor of the Arabians.

more or less dim, and a considerable degree of inflammation * accompanies it, which is either confined to the white of the eye contiguous to the pustule, or is spread over the eye-ball.

Whilst the Pustule is forming, the inflammation is generally confined to that part of the white of the eye which is in its immediate vicinity. The blood-vessels, instead of being of a bright scarlet colour, as in the inflamed cornea, are of a pale livid hue. They appear superficial, and can readily be elevated by a pointed instrument. Each trunk can be distinguished, for they are never so numerous as to appear confused, or like one red mass, an appearance so common when a portion of the conjunctiva is inflamed. † They sometimes run in various directions, and anastomose freely with one another, forming net-works upon the white of the eye.

If the inflammation and Pustule remain for

* Ophthalmia Pustulosa, Ophthalmic Bourgeonée.

† See Plate I. fig. 3.

some time, the pustule generally advances to suppuration. When suppuration takes place, the apex of the pustule ulcerates, and frequently a chalky white spot appears at the centre of the ulceration, and the opacity of the cornea at the same time daily increases around it. In other cases the opaque matter separates, and leaves behind it a deep ulcerated excavation. *

Sometimes the suppuration proceeds more like a common pimple or phlegmon of the skin; a small quantity of a thick matter collects within the pustule, and when it is discharged, a conical tumour remains, which has a depression at the apex. †

When the Pustule contains a watery fluid, the fluid is most frequently absorbed in a gradual manner, but at other times the pustule breaks, and an ulcer is formed.

I observed in a young man who had been some months liable to a dulness of the anterior chamber, that in two or three places of the cornea, there were distinct blisters or

* See Ulcer of the Cornea. † See Plate V. fig. 1.

vesications of its external layer, which disappeared in a few days. Similar cases are not unusual.

When the contents of a pustule are artificially discharged, all the accompanying inflammatory symptoms are much increased. *

When the ulceration of a pustule has taken place, besides the ulcerated surface, there is more or less obscurity of the surrounding cornea, which goes away as the ulcer heals. There is also a cluster of blood-vessels generally seen passing along the cornea to the ulcer, which appears to be an increased vascularity of the mucous covering of the cornea. These also gradually vanish, whilst the ulcer is healing.

Most frequently there is only one pustule, and only one eye affected, but in some cases there are several pustules, both on the cornea and sclerotic coat of each eye.

The disease, at its commencement, is almost invariably accompanied with the sen-

* Vide Richter's Anfangsgriinde.

sation of a mote in the eye, and the whole conjunctiva covering the sclerotic coat has often a yellowish and shining glassy colour before the redness appears. There is often also a degree of redness and swelling, chiefly of the upper eye-lid, and the tarsi are found adhering together in the morning from the exudation of a yellow matter among the ciliæ. There is frequently an unusual dryness felt in the eye; but if it be exposed to a bright light, or any attempt made to use it, the secretion of tears is increased.

This species of inflammation is always accompanied with a much greater degree of general fever, in proportion to the severity of the other symptoms, than most other forms of ophthalmia. The pain is rarely acute till the pustule ulcerates, but, if that takes place, it is commonly very severe.

As the pustule disappears, and the subsequent ulcer heals, the inflammatory symptoms generally abate. It is not, however, unfrequent to find, that, although this has taken place, the inflammation returns on any

slight irritation; and I have known many instances of persons who have been subject to repeated attacks of this disease. In some cases, where proper remedies are not employed, one pustule succeeds another, so that, during many months, or even years, the eye is never altogether free from inflammation. In some of these cases where they return frequently, the pustules seldom ulcerate, but disappear gradually, after having remained a few days, or sometimes a much longer period.

I have seen several instances of this disease, where, besides the Pustule, a small quantity of puriform matter formed in the anterior chamber. It was readily distinguished by its yellow colour at the inferior margin of the cornea, and it diminished daily as the inflammation abated. In these cases it sometimes happens that the matter, along with the aqueous humour, is evacuated by the cornea ulcerating, immediately after which the inflammatory symptoms rapidly subside.

Pustules of the cornea are met with in persons of all ages, but they are more common in the young than those advanced in life.

This disease appears to be most frequent in particular places, and in particular seasons of the year. I have generally observed it in the winter months; and in several cases, I have been able to trace its origin to the sudden change from a very warm to a cold atmosphere. At one of the theatres of Vienna, where a cold stream of air passed from behind the stage, over the orchestra, Beer observed, that those who were placed near it were very often affected with this complaint.

It appears to me that these Pustules very much resemble *Aphthæ*, which are so frequently met with in the cavity of the mouth, on the tongue, lips, internal surface of the alimentary canal, and other mucous surfaces; and it is not improbable that the disease arises from inflammation of the mucous glands.

As some remarks of Professor Himly il-

lustrate very strikingly this analogy, I shall finish the account of this disease, by quoting his words: " At a time, when Aphthæ of the throat were very frequent at this place, I also found many vesicles, beginning with an inflammation of the sclerotic coat, and also sometimes, but more rarely, of the cornea. Once I saw a whole family affected with this disease, one after another. It was a true catarrhal affection, and in some cases these vesicles disappeared by diaphoretic medicines, in some by blisters, camphor, and antimony, without any local application, except mucilaginous ones. I think that it is just the same disease as Aphthæ of the intestinal canal, of the corona of the glans penis, and other fine continuations of the external skin." *

* See Bemerkungen über einige Augenkrankheiten, von Professor Himly zu Braunschweig, p. 402 of the 1st volume of Loder's Journal.

CHAP. VI.

OF THE ABSCESS OF THE CORNEA AND ANTERIOR CHAMBER.

A PURIFORM matter may either be effused between the laminæ of the cornea, when the disease is termed *Unguis* or *Onyx*, or in the anterior chamber, along with the aqueous humour, when it is called *Hypopion* or *Empyesis oculi.** This fluid, which has generally been denominated matter, is probably albumen, such as is observed to be effused in other serous cavities during inflammation, and which, as in these, varies in consistence, colour, and other qualities. †

When the matter is effused between the

* Die Eyterung des Auges,—Der Hornhaut Apostem.

† Scarpa, Malattie degli occlis.

laminæ of the cornea, it first appears like a small spot; and instead of resembling a *Speck* in colour, it is of the yellow hue of common pus. As the quantity of matter increases, this spot becomes broader, and it does not alter its situation from the position of the head. If it be situated among the external laminæ of the cornea, or immediately below the corneal conjunctiva, a tumour is formed anteriorly, which, if touched with the point of a probe, the contained fluid can be felt fluctuating within it, or if the eye be looked at side-ways, there is readily perceived an alteration in the form of the cornea.

When the matter is effused between the interior laminæ, it does not produce any evident alteration in the external form of the cornea, but if it be touched with the point of a probe, a fluctuation can be more or less distinctly perceived, and the spot alters its form, and becomes somewhat broader. *

Such collections of matter appear on every part of the cornea. Sometimes they alter their situation by degrees, and sink down-

* See Plate VI.

wards; and sometimes they change both their situation and form.

They very seldom cover more than one-fourth or one-third of the cornea: in one instance, I saw the matter so extensive, as to be spread over nearly the whole cornea.

If the quantity of matter be small, it is often completely absorbed during the abatement of the inflammatory symptoms, and generally no vestige of it is left: In other cases, the cornea is eroded externally, producing an ulcer and subsequent opacity. * In some few instances, the internal lamina of the cornea gives way, and the matter escapes into the anterior chamber. In others, the ulceration is so extensive as to destroy the whole thickness of the cornea, and allow the matter to escape.

If an artificial opening be made, in order to discharge the matter, it often does not flow out readily; and it is sometimes so tenacious, and contained in a cavity apparently so irregular, that it neither escapes

* See Ulcer of the Cornea, Chap. VII.

spontaneously, nor can it be evacuated by art.

When matter is collected in the anterior chamber, it usually appears like a small yellow globule between the iris and cornea; and as its specific gravity is greater than that of the aqueous humour, it generally occupies the inferior part of the cavity.* In some cases I have observed the matter appearing like small opaque flocculi diffused through the aqueous humour, and these, by gradually uniting, formed a drop, which sunk to the inferior part of the cornea.

As the quantity of matter increases, the spot becomes larger, and often assumes a semilunar form at the edge of the cornea.

Sometimes the matter collects in so large a quantity as to pass through the pupil, and fall behind the iris. When this happens, the cornea generally becomes not only opaque, but also loses its natural firmness of texture; and in some very far advanced cases of the disease, when attempting to discharge the matter, I have found

* Richter's Anfangsgründe.

the cornea quite soft, and easily torn to pieces.

Unless when in great quantity, the matter is generally absorbed in proportion as the inflammatory symptoms are alleviated; but if it remains a long time, it sometimes ulcerates the cornea, or becomes inspissated into a tough, light-coloured mass, which remains after all inflammatory symptoms have disappeared.

Schiegel mentions a case of hypopion, where, " by the application of an emollient decoction, the matter discharged itself in an uncommon manner. Whilst using it, the fine pores of the cornea opened, and the matter oozed out in the form of delicate threads. On the second day the distended cornea was considerably flatter, the oozing out of the matter continued without interruption, and in four days nearly two drams of matter had passed through the pores." *

* Vide Magazin für die Wundarzneiwissenschaft herausgegeben, von J. Arneman, 2d Band. 2d Stück.

Abscesses of the cornea and anterior chamber are commonly the effect of violent ophthalmia, occasioned by injuries of the eyeball, as well as of specific diseases. Richter remarks, that matter sometimes collects in venereal and scrofulous patients, without any preceding inflammatory symptoms.

Dr Rutherford related to me the case of a woman who had a very considerable collection of matter in the anterior chamber, accompanied with very little or no inflammation. The matter altered its form and place, according to the position of the head, and, during the day, the agitation of the body, produced from walking, mixed the matter with the aqueous humour, and rendered the whole anterior chamber turbid.

Janin relates a very curious case of Hypopion, where there was not only the absence of the inflammatory symptoms, but where the disease recurred periodically. " Peter Valis consulted me about a periodical blindness with which he had been affected for twelve

months, during the first fifteen days of every month; and, after that time had elapsed, his eyes were restored to their natural state. I examined the organ, in order to ascertain the cause of that singular kind of blindness, and I observed that the anterior chamber of both eyes was filled with a yellow-coloured matter, so thick as neither to allow the colour of the iris, nor the state of the pupil, to be seen through it. The most remarkable circumstance in this case was, that the conjunctiva was very little inflamed, and the eye not painful."*

Richter saw a man who was blind every morning, and it was always remarked that, while the paroxysm lasted, the aqueous humour was quite turbid.

It has been a subject of dispute, to account for the source of the matter which is formed in Hypopion. It appears probable, that as there is no ulcerated surface from which it can be derived, it is the pro-

* Vide Memoires sur l'Oeil, par Janin, p. 412.

duce of a secreting organ. There are numerous examples of the natural secretion of surfaces being altered by diseases. It is very remarkable in inflammation of the mucous membranes, and also in the Pleura, Pericardium, and others of the serous class, to which the membrane which contains and exhales the aqueous humour belongs. When these are inflamed, it is a very common morbid appearance to observe their surfaces covered with a matter, varying from the consistence of thick coagulated albumen to that of a thin yellow puriform fluid.

CHAP. VII.

OF ULCERS OF THE CORNEA. *

ULCERS on the cornea have been divided by some authors into a number of species, from differences in their size,—in their duration,—in the degree of the severity of the accompanying symptoms,—and from the various causes from which they have been supposed to originate. But as these divisions are not founded on any specific differences in the nature of the disease, and as, instead of elucidating the subject, they lead to erroneous conclusions, and render more complex a

* Helcoma.—Das Geschwür der Hornhaut.

subject in itself simple, I shall omit mentioning them, referring those who wish for information on this subject to the works of Wallis,* Maitre-Jan, Mauchart,† and Rowley.‡

The most frequent variety of Ulcer is that which remains after the cornea has suppurated and burst, either in consequence of a pustule or abscess.

When a Pustule suppurates, the central part generally first gives way, and, as the disease continues, the ulceration extends in all directions from that point. Ulcers of this kind are generally circular, and the edges rounded and smooth, having sometimes the appearance of a small artificial dimple.§ In other instances, they have an

* A Treatise on the Diseases of the Eye, by George Wallis, M. D. 1785.

† Burcard, David Mauchart, *De Ulceribus Corneæ*. Tubingæ, 1742.

‡ A Treatise on the Diseases of the Eye and Eyelids, by William Rowley, M. D. 1790.

§ See Plate V. fig. 1.

irregular shape, and their edges are jagged and acute.

The size of Ulcers is very various; in some cases they do not appear larger than a depression made by the point of a pin; whilst in others they cover a much larger portion of cornea. In a boy I saw an Ulcer, which covered at least one-third of the central part of the cornea. It seldom, however, happens that they spread over a large surface, for those of the most malignant kind are more apt to increase in depth than in breadth.

Ulcers are generally superficial, and do not extend deeper than the external lamella; at other times, they penetrate the whole thickness of the cornea, allow the aqueous humour to escape, and the iris to protrude.

Most frequently the part of the cornea contiguous to the ulcer becomes more or less obscure; and in some cases red vessels may be traced in it. It is not unusual, however, to observe a small ulcer without any perceptible obscurity of the cornea.

The surface of an ulcer sometimes retains the natural transparency of the cornea; and sometimes it has a dull unclean appearance, which will be observed to go away, and the surface become transparent when the ulcer begins to heal.

In some violent cases, where the ulceration spreads with great rapidity, the cornea loses not only its transparency, but its tenacity and firmness, and becomes like a piece of wet paper separating in the form of sloughs.

Ulcers often penetrate the whole thickness of the cornea, leaving entire the interior lamina, or capsule of the acqueous humour, which protrudes through the ulcer in the form of a small transparent and prominent vesicle. This affords an additional illustration of the structure of the cornea. I have remarked the same phenomenon in the progress of ulceration of other parts composed of different textures, the ulcerative process being limited to one or more of these structures. I have observed the whole

hernial sac and adjacent cellular membrane destroyed by suppuration, and the intestine remain uninjured. Extensive suppurations often take place around arteries, destroying the cellular membrane, but leaving the coats of the artery untouched.

When the aqueous humour is discharged, from the whole thickness of the cornea being destroyed, the iris sometimes falls forwards, comes in contact with the cornea, and, in many cases, a portion of it is insinuated through the opening made by the ulcer. If the ulcer heals speedily, and the aqueous humour is regenerated, the iris sometimes resumes its natural situation; but more frequently an adhesion takes place between the iris and cornea, so that ever afterwards the pupil remains drawn from its natural situation, and of an irregular form. Sometimes the ulcer is tedious in healing, so that the aqueous humour continues constantly to ooze through it, and thus a *fistula* of the cornea is formed.

In many instances where an ulcer has

penetrated the anterior chamber, the ulcerated orifice is closed by a thin delicate and transparent membrane, which occasionally gives way, allowing the aqueous humour to escape, and the opening appears like a small dark puncture. In such cases the eye-ball usually feels softer than natural.*

In cases where a great portion of cornea is destroyed by ulceration, not only the aqueous, but also the vitreous humour and crystalline lens make their escape, completely destroying the eye-ball.

In a woman, in whom, by a violent attack of inflammation, the cornea was destroyed and came off in large sloughs, a transparent tumour formed by a prolapsus of the vitreous humour through the opening of the cornea. She was thus enabled to see with considerable distinctness for several days, until the vitreous humour began to be absorbed, and the eye-ball to collapse. A man had a cancerous sore on the under eye-

* See Plate VIII. fig. 1.

lid, which, in spreading, inflamed the eye-ball, and ulcerated nearly the whole cornea. Through this ulcer a portion of vitreous humour was pushed, forming a large transparent tumour, which enabled him, for several days, to distinguish minute objects with tolerable distinctness.

Ulcers are seldom accompanied with much swelling of the cornea, except in children, in whom I have sometimes observed the cornea all round the ulcer considerably tumefied.*

Ulcers are generally attended with acute pain, which is much aggravated by exposure to light, or even by the most careful motion of the eye-lids. I recollect having seen only one instance, of an ulcer of considerable size and depth, attended with little pain or uneasiness.

Ulcers, such as have been described, have a striking analogy to those which form on mucous surfaces, or on those parts of the body where the skin is very thin and inflect-

* See Plate V. fig. 1.

ed inwards,* as on the mouth, lips, internal surface of the nose, tip of the tongue, &c. The pustules or aphthæ † which precede these, have the same tendency to ulcerate rather than form matter; they discharge an acrid serum instead of pus; they spread rapidly, and are attended with acute pain.

Ulcers sometimes, though rarely, take place after wounds of the cornea.

Ulcers are also formed in consequence of the action of corrosive substances destroying the vitality of the cornea, producing an ulcer being produced where the dead portion was separated from the living. Lime getting into the eye is the most frequent accident which produces this effect; but the application of the nitrate of silver, muriate of antimony, &c. produces one nearly similar.

When lime falls within the eye-lids, those parts of the surface of the cornea to which it is applied, become covered with an opaque white scale, accompanied by inflammation

* Vide Scarpa Mallatie degli Occlii.

† See Pustules of the Cornea.

over all the external parts of the eye-ball and lids;* but the degree of thickness of the slough and violence of the inflammatory symptoms vary, according to the quantity of lime, and the length of time it has been applied.

The circumstances attending this accident are strikingly illustrated in the case from which the drawing was taken. † Nearly the whole external lamella of the cornea was destroyed from the application of lime; and, from the small share of sensibility which the cornea possesses in its healthy state, the process of separation of the dead parts went on very slowly, lasting several months. After the violent inflammatory symptoms were subdued, the chalky matter began to separate at the union of the cornea with the sclerotic coat, and numerous small red vessels were seen at the place where the separation was going on. The process of

* See Plate V. fig. 3.

† Plate V. fig. 3.

separation proceeded from the circumference to the centre of the cornea; small flakes of the white matter could be daily observed to be coming away; and, after the lapse of several months, the whole disappeared, and the cornea regained nearly its natural transparency.

In some cases Ulcers form on the surface of the cornea, where no previous pustule or abscess has been observed. Sometimes they appear like a mere abrasion of the external lamina, or corneal conjunctiva, and such are usually attended with a good deal of inflammation.

There are other two kinds of Ulcers, of which I have seen a few examples. In one, a considerable number of small white points appeared on the cornea, which, in the centre, had a distinct depression, as if made by the point of a pin. In the other, there was an ulcerated surface of considerable extent; the limits, however, were distinctly circumscribed, the adjacent cornea remaining transparent, whilst the whole surface of the ulcer

was covered with a matter resembling wet chalk.*

The healing process of ulcers shews that the cornea, like most other textures of the body, is capable of Cicatrization. In most cases, this process seems to advance little farther after the principal part of the cavity of the ulcer is filled up, and a plain surface formed; so that, even after all the symptoms of disease have abated, a small dimple or inequality of surface of the cornea remains. If the ulcer has been small or superficial, the depression is almost imperceptible; but when it has been of considerable size, the inequality of surface is distinct, and if it be situated opposite to the pupil, it is very apt to render vision obscure.

The portion of cicatrized cornea, it ought to be remarked, is not only unequal, but is by no means in all cases transparent, for it often happens, that an ulcer leaves a *Speck* of the most opaque and incurable kind. †

* Plate V. fig. 2.

† See Speck of the Cornea, Chap. XI.

CHAP. VIII.

OF WOUNDS OF THE CORNEA.

Wounds of the cornea unite readily, and often without leaving any perceptible cicatrix. When the wound heals by adhesion, a very slight opacity only remains, and commonly there is nothing to be observed but a little elevation or inequality of the edges; which, in many cases, arises chiefly from the lips of the wound not having been adjusted with sufficient accuracy immediately after the wound was made. When all inflammation has abated, and a few months elapsed, the cicatrix appears like a hair sticking on the cornea; and even this can only be dis-

tinguished in certain lights by an attentive eye. In a man whose lens had been extracted, I could not, even with bestowing the greatest care, distinguish the least remains of a cicatrix of the cornea.

If a wound of the cornea, in place of healing by adhesion, goes through the more tedious process of suppuration, a considerable time elapses before the parts resume their natural form; and there always remains an obscurity, extending from the divided edges over more or less of the adjacent cornea. When suppuration commences, the edges of the wound swell, and are separated from one another, to a considerable distance, by a yellow, tough matter, resembling albumen, which sometimes hangs down from the wound in the form of flakes. As the healing process goes on, the quantity of this matter diminishes, and the edges gradually approach each other, until a firm and complete cicatrix is formed. It is generally several weeks before this process is completed, supposing every thing to go on

in an uninterrupted course. In one case I made an incision of the common form, to discharge puriform matter, and the wound neither adhered, nor did any appearance of suppuration ever take place. But it often happens, that, when wounds are accidentally inflicted, or even in the incision of the cornea, made for extracting the crystalline lens, a portion of iris falls forwards, and either adheres to the edges of the wound, or passes completely through it. This accident is always attended with disagreeable effects; for, besides the permanent defect in the form of the pupil, and the distressing symptoms of pain and inflammation, which the strangulation of a portion of iris never fails to produce, the lips of the wound are seldom allowed to close altogether, so that the aqueous humour drills out, until a very tedious process of cicatrization is completed.

In most cases of wounds of the cornea, the subsequent opacity does not extend far beyond the edges of the wound, except in those where the inflammation has been long

protracted. It then seems to be confined to the cut surfaces; and when, in making the incision for the extraction of a cataract, the knife runs between the layers of the cornea for a considerable extent, and does not make a division perpendicular to the plane of its spherical surface, the subsequent opacity is of very considerable breadth, thus pointing out the precise form of the incision.

If a portion of the cornea be completely separated, it is never again regenerated, at least by a transparent substance; and when a portion is removed, a practice which is sometimes attended with the most happy effects, in large and very opaque specks, in some cases a similar opaque matter is regenerated.

CHAP. IX.

OF EXTRANEOUS SUBSTANCES ADHERING TO THE CORNEA.

When an extraneous substance adheres to the cornea, all attempts in rubbing the eye-lids, or forcibly winking and shutting them, rather tend to imbed it more firmly, than to remove it.

From the external lamina of the cornea being soft and yielding, the extraneous body, if small, soon forms a seat, and the constant flow of tears and disposition to shut the eye-lids produced by its irritation, bring on inflammation, which does not abate until the substance is either removed by art, or comes away by a tedious and painful process of suppuration.

When the extraneous body is removed by art, it leaves a depression in the cornea, which is often discoloured; the colouring matter, however, is soon absorbed, and the depression is generally filled up, and all surrounding opacity removed in a short time.

A few hours after an extraneous substance adheres to the cornea, the adjacent portion of cornea becomes opaque, and the opacity extends according to the violence of the inflammatory symptoms, which the irritation of the new substance creates. I have observed this opacity form very rapidly, and to a great extent, in the eyes of animals, from a similar cause; but in animals, opacities of the cornea are more rapidly formed, and are more speedily removed than those in man.

Sometimes an extraneous body remains imbedded in the cornea for a long time, and is the source of constant inflammation and pain, till suppuration takes place around it, and allows it to drop out.

It sometimes happens that, after a body is imbedded in the cornea, a layer of a new substance is formed over it, so that it does not excite inflammation, but remains through life in a kind of sac. I have observed a similar process to begin and be completed in cases where a small portion of iris had been pushed through an ulcer of the cornea. The cornea near the prolapsed iris became obscure, and the opaque matter was daily effused from the circumference towards the centre of the opening, so as finally to cover the prolapsed iris so completely, that it appeared afterwards like a common speck of the cornea.

It is, indeed, by no means uncommon for extraneous substances, as musket-balls, to remain during life in different parts of the body, by thus forming to themselves, in a similar manner, a kind of sac. In one case, I found a piece of whinstone inclosed in a sac of cellular membrane, lying close to the sclerotic coat, which had remained for ten years prior to the person's death, without

his experiencing the least uneasiness, or even suspecting its presence.

Manniske of Frankenhausen mentions a curious instance,* where a body, which stuck on the conjunctiva covering the white of the eye, gradually advanced to the central part of the cornea.

"A priest," says he, "requested my assistance concerning a speck on the eye. He had on the cornea of the right eye a dark speck, which greatly impaired his vision, and of which he gave me the following account. Two years before, he found suddenly a little pain in the eye. By examination he remarked, on the white of the eye, below the upper lid, a black spot; it did not hurt his sight, and the pain soon went away, so he took no further notice of the accident. Some time having elapsed, he was aware that this spot had changed its situation, and appeared at the union of the cornea with the sclerotic coat. The speck continued its

* Journal für die Chirurgie, &c. Von Just. C. Loder, 2d Band. 1st Stück. 1799.

progress very slowly, but uninterruptedly; it came forwards on the cornea, approached towards the pupil, and at last covered a portion of it. The patient was in this situation when I saw him. There was a prominent spot above the cornea, which felt hard, and equalled the size of a small lens, but was longer than it was broad. Many small red vessels appeared like streaks around it. The patient had no pain. The undescribable hardness of the spot, along with its situation, made me think that it was a foreign body fastened in the eye. I made an incision on the spot from without inward, and saw, with the assistance of a microscope, a black body lying in the incision. I removed it with the point of the knife, from the small hole it had formed for itself in the cornea, and found it to be a hard wing-case of a beetle."

A case in many respects similar is mentioned by Morgagni,* where an insect flew

* Letter XIII. Art. 23.

into the eye, the wing being left behind sticking to the cornea, where it created an ulcer, which immediately got well when the wing was removed.

There is a remarkable instance related by Wenzel, * where a husk of seed adhered four months to the cornea of a child. A round yellowish spot was perceived on the cornea, elevated above its surface, and from its resemblance to a pustule, had been treated as such. From this spot proceeded a number of varicose vessels diverging like radii from a centre. On examination, it was found to be the hard skin of a millet seed, which having fallen into the child's eye, stuck on the cornea in such a manner that its sharp edge and concave side adhered to this membrane, whilst its smooth and convex surface made a slight projection outwards.

* Treatise on Cataract,—Ware's Works, Vol. I. p. 81.

CHAP. X.

OF OSSIFICATION OF THE CORNEA.

The deposition of Bone is a morbid change, which takes place only in some textures of the body, and is rarely met with in the cornea.

In an eye which was changed in form, and the cornea opaque, on maceration a piece of Bone, weighing two grains, oval-shaped, hard, and with a smooth surface, was found between the laminæ. A piece of bone was also found between the choroid coat and retina of the same eye.

When dissecting an eye, for an anatomical purpose, of which no history could be ob-

tained, I found several gritty particles and inequalities on the internal surface of the cornea.

Walter had in his museum a piece of cornea, taken from a man sixty years of age, in which a bony mass was enveloped. It was three lines in length, two lines broad, and weighed two grains. *

The account of a very curious case of a piece of Bone, which was formed in the cornea, or immediately behind it, was communicated to me by Mr Anderson, Surgeon at Inverary. "Upon carefully examining the right eye of a woman thirty-one years of age, I observed a substance of a whitish appearance, in the under part of the globe of the eye, arising from the inside of the sclerotic coat, and extending upwards, below the cornea, over a great part of the iris, to very near the pupil. It had created much irritation in the eye, and induced a degree of inflammation, severe pain, almost a constant flow of tears, and inability to bear the

* Anatom. Museum, B. I. S. 139. No. 275.

light, with a considerable diminution of sight. The ball of the eye performed its natural rotatory motion, but was less in size than the left eye. This complaint had been occasioned fifteen years before, by a fall at the root of a tree, by which she struck her right eye, but did not cut any part of it."

"From this period, the above substance had begun to grow, and gradually increased in size; but the pain in the eye, and other symptoms, were sufferable until about nine months ago, when the complaint became more violent. I advised her to submit to an operation, for the purpose of extracting this substance, that appeared to injure her eye, to which she readily agreed. I made an incision into the cornea, in the manner recommended for the extraction of the cataract, then raised the flap of the cornea with a flat crooked probe, and, with the same instrument, turned out a small piece of Bone. The upper part of the bone was as thin as a piece of paper; at the under

part it was thicker, porous, and brittle, of an irregular semilunar form, and about the size of half an ordinary silver sixpence. The upper part was quite detached, but the under part slightly adhered to some part of the globe out of sight; but it was easily extracted without requiring the knife to separate its adhesions. From the unsteadiness of the patient, she would not permit me to examine from what part the ossification originated. I am consequently at a loss, whether to suppose it took its growth from any of the coats of the eye, or if any osseous matter might, in consequence of the accident, collect within the coats, and, in the course of fifteen years, form a complete bone."

The cornea varies very much in the firmness of its texture, at different periods of life, and in different individuals of the same age. In the fœtus, its cellular lamellæ adhere to one another loosely, so that it is thick and spongy, whilst in old people it is sometimes extremely hard and coriaceous. Ange-

ly remarks, that he has sometimes met with it in old people as hard as a piece of wet cartilage. *

* Commentatio Medica de Oculo, organisque lacrymalibus. Auctore, J. L. Angely.—Erlangæ, 1803.

CHAP. XI.

OF THE SPECK OF THE CORNEA. *

1. *Of the Varieties of Speck of the Cornea.*

ALTHOUGH the cornea is naturally quite transparent, yet it often happens, that the means employed to preserve it in that state are not sufficient to prevent its being rendered obscure by disease.

The obscurities or Specks to which the cornea is liable are observed to be of very different shades, varying from the slightest

* Macula Corneæ,—Die Verdunkelung der Hornhaut, or Die Flecke of the Germans.

perceptible cloudiness or mist, to a dense white, or pearl-coloured opacity. The great varieties in the degree of obscurity, as well as those in the shape, the mode of formation, the relative position, and the extent of corneal Specks, have induced some authors to consider each as a distinct species, and to distinguish them by particular names. As the meaning, however, of these names is ambiguous, there being scarcely two authors who use the same word to denote the same variety of the disease, and as it will appear that there is such a close resemblance between some, and such a similarity of character in all the forms in which Specks appear, these arrangements are not only useless, but inconsistent. Instead, therefore, of introducing a variety of names, or attempting to arrange, in a systematic manner, the varieties of this morbid alteration of structure, I shall consider the disease in whatever form it may appear, or in whatever degree, under the general

name of obscurity of the cornea, or Corneal Speck.

The *first*, and most simple variety or form of corneal Speck is, when a particular part of the cornea loses its natural transparency, and becomes clouded, objects appearing to the patient as if seen through a mist or smoke. Such obscurities are either undefined, or distinctly circumscribed, and have either an equal degree of opacity throughout, or one part is more opaque than the rest. They are most commonly of a circular or rounded form, but, in some cases, their shape is very irregular. Their size varies from the smallest spot to such an extent as to cover the whole cornea, * and they generally appear to occupy the exterior laminæ of the cornea.

In the *second* form of Speck the opacity is of a darker shade, giving the cornea a bluish, or, in some parts, a white milky appearance. It is seldom equally opaque

* Nuage—Film. See Plate VII. fig. 1.

through its whole extent, being generally more so at the centre, and becoming gradually of a lighter shade towards the margin. In some instances, the shade is very unequal in different parts of the speck. *

In the *third* form of Speck, the cornea becomes of the opaque glistening white colour of common pearl; and the opacity generally extends through the whole of the laminæ of the cornea, so that if even several of the layers which are external be removed, those which remain continue to form a complete obstruction to the entrance of light. Specks of this description sometimes produce a slight thickening of the cornea; and they are accompanied with adhesions between the cornea and iris. They are almost always distinctly circumscribed, though the edge is usually more transparent than the middle, and, if of any considerable size, they are nourished by one or more red vessels. †

* See Plate VII. fig. 2, and Plate I. fig. 1.

† Leucoma, See Plate V. fig. 3, and Plate VI. fig. 2.

In the first form of speck, the iris can be seen through the diseased portion of cornea ; but, in the second and third forms of the disease, the degree of opacity is such, that nothing can accurately be distinguished behind it.

If an active inflammation accompanies the speck, the red vessels are seen in a cluster on that part of the sclerotic coat nearest to it ; and some branches may often be traced passing over the edge of the cornea, and terminating in the substance of the speck. As the accompanying inflammation abates, the number of red vessels on the cornea commonly diminishes ; but sometimes one or more trunks remain, and are distributed on the speck.

In some cases there are large specks, with numerous blood-vessels supplying them during the continuance of active inflammation, and although the opacity remains extensive after the inflammation abates, yet no red vessels continue to nourish it. The number of blood-vessels is in no case in

proportion to the extent or degree of the opacity during any stage of the accompanying inflammation ; for a net-work of blood-vessels is frequently observed on a cornea which has very little obscurity, and at other times there is a large opaque spot with only one, or even without a single red vessel supplying it.

Specks appear on every part of the cornea, but, as far as I have been able to observe, they occur most frequently towards its centre.

Specks are most frequently formed in the external laminæ of the cornea, but it is difficult to determine accurately their situation. In some instances, I have been able to distinguish the internal laminæ alone opaque.

Specks vary in number : Commonly there is only one ; but it frequently happens that there are two, three, or more distinct spots on one cornea, each differing in size, shape, and degree of opacity.

Specks impede vision in proportion to their degree of obscurity, and according to

their situation. Even a speck of the lightest shade, which is hardly perceptible to a common observer, if situated directly opposite to the pupil, materially injures the sight; whereas those of the most opaque kind, if placed beyond its circumference, diminish the sphere, but not the accuracy of vision. In those cases where the speck is of a moderate size, and placed towards the centre of the cornea, the patient sees better in a dull than in a clear light; for in a clear light the pupil contracts so much, that it becomes covered by the speck, and the rays of light are prevented from entering it; but in a dull light that opening dilates and becomes larger than the speck, so that rays enter by its edge. Specks impede vision more when they are situated on the under than on the upper half of the cornea.

Those who have a Speck on the cornea sometimes have a Squint. In one case this was so remarkable, that I found it impossible for the eye-ball to be turned, so as to

render more than one half of the cornea visible.*

In some instances where a Speck is situated towards one side of the cornea, the pupil seems to have a tendency to dilate or extend towards that portion which remains transparent. I first observed this in an adult who had completely lost the sight of one eye, and had a large speck which formed on the temporal and central part of the cornea of the other eye soon after birth. The pupil was considerably dilated towards the nasal side, which remained transparent; so that, by this effort of nature, in drawing the pupilar opening from the opaque to the transparent part of the cornea, the patient was enabled to guide himself through the streets, and in twilight he could see large objects around him with considerable accuracy. I observed the same thing in the eye of a young woman, precisely under similar circumstances.

* See Squinting, Chap. XLVIII.

A simple speck is seldom accompanied by any sensible alteration in the external form of the cornea. In some cases where the preceding inflammation has been very violent, or where the disease has been of long duration, the cornea becomes thickened, so that its internal surface comes in contact with the iris, and adheres to it, suffering, at the same time, a slight increase in its convexity; and in many cases a cornea, which for some time was only opaque, becomes at last staphylomatous;* but in all such cases ulceration of the cornea will generally be found to have previously taken place.

Besides those varieties of Specks which have been described, there are others that occur much less frequently, the mode of formation and appearances of which are somewhat different.

I have remarked a few instances where the cornea acquired a very peculiar *mottled*

* Vide Staphyloma, Chap. XII. and Plate VIII. fig. 3.

appearance. In one case this was the consequence of an inflammation of the eye, which came on during a mercurial course, and, in another, it was the effect of an inflammation occasioned by lightning. In both these cases, some parts of the cornea retained their transparency, while the rest was covered by a number of very small, white, rounded spots, varying in obscurity.*

In some cases the opacity, instead of being formed towards the central part of the cornea, or at some distance from its circumference, begins at the place of junction of the cornea and sclerotic coat, and gradually extends towards the centre of the cornea, forming an opaque ring around its circumference. Most authors have described this as an appearance only to be remarked in the eyes of those advanced in life, and have given it the name of *Arcus Senilis.* Though it is usually met with in old people, yet I have observed it at all periods of life, and it

* See Ware's Works, Vol. I. Case XII.

may be seen in several of the drawings which were taken from young subjects.* It generally appears like a bluish ring at the edge of the cornea, and extends round the whole of its circumference. It is almost universally to be found more or less distinct in the eyes of old people, and it increases in breadth as the person advances in life, but is never attended with any impediment or inconvenience to vision.

In a few instances I have observed a cloudiness gradually extending from several points, or from the whole circumference of the cornea towards its centre, which, in most cases, went off along with the inflammatory symptoms by which it was accompanied; but in others it was more permanent.

In a patient under the care of the late Mr Gibson of Manchester, the cornea of both eyes became milky at different times every day, and generally after half an hour, or

* See Plate I. fig. 1, Plate III. fig. 3, Plate VII. fig. 3.

sometimes longer, they recovered their transparency.

I have known one instance where this disease appeared to be *hereditary*. Four branches of a family had the cornea of each eye affected with Speck. The cornea of all these persons had a general cloudiness, with opaque white spots interspersed on different parts.

There is another variety of Speck which appears at birth, and which may, therefore, be with propriety denominated *Congenital*. In this disease the whole anterior chamber is more or less clouded, accompanied by no apparent inflammation. As the child affected with this disease advances in life, the obscurity is gradually diminished, so that generally in one or two years the transparency of the cornea is completely restored. The period of restoration is, however, very different in different cases. In one instance, an eye had nearly quite recovered about the eighteenth month, whilst the other still remained very obscure.

Professor Withausen of Copenhagen saw

a family, consisting of three boys and three girls, the three girls being born with this congenital obscurity of the cornea. They all recovered perfect vision when about four years of age. Cases of this congenital imperfection have also been recorded by Mr Farr of Deptford. *

2.—*Of the Formation of Specks of the Cornea.*

Specks are most commonly either preceded or accompanied by Inflammation or Ulceration of the Cornea. In children they occur very frequently during the progress of the more severe cases of the puriform ophthalmia,—in small-pox and measles,—in that peculiar inflammation of the eyes accompanied with eruptions of the head,—and in all those inflammations in which the cornea participates. Lues venerea and Scrofula, each of which produce specific inflam-

* Medical Communications, Vol. II.

mations of the different structures of the eye-ball, also occasion various degrees of obscurity of the cornea. Likewise wounds of the cornea accidentally inflicted, or for the extraction of the cataract, if they do not unite without suppuration, generally leave an opaque mark; and Ulcers, if they have been deep, or of long duration, are followed by white pearl-coloured Specks.

When the inflammation accompanying a Speck abates, the speck most commonly diminishes, and the opacity which remains becomes more distinctly defined, and less opaque; or, if small, it entirely disappears.

In some instances the cornea acquires a very remarkable degree of obscurity, when the inflammatory symptoms are apparently mild, and where there is very little perceptible redness. I have observed several instances of this kind, and in all of them the obscurity came on by very slow degress, and was attended by no pain. *

* Traité de Maladies des Yeux, par A. P. Demours. Paris, 1818.

The length of time necessary for the formation of Specks varies much in different instances. In some cases they are formed very slowly, and do not acquire any great degree of opacity, even when the inflammatory symptoms are extremely violent. Most frequently they require several weeks or even months before they become either large or very opaque; so that when they are of considerable size, it may generally be concluded they have been formed after repeated inflammatory attacks, each attack having added both to their size and degree of opacity. Sometimes they are formed very rapidly, as in cases where the cornea is wounded, or where a foreign body has adhered to it.

Specks are formed at every period of life, but they occur most frequently in young people; probably because in them the cornea is much softer and more spongy, and, also, as they are more subject than adults to the various inflammatory complaints of the eye.

The specks which are formed rapidly are in general most speedily removed, whilst those whose progress is slower disappear in a more gradual manner.

It may in general be remarked, that when a part of the cornea has become opaque, the opacity begins to disappear at the circumference of the speck, or at that portion nearest the circumference of the cornea. This probably depends on the vessels being more numerous at the circumference than at the central part of the cornea.

In some cases it may also be observed, that the external laminæ first regain their transparency, the opacity disappearing from the external towards the internal parts.

Specks are removed much more quickly in children than in old people, and in them also a much greater degree of obscurity can be made entirely to disappear.

Specks described under the first and second forms generally disappear either by the use of remedies, or in some cases, after the inflammatory symptoms are sub-

dued. Those of the opaque pearly-colour seldom disappear, even by the use of the most active means, and even if portions of them are cut away, the opacity in most cases is found to penetrate to the internal lamellæ, and is generally regenerated by an equally opaque matter.

When applications are employed with the view of removing specks, the obscurity generally diminishes much more rapidly for a short time at first than at any future period.

Dr Vetch, in his excellent treatise on the Egyptian Ophthalmia,* gives an account of a singular instance, which shews the rapidity with which some forms of speck disappear under particular circumstances. It occurred in a man during his convalescence from ophthalmia. " Some pectoral symptoms, to which he had been long subject, suddenly assumed the appearance of pulmonary consumption, which proceeded in

* See Account of an Ophthalmia, &c. by John Vetch, M. D. 1807.

a rapid manner towards its last stage. Five days previous to his death, he was seized with a violent aggravation of the hectic fever and the other symptoms, and his death was hourly expected. At this time, to the surprise of all his attendants, the opacities, by which the vision in both eyes had been long obstructed, disappeared with amazing rapidity; and, a short time before his death, his vision became nearly as distinct as ever."

A case, though of a different kind, deserves to be mentioned in this place, as it strikingly illustrates the same remarkable power in the absorbent system. A patient had a very perceptible obscurity of the crystalline lenses of both eyes, which had considerably impaired his sight. This complaint had continued for several months, when he was seized with a pain of the chest, attended with fever and spitting of blood. These symptoms continued for several weeks, and, during that period, the obscurity of the crystalline lenses altogether disap-

peared, and his vision was restored. I saw him many months afterwards, when his eyes continued well.

3.—*Appearances of Speck on Dissection.*

When the cornea is examined after death, no change of structure can be observed in those cases where there has been a mere cloudiness, or general opacity during life; for even before death, more especially if it be slow and lingering, the fluid which, in the natural state, is deposited between the lamellæ of the cornea, exudes, forming an obscure layer over its anterior surface, and the aqueous humour oozes out, giving the cornea an unequal puckered appearance. * Indeed, it is from this change in the eye that approaching death is often foreseen; for, whenever the cornea begins to collapse, and becomes turbid, the eye loses all its

* Anatomie Descriptive, par Xav. Bichât.

lustre and intelligence, and gives that awful expression to the countenance, which has been called *facies hypocratica.*

When the cornea has been much more opaque, no other change is to be perceived after death, than a diminution of the transparency, either of the external laminæ, or of the whole substance of the cornea. I have had many opportunities, in the living body, of taking off layers of very opaque specks, and have never been able to observe any other change of structure, except that, in some of those opacities which have been of long duration, the cornea had acquired a degree of hardness much greater than that of sound cornea, and even, in some instances, it cut like cartilage.

In most cases, a Speck bleeds when a piece of it is removed in the living body; and I have observed this happen even when no red vessels could be detected by the naked eye passing into it.

An incision made in the healthy cornea gives little or no uneasiness, but, when a

portion of speck is removed, it often excites acute pain.

4.—*Causes of Specks of the Cornea.*

As the deposition or effusion of the albuminous part of the blood is a common effect of inflammation in many organs of the body, and as this change produces a diminution in the transparency of serous membranes, it is probable, from analogy in the natural structure, that a similar change takes place in the cornea, during the formation of speck. This effect of inflammation is very remarkable in the pleura, after an attack of pleurisy; in the peritoneum after peritonitis; and in the membranes of the brain after phrenitis: for, on dissection, it is invariably found, that there is not only an effusion of albumen on the surface of these membranes, but the membrane has likewise become thicker, changed its colour, and lost its transparency.

It is, perhaps, difficult to determine whether the new matter, added to the diseased cornea, be effused among its layers, but it appears to me the most probable opinion. It has already been remarked,* that the cornea is composed of a number of concentric cellular laminæ, and that a fluid is deposited in its cells by exhalation. It is, therefore, in the cellular structure in which this fluid is contained that albumen may probably be deposited, the cells being like as many serous surfaces, and subject to similar morbid changes.

An opacity may also be produced by the cornea losing its vitality. This change may arise either from the inflammation being so violent as to terminate in the death of the part, or from the action of caustic substances, such as lime or lunar caustic. †

When lime or caustic gets into the eye, a white film is formed on that part of the cornea which it touches. This either sepa-

* General Remarks on the Cornea, Chap. I.

† Ulcer of the Cornea, Chap. VII.

rates in the form of a scale or slough, or is absorbed, leaving the subjacent cornea quite transparent.

In a patient in whose eye a drop of melted tallow fell, a large white Speck appeared on the centre of the cornea, which evidently arose from opacity of its external lamina. By applying leeches to the temple, and giving a purge, on the following day no vestige of the speck could be seen, and all inflammation had subsided.

Mr Nickolson saw a patient with mercurial erythema, in whom both cornea lost their transparency during one night, appearing dry, and exactly resembling an eye which has been exposed to the air for some time after death. In a few days they regained their natural appearance.* I have observed the cornea acquire a similar appearance when, from the want of the secretion of tears, the corneal conjunctiva had become dry and opaque. This was very

* Edinburgh Medical and Surgical Journal.

remarkable in a young woman who was born without any lacrymal organs.

It is also probable that the cornea may become obscure by an alteration in the quantity of the contents of the eye-ball, producing a change in the arrangement of its component particles. In the dead body this change is very remarkable, for, if pressure be applied to the eye-ball, or if the ophthalmic veins be injected with quicksilver, or pure water, so that the quantity of the contents of the globe be increased, the cornea is found to lose its natural transparency, and to acquire a milky colour. * As it was probable, from this curious phenomenon in the dead eye, that, in the living body, some opacities of the cornea might arise from an increase in the quantity of the contents of the eye-ball, it appeared to me, that, in cases of this kind, the opacity might be removed, by making

* The Muscular Motions of the Human Body, by John Barclay, M. D. 1808.

a puncture through the cornea, and discharging the aqueous humour.

That a certain degree of opacity of the cornea in the human eye is sometimes produced by a mere derangement of its component particles, is proved from the immediate effects which followed the discharge of the aqueous humour, in cases where the opacity had a general clouded appearance over the whole cornea, besides some defined spots at particular places. In some cases of this kind, the instant I discharged the aqueous humour, by a small opening in the cornea, all the general obscurity disappeared, and nothing remained but the very opaque spots, which became more distinctly circumscribed. *

In the lower animals, I have had several opportunities of observing the cornea affected with a general obscurity and cloudiness,

* See "Observations on the Effects of Evacuating the Aqueous Humour in Inflammation of the Eyes," in the Edinburgh Medical and Surgical Journal for January 1807, and in the Transactions of the Medical and Surgical Society, Vol. IV.

which was not like common speck, but more resembled that obscurity so easily produced artificially in the dead eye, by injecting the veins, or by the application of pressure. A disease of the cornea, very similar, is common among sheep that have made long journies, or have been much fatigued; and, although the opacity of the cornea is in them accompanied with little apparent inflammation, or fulness of vessels, its transparency is quickly restored by the common practice of the shepherds, which is opening a vein at the inferior part of the orbit, and allowing the blood to flow over the eye. * The same kind of obscurity of the cornea is by no means unfrequent among dogs and horses, who, after having been long fed in stables where their food is placed high, are put out to graze, and their heads kept constantly on the ground.

* See Dr Duncan's Essay on the Diseases of Sheep, in the Transactions of the Highland Society of Scotland.

CHAP. XII.

OF STAPHYLOMA OF THE CORNEA.

When the cornea, besides losing its transparency, is altered in thickness, and forms a prominent tumour externally, the disease has generally been called Staphyloma. *

This term, however, has had very extensive applications, having been employed by some authors to denote not only various morbid changes of the cornea, but also a variety of tumours involving other parts of the organ of vision. I shall follow Richter, and limit its signification to those

* Das Staphylom,—Der Forfall der Hornhaut of Richter, —Ceratocele,—Corneal Hernia.

changes which produce an alteration in the structure and form of the Cornea and Sclerotic coat. *

When the structure of the whole Cornea is changed, the disease has been called *Staphyloma totale*, and when confined to a particular part, *Staphyloma partiale.*

In Staphyloma, where the whole cornea participates in the disease, it generally assumes a form more or less rounded or conical, † loses its natural transparency, and vision is completely destroyed.

The opacity is often most remarkable towards the apex of the tumour, and is generally of a pearly white colour, diffused through the whole corneal substance. ‡

In some instances, I have remarked the opacity confined to one-half of the cornea, which has generally been the inferior one. §

* See Diseases of the Sclerotic Coat, Vol. II.

† Staphyloma conicum et rotundum.

‡ See Plate VIII. fig. 2.

§ Plate VIII. fig. 3.

As far as I have been able to observe, Staphyloma never occurs unless the cornea has been previously ulcerated, and unless the ulcer has penetrated into the cavity of the aqueous humour, or destroyed the cornea as deep as its internal tunic.

Hence the internal surface of the cornea adheres to the iris in almost every case of Staphyloma, so that, in this disease, the anterior chamber is often found almost entirely obliterated. This takes place in consequence of the discharge of the aqueous humour through the ulcer and the cornea allowing the iris to come in contact with the cornea, and thus to form adhesions with it. The adhesion between the cornea and iris happens most frequently, and to a greater extent, in children, for in them the cornea is much thicker than in adults, and is very nearly in contact with the iris even in the sound eye.

In Staphyloma, the pupil is hid according to the situation and degree of opacity of the cornea; but in most cases it is alto-

gether obliterated, and, even where a transparent portion of cornea is opposite to it, vision is much impaired; for, as the eye has lost its form, like an optical instrument, the change in its refractive power renders objects seen through it very indistinct.

If the tumour be recent, and has not acquired a very large size, the diseased portion of cornea, when cut into, will be found softer and more spongy than the transparent part; and, generally, if the incision penetrates into the anterior chamber, only a very small quantity of aqueous humour flows out. This is more particularly the case in children. But, when the tumour is large, and formed in an adult, the cornea often becomes extremely hard, and much thinner than natural, and the quantity of aqueous humour, instead of being diminished, is greater than in the sound eye. Scarpa mentions having found the cornea, in some cases of staphyloma, as hard as parchment, and even converted into bone; Rich-

ter * relates a case where it resembled a cartilaginous excrescence; and Beer † describes and gives a delineation of a Staphyloma which was so thick and tough, that, on cutting it away, he could scarcely penetrate it with the knife.

Usually the staphylomatous cornea has vessels containing red blood ramified through it, and there is generally one or more trunks distributed on the sound part of the cornea, which are continuations of vessels on the white of the eye, some of which appear superficial, belonging to the conjunctiva, whilst others are deep seated. ‡

When vision is altogether destroyed, and the disease has extended far, the humours collect in great quantities, and, in some cases, form a tumour of an enormous size. § In such cases, the eye does not retain its conical form; for, when the cornea has be-

* Chirurgische Bibliothek, Vol. VIII. S. 76.

† Practische Beobachtungen über den grauen Staar und die krankheiten der Hornhaut. Wien, 1791.

‡ See Plate VIII. fig. 2, and Plate IX. fig. 3.

§ Haller's Dissertationes Chirurg. Tom. I. p. 25.

come so much distended, and when the humours have insinuated themselves between its laminæ, one part yields more readily than another; the tumour becomes irregular in its form, hangs over the under eyelid, and, in many cases, has the appearance of a large swelling composed of several smaller ones. A change also takes place in the colour of the tumour. Instead of the opaque white, or pearl-coloured opacity, it becomes of a dark blue colour, and sometimes one or more of the smaller swellings are semi-transparent. A fluid can be felt fluctuating within them, and they appear as if ready to burst.

The blood-vessels increase both in number and size along with the bulk of the tumour, and they will sometimes be seen ramifying and forming net-works in a most beautiful manner over its whole surface. * In cases of this description, the patient generally complains of more or less pain, not

* See Plate IX. fig. 3.

only in the eye, but also in the brow of the affected side, and this pain often extends to the other eye.

If the bulk of the swelling prevents the eye-lids from closing, the exposure to bodies floating in the air, and the contact of the ciliæ, always excite more or less inflammation on the eye-ball and lids. At the same time, also, it often happens, that the tears are of an acrid and irritating quality, inflaming and excoriating the outer surface of the palpebræ and cheek. In this situation the patient is often relieved by a part of the tumour giving way, and allowing the contents of the eye-ball to escape. Even when this has taken place, and the subsequent inflammation has abated, the disease sometimes returns as before, and a large staphylomatous tumour is again formed. More frequently, however, the cornea remains collapsed into a whitish mass, in which no vestige remains of natural structure.

When the eye is in this state, if the dis-

organized cornea be accurately examined, a dark point will be discovered not larger than a small pin-head, on some part of the opaque portion. This will be found to be a fistulous orifice leading into the anterior chamber, but actually covered, in most cases, by an extremely delicate, pellucid membrane, which, if punctured with a needle, gives outlet to a larger or smaller quantity of aqueous humour. This opening seems to me to be established for the purpose of carrying off the superabundant aqueous humour, the secretion of which is not arrested by the disease; and I have had frequent opportunities of observing a staphylomatous eye become extremely painful and inflamed, which symptoms were instantly relieved by puncturing the membrane by which the fistulous opening was covered, and thus discharging the aqueous humour.

The sudden relief which is produced by the discharge of the contents of an eye affected with Staphyloma, may be accounted

for on the same principles as the utility of the practice of evacuating the aqueous humour in violent inflammation of the eyes, or in the rupture of a common abscess. This effect, as well as the mode by which a fistulous opening was established, are so strikingly illustrated, and so accurately described in the following case of a medical gentleman who had been seized with violent ophthalmia in both eyes, which was followed by Staphyloma, that I shall give an account of the case in his own words.

"When my eyes were examined, I was told that there was a considerable elevation of the cornea of both, but particularly of the left; indeed, this was quite evident to my own sense of touch. In July 1800 I returned to England; and, on my voyage from London to Edinburgh, I was much surprised, one morning when I awoke, to find that the Aqueous Humour was completely discharged from the left eye; the eye being quite soft. The opening by which it had escaped soon closed, and the humour again

collected; but I conceived that the cornea was not quite so prominent as formerly. From this circumstance I concluded, that if the humour was again evacuated, the eye might assume its natural form, or at least approach nearer to it. In March 1801, I attempted to make a small perforation in the cornea with a large needle, and succeeded easily in evacuating the aqueous humour. This, I think, was repeated at least three times, and the eye gradually acquired its present shape. I wished to perform the same upon the right eye, but was baffled, on account of its greater sensibility. If I can place any dependence on my own feelings, I think the left eye was never perfectly free of inflammation until the above mentioned evacuations were effected; though they were made without having the most distant idea that such would be the result of them.

" About three years ago, when rubbing the right eye with my finger, it suddenly became soft, part of the aqueous humour hav-

ing been discharged. Since that time, two or three drops have flowed out every week. But if, as it sometimes happens, the discharge does not take place in the time mentioned, I am in general seized with a pain immediately above the right eye-brow, accompanied with a sensation of tension, and uneasiness of the eye itself: These symptoms, however, vanish when the accidental evacuation takes place.

"When the humour was first discharged, a small degree of pressure upon the eye, when soft, gave considerable uneasiness; and the pain seemed to be situated in the bottom of the eye. The pain, however, is not now excited by the same degree of pressure."

The cornea being in young persons more spongy in its texture, and much thicker than in adults, is probably the cause why they are more subject to this disease. * Scarpa mentions, that he never saw a Staphyloma of such

* Angely, Commentatio Medica de Oculo, &c.

a size as to project beyond the eye-lids, which did not begin during childhood. I have, however, seen several instances, particularly where the disease arose in consequence of an wound, in which the tumour extended beyond the eye-lids, and did not commence till the patients were advanced in life: These cases, however, are no doubt rare.

Staphylomas which arise after wounds in the eye with sharp pointed instruments, present nearly the same appearances as those which have been already described. In such cases, the swelling is generally more irregular in its shape, the coats are thinner, the disease advances more rapidly, and is attended with much more pain and inflammation.

Though Staphyloma generally attacks only one eye, in some cases it affects both, and it is not unfrequent to see a person with two staphylomas.

I have seen also one case of this disease, where the sympathy between the two

eyes was very remarkably illustrated. A person received a blow with a pike on one eye, which produced staphyloma, and more than a year afterwards, the other eye became inflamed, and the cornea of it also became gradually staphylomatous. *

In those cases of staphyloma which are accompanied with pain, the other eye becomes often weak, uneasy, and irritable, all which symptoms disappear when the staphyloma is relieved.

Staphylomas are variable in their progress; sometimes they grow suddenly to a certain size, and afterwards remain stationary; sometimes they grow progressively larger till they burst; and often they increase in bulk as if by starts. From small-pox particularly, and also in consequence of the puriform ophthalmia, staphylomas grow rapidly, and the coats of the tumour appear extremely thin; but, after some time, they seem to acquire additional thickness and

* See Sympathy of the Eyes, Vol. II. ii.

strength, whilst the tumour remains of the same size. Richter * remarks, that the swelling and thickening of the cornea sometimes depart with the accompanying inflammation.

Staphyloma occasionally occurs where only a small portion of cornea is affected, in which case the disease is called *Staphyloma partiale.* Sometimes there is only one swelling of this kind, and sometimes several of them arise in the same cornea, forming an irregular shaped mass, which has been compared to a cluster of grapes ; hence the name *Staphyloma.* Such swellings vary from the size of a pin head to that of a small pea. In some cases they are transparent, communicate with the anterior chamber, and contain a quantity of aqueous humour, or even a portion of iris. More commonly they are horny or warty excrescences, and if cut off, they generally grow again. † Tumours of this kind are often observed where there

* Richter's Angfangsgrunde, B. iii.

† Richter's Angfangsgrunde.

have been wounds or ulcers of the cornea; but they are also met with where there has been no such previous cause.

There is also a formidable disease, a few examples of which I have seen, and traced the progress, which, perhaps, may be with more propriety considered as a variety of staphyloma than any other disease. It occurred in adults, whose eyes had been exposed to much fatigue, and suffered from deep-seated, and long continued inflammation; but I have seen one or two cases of this disease, where, from its commencement, and during its whole progress, there was neither pain nor any inflammatory symptom. Whilst the sphericity of the cornea increased, the aqueous humour became turbid, and substances were seen floating in it, resembling flakes of the black pigment. The crystalline lens also became opaque, and appeared to separate into pieces, and moulder down. The sclerotic coat became preternaturally distended, and instead of retaining its pearly white colour, it assumed a dark

blue, or almost black shade. At last, a large prominent tumour of the cornea was formed, more spherical than the common staphyloma, which terminated by bursting, and in a total loss of the organ.

CHAP. XIII.

OF ALTERATIONS IN THE FORM OF THE CORNEA.

THE form of the cornea varies in different persons, and in the same individual at different periods of life.

It is in many so convex, that objects are seen very indistinctly, unless when held close to the eye, or viewed with the assistance of concave glasses. This preternatural convexity of the cornea is sometimes the failure of original organization, at other times it is produced from some morbid change. *

* Myopia.—Kurzsichtigkeit.

The cornea is most convex at the earlier periods of life, and, as far as I have been able to observe, it is very liable to acquire its greatest degree of convexity about the age of puberty, persons being most apt to become short-sighted at that period. The pupil is always very large in those who have a convex cornea; but there does not appear to be any deviation from the natural state in the structure of the cornea.

When people advance in life, the cornea gradually loses its convexity, in consequence of the quantity of humours within the eye-ball being diminished.* In the case of a girl eight years of age, the cornea of each eye was observed to be remarkably flat, and vision had been imperfect from her infancy. In persons much enfeebled by evacuations, by numerous bleedings, or by disease, the quantity of the aqueous humour diminishes, the convexity of the cornea is lessened, and the sight is enfeebled, so that

* Presbiopia.—Weitsightigkeit.

they are not able to see objects but at a distance. *

The cornea is also observed to collapse at the approach of death, particularly if it be slow and lingering. †

From the ingenious experiments of Sir Everard Home, and the late Mr Ramsden, recorded in the Philosophical Transactions, it appears probable that the sphericity of the cornea is somewhat altered according to the distance at which objects are viewed.

I have known several instances of persons who, in order to see minute objects, were in the habit of squeezing the eye-ball with the point of a finger, the effect of which probably was to elongate the visual axis by increasing the convexity of the cornea.

The power which the eye has of changing its form, is also very remarkable in those who have had a cataract removed; for, when the eye has recovered from the inflammation and irritability occasioned by the

* Vide Anatomie Medicale, par Portal.

† Vide Anatomie Descriptive, par Xav. Bichât, Tom. III.

operation, so as to allow the person to look at objects, it requires commonly the assistance of a lens of two and a half inches focus to read a common printed book; but, if lenses of lesser powers be gradually used, the eye, by accommodating itself to the change, will see very distinctly with a glass of much smaller power than what was first necessary. Thus a person generally finds his sight improve for many months after the removal of the lens; and the change appears chiefly to arise from the cornea gradually acquiring a greater degree of convexity, by the action of the muscles of the eye-ball.

Mr Ware observed the cornea acquire a very considerable degree of convexity during a short attack of inflammation. A gentleman, after recovering from a severe attack of a Rheumatic Ophthalmia, could read without a magnifying glass, which he had previously found necessary for many years.

I met with another case precisely similar, and I conceived that this change arose from

the cornea having acquired an additional degree of convexity.

Besides these slighter changes in the form of the cornea, it sometimes collapses so much, or increases to such a size, whilst at the same time it retains its transparency, that the functions of the eye are much interrupted, or even entirely destroyed. In the first case, the disease has been called *Rhytidosis*; and in the second *Staphyloma Pellucidum*.

A boy was born with a cataract in one eye, and in the other orbit there was scarcely the vestige of an eye-ball, nothing like cornea being perceptible. A child was born with eye-balls not larger than a pea, in which no organization could be discovered. It is most probable, that the eyes had been destroyed by disease whilst in utero.

The corrugation or collapse of the cornea arises either from a diminution in the quantity of the contents of the eye-ball, or from some disease of the cornea, or sclerotic coat. Violent inflammation of the eye, wounds

and ulcers of the cornea, penetrating into the anterior chamber, are frequently followed by this disease.

After violent deep-seated ophthalmia, it is not unfrequent to observe the eye-ball alter in its form, and become smaller; the change appearing chiefly to arise from a diminution of the anterior chamber. *

Sometimes this change is only such that the cornea becomes nearly a plane surface, and falls into contact with the iris. In other cases it becomes puckered, and a furrow is formed, sometimes at one part, at other times completely across the cornea.

The adjoining part of the sclerotic coat sometimes assumes the same form, and is corrugated in a similar manner.

It seldom occurs that there is such a total change in the appearance of the cornea, that the original division between it and the sclerotic coat cannot be distinguished. I have seen a few cases where no such line

* See Plate IX. fig. 2

of demarcation could be observed. * Reil † could distinguish no remains of the cornea in a blind eye, which had grown smaller for eighteen years. "The eye-ball appeared to be formed of four parts; two deep furrows divided it, which probably arose from the action of the four straight muscles."

It also sometimes happens, that the cornea is lessened to half its natural size, or is altogether wanting, from an original malconformation. ‡

It very frequently, too, happens, that the eye-ball does not recover its natural form after the cornea or sclerotic coat has been wounded; for, although the wound heals soon after the accident, yet there is often so much inflammation excited, and such extensive injury done to other parts of the eye-ball, that the humours are neither again

* See Plate VI. fig. 3.

† Archiv. fur die Physiologie, von Joh. Christ. Reil.

‡ Vide Handbuch der Pathologischen Anatomie, von Voigtel.

collected in sufficient quantity, nor does the retina recover its power.

Ulcers are still more apt to produce a permanent change in the form of the cornea than wounds. When these penetrate the whole thickness of the cornea, and allow the aqueous humour to escape, they heal so slowly that the relative situation of parts is permanently altered; the iris comes in contact with the cornea, and sometimes projects through the ulcerated opening, so that the aqueous humour oozes out until the ulcer is healed, the eye afterwards remaining of an unnatural shape.

Vision, in such cases, is always more or less impaired, and sometimes altogether destroyed.

Of the Conical formed Cornea.

Léveillé, * the French translator of Scarpa's work on the Diseases of the Eye, has

* Vide Traité sur les Maladies des Yeux, traduit de l'Italien de Scarpa, par J. B. F. Léveillé, Tom. II. p. 179.

described a case where the cornea of both eyes were of a conical form. Frequent examples of a similar disease have fallen within my own observation.

In these cases the conical form of the cornea has been more or less distinct, in some the anterior chamber appearing unusually prominent, whilst in others the conical figure was much more remarkable.

The apex of the cone has generally been in the centre of the cornea or near it.

An eye affected with this disease, when viewed laterally, resembles a piece of solid and very transparent crystal, and when looked at directly opposite, it has a transparent and sparkling appearance, preventing the pupil and iris from being distinctly seen.

In the cases of this disease which I have examined, there has always been a small portion of the cornea where the surface was irregular, having very much that appearance which is usually observed when a thin pellucid membrane fills up a part of the cor-

nea, which has previously been destroyed by ulceration. The irregular portion of cornea at the apex is generally very thin, and sometimes becomes clouded and opaque. In one case, a gentleman who had this disease received a blow with a whip on his eye, which burst the cornea.

From these observations it is probable that where the cornea becomes conical, it is always the consequence of a change in the structure of that organ.

This disease of the cornea usually advances imperceptibly. It generally begins in one eye, though the other frequently becomes sooner or later affected. After first becoming prominent, the cornea gradually assumes the conical form, and the disease seldom advances equally far in both eyes.

Like common short-sightedness, this change in the form of the cornea takes place most frequently about the age of puberty, or at least assumes its most advanced form at this period of life. In one instance I met with it in a boy eight years of age.

The change produced in vision by this disease is merely short-sightedness in the early stages; but when the cone becomes distinct, and its apex very irregular, the changes are very remarkable. They are illustrated in the following case of a lady thirty years of age, in one of whose eyes the cornea was unusually convex, and in the other it was conical.

At one, or one and a half inch distance, she could distinguish small objects distinctly, when held towards the temporal angle of the eye, although it required considerable exertion; but the sphere of vision was very limited.

On looking through a small hole in a card, she could distinguish objects held very close to the eye, and could even read a book.

At any distance greater than two inches vision was very indistinct, and at a few feet she could neither judge of the distance nor of the form of an object.

When she looked at a luminous body at a distance from her eye, such as a candle, it

was multiplied five or six times, and all the images were more or less indistinct. She could never find any glass sufficiently concave to assist her vision. She did not remark this complaint in her eye, until she was about sixteen years of age, and she does not think that it has undergone any change since that time.

On mentioning to my ingenious friend Dr Brewster this case, which appeared to me so remarkable, he examined the eye, and favoured me with a most satisfactory and philosophical explanation of all the phenomena:

"When you first mentioned to me the case of Miss ———, I was much surprised at the number of images which she observed round luminous objects. As this multiplication of images could arise only from some irregularity in the cornea, or crystalline lens, which gave their surface the form of a polyhedron, it was completely inexplicable from the shape of the cornea itself, which your drawing represented as a re-

gular surface,* resembling very much that of a hyperboloid; for the only indistinctness occasioned by a cornea of this form, would arise from the concentration of the rays before they fell upon the retina.

"When I examined the eye itself, the difficulty of explanation was in no respect diminished. In every aspect in which the cornea could be viewed, its section appeared to be a regular curve, increasing in curvature towards the vertex; a form which could produce no derangement in the refraction of the incident rays. As the disease was evidently seated in the cornea, which projected to an unnatural distance, it did not seem probable that there was any defect in the structure of the crystalline lens. I was, therefore, led to believe, that the broken and indistinct images which appeared to encircle luminous objects, arose from some eminences on the cornea, which could not be detected by a lateral view of

* See Plate VII. fig. 1.

the eye, but which might be rendered visible by the changes which they induced upon the image of a luminous object that was made to traverse the surface of the cornea. I therefore held a candle at the distance of fifteen inches from the cornea, and keeping my eye in the direction of the reflected rays, I observed the variations in the size and form of the image of the candle. The reflected image regularly decreased when it passed over the most convex parts of the cornea; but when it came to the part nearest the nose, it alternately expanded and contracted, and suffered such derangements, as to indicate the presence of a number of spherical eminences and depressions, which sufficiently accounted for the broken and multiplied images of luminous objects." *

* Since the above letter was written Dr Brewster has had occasion to examine a great variety of cases of conical cornea; and in all of them, without exception, he has detected inequalities in the superficial conformation of the cornea. He conceives, therefore, that the disease is incurable, but that its injurious effects upon vision may, within certain limits, be removed by glasses, and by preventing the image from being

Beer * mentions, " That there is a kind of Staphyloma worthy of remark, which I have seen in more than one case of hydrophthalmia." He adds, " The cornea, in such cases, is inconceivably distended, but it does not lose its transparency; when punctured, it is found to be very thin, and it has also happened that it has burst. The patients, notwithstanding the transparency of the cornea, saw little or none at all.

" I had last year an opportunity of observing a remarkable case of this kind in a woman, who, after an inflammation of the brain, was seized with a violent inflammation of the left eye. Soon after, she was attacked with a very violent pain in the left half of the head, and afterwards with an uncommon weakness of sight. The eye was a little red, and then swelled; the pupil was very much dilated, and contracted but slowly. During this attack, the iris gradually

formed by rays which pass through any part of the corrugated surface.

* Pratische Beobachtungen uber den Grauen Staar, &c.

changed its colour, and at last became quite red. The stinging pain soon became heavy and beating, and the patient lost the sight of this eye altogether, whilst the cornea continued to expand. I was at last forced to make an incision into the cornea, to prevent its bursting, but the aqueous humour was soon renewed. I repeated the operation; and the constant application of a cold vinous infusion of bark after it, prevented the eye from again filling. The organ afterwards remained shrunk; the iris retained its reddish colour; the pupil continued much dilated and immoveable, and she never recovered her sight." *

Richter † says he never saw this disease; Burgman ‡ saw a very remarkable case, where the cornea of both eyes of a person who was hanged were so prodigiously extended, that they reached down to the mouth like two horns.

* See Plate IX. fig. 2.

† Richter's Angfangsgrunde.

‡ Haller Disputationes Chirurg. Tom. II.

CHAP. XIV.

OF EFFUSION OF BLOOD BETWEEN THE LAMINÆ OF THE CORNEA, AND IN THE ANTERIOR CHAMBER. *

THE effusion of blood between the laminæ of the cornea, or into the anterior chamber, is generally the consequence either of violent inflammation or of wounds.

When treating of inflammation of the cornea, I took notice that it sometimes happened that blood was effused between its laminæ. When this takes place, a dark red-coloured circumscribed spot appears on

* Hypoæma—Das Blutaug of the Germans

some part of the cornea, which never alters its situation, but remains stationary until it is absorbed. When the internal parts of the eye are much inflamed, the aqueous humour often loses its natural transparency, and becomes tinged of a red colour from the admixture of blood. The red shade turns deeper as the quantity of effused blood increases, and in very violent inflammation, the blood is sometimes effused in such a quantity as to render the aqueous humour so opaque, that the iris and pupil cannot be distinguished.

An wound of the iris, whether made accidentally or during any of the operations for the cure of cataract, is very often followed by an effusion of blood into the anterior chamber; and it also happens that blood is effused, not only when an wound has been received, but even some days afterwards, probably the consequence of subsequent inflammation. *

* This disease has been called *Cataracta secundaria Crumosa*. See Vol. II.

I have seen several instances of an effusion of blood from an improper use of the couching needle, and also when the iris has been torn from the ciliary ligament, in order to form an artificial pupil. The blood, however, is, in such cases, readily absorbed, and followed by no bad consequence.

It sometimes happens, that blood is effused into the anterior chamber from a violent blow on the eye. A very remarkable case of this kind was under the care of Mr Campbell, surgeon of the Inverness-shire militia: In consequence of a blow with the fist, a drop of blood was effused in the anterior chamber, at the junction of the cornea and iris, but in a few days it was altogether absorbed.

There are also diseases of the iris, and of the internal parts of the eye, which are attended with hemorrhage, and which tinge the aqueous humour with blood. Voigtel * mentions a case where the quantity of blood was so great as to distend the eye-ball, and

* Des Pathologischen Anatomie.

burst it. "A man, fifty years of age, had by degrees lost the sight of the left eye;—a year afterwards, a round white speck formed on the cornea, and in three months it changed to a blue colour; for other nine months it remained in the same state, and then became inflamed, but the inflammation soon went off. One day, after this, the patient felt his eye so much distended, that it appeared to him as large as a hen's egg. This sudden swelling was accompanied with acute pain; and when slightly pressed, the pain became extremely violent, and darted through the whole head; at the same moment, blood flowed from the eye-lid, when the pain began to lessen, and went off entirely in half an hour. The bleeding lasted two hours, and there were from five to six ounces of blood discharged—the eye-ball was afterwards completely destroyed."

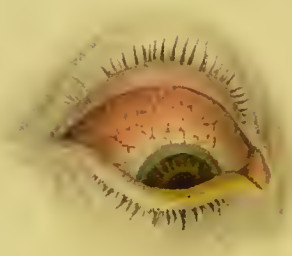
A gentleman had a small tumour growing from the iris, which had frequently filled the anterior chamber with blood, but which was always soon absorbed.

EXPLANATION

OF THE

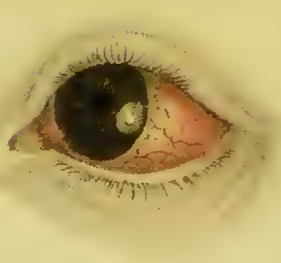
Plates.

Inflammation of the Conjunctiva.



Inflammation of the Cornea and Sclerotic coat.

Vascular Inflammation.



EXPLANATION

OF THE

PLATES.

PLATE I.

The three figures of this Plate are grouped together, in order to contrast the variety in the appearances of the peculiar Inflammation represented in each.

Fig. 1.—Represents the Conjunctiva covering the sclerotic coat, and lining the eyelids, inflamed to a considerable degree, in the eye of a young boy, eight days after the commencement of the disease. The inflammation increased for several days afterwards,

so that this drawing may be said to represent the disease in its first or active stage.

The upper eye-lid is elevated, in order to show a larger surface of the eye-ball. The colour, mode of distribution, and general appearance of the blood-vessels, were accurately copied from nature. They are of a deep scarlet hue; they do not seem to run to any particular point, but anastomose freely with each other, and give off branches over the whole surface of the eye-ball. They appear lying loose, and quite superficial, so that they could be readily elevated with forceps, or on the point of a needle. The conjunctiva was slightly swelled. The cornea remained quite transparent, and none of the red vessels passed over it. There is a light blue circle at the circumference of the cornea, resembling the *Arcus Senilis* of old age.

The palpebræ were considerably swelled, and had a dark purplish hue externally. Their internal surface had a villous appearance, being very turgid with red vessels,

which were so numerous as not to be distinguished in separate trunks. The *Ciliæ* are glued together with a puriform fluid, and several globules of pus are seen on the under eye-lid, floating among the tears, and collected towards the angles of the eye.

Fig. 2.—This drawing represents Inflammation of the Cornea and Sclerotic coat, and the commencement of a corneal speck. The general expression given to this eye differs much from that of Fig. 1., and this arises chiefly from the appearance of the blood-vessels. The inflammation is confined, or is at least much more remarkable on one-half of the eye-ball. There are numerous blood-vessels on the inferior part of the sclerotic coat, which pass over the transparent cornea, and form on it a red cluster. They are of a deep scarlet colour, tinged with brown; they run nearly in straight lines on the sclerotic coat, and do not give off any branches till they approach the cornea. Each trunk is seen distinct,

and the vessels appear deeper, or more in the substance of the sclerotic coat, than those in Fig. 1. There is a small circumscribed Speck near the centre of the cornea, of a circular form, and rather more opaque at the centre than at the circumference. A blood-vessel is seen running towards it. The whole anterior chamber had that muddy, turbid appearance, which disappears instantaneously when the aqueous humour is evacuated: The eye-lids were turgid with vessels, but they were neither much swelled, of the livid colour, nor covered with a puriform fluid, as those in Fig. 1.

This drawing was taken from a young woman, who had symptoms of inflammation in the eye during six weeks, which came on suddenly, without any known cause, and was accompanied with violent pain in the temples and eye-ball.

Fig. 3.—This drawing represents a Pustule of the Cornea advanced to ulceration,

and the peculiar Inflammation which accompanies this disease.

The blood-vessels are of a pale livid colour, and are most numerous on that part of the white of the eye adjoining the pustule. They also appear superficial when compared with those in Fig. 2.; and they anastomose freely with each other, each trunk being easily distinguished. The small white spot on the centre of the pustule is the chalky looking matter so frequently covering ulcers of the cornea. There is also a diffused opacity round the cornea, immediately contiguous to the spot. The eyelids are not affected, and there is no appearance of puriform matter among the ciliæ.

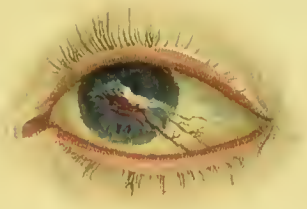
The drawing was taken from a young girl, six days after the commencement of the disease; and she had been subject to frequent attacks of it.

PLATE II.

The three figures of this Plate are intended to illustrate the changes which take place in the Corneal Conjunctiva from Inflammation.

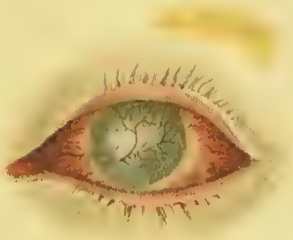
Fig. 1.—Represents the inflammation of a small portion of conjunctiva covering the cornea, as described in page 7. The diseased portion appears of an opaque white colour, a little elevated above the natural surface of the cornea, and extending from the sclerotic coat to beyond the centre of

Inflammation of the Corneal Conjunctiva



Inflammation of the Corneal Conjunctiva

Conjunctiva thickened and covered with varicose vessels



the cornea. It has an oblong form, except near its extremity, where it becomes broader, and two large vascular trunks pass to the cornea, and are ramified into a number of minute branches when they reach the extremity of the opaque spot. The whole cornea is a little clouded. The eye-lids are swelled and turgid with blood. A comparison of this figure with Fig. 2. Plate I. will illustrate the difference in the appearances of the inflammation of the corneal conjunctiva with that which accompanies the common corneal speck.

This drawing was taken from a young lady about eighteen years of age, who had suffered from inflammation in her eye during three months, attended with pain in the head and temple, intolerance of light, and increased secretion of tears. She had formerly four similar attacks, each lasting between three and four months. In this case the vessels going to the corneal conjunctiva were divided, by introducing behind them a very sharp pointed curved needle, then ele-

vating them, and cutting away the elevated portion with a pair of scissors. This operation was followed by an increase of the inflammatory symptoms for a few days, but they gradually abated ; the diseased portion of conjunctiva came away in the form of a slough ; and, after the lapse of a considerable time, the transparency of the cornea was nearly completely restored.

Fig. 2.—Represents a portion of the Corneal Conjunctiva inflamed in the eye of a child. The peculiar characters of this affection form a striking contrast with the appearances of inflammation of a portion of the proper corneal substance, as represented in Plate I. Fig. 2.

Fig. 3.—In this eye the whole Corneal Conjunctiva has become thickened, opaque, and filled with varicose blood-vessels, in consequence of an attack of puriform ophthalmia, a disease where the inflammation

affects chiefly the conjunctiva. The whole opacity is not, however, confined to the corneal conjunctiva in this instance, but extends to the substance of the cornea, particularly its central portion.

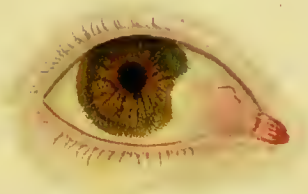
PLATE III.

The three figures of this Plate are intended to explain the most remarkable appearances of *Pterygium*, varying in thickness from a thin membranous pellicle to a fleshy, cartilaginous excrescence.

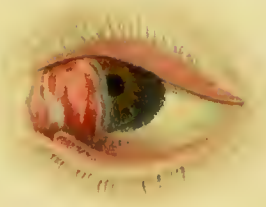
Fig. 1.—Represents a thin membrane, covering about one-half of the cornea and sclerotic coat, which had nearly destroyed vision. It is interwoven with blood-vessels, which appear lying superficial, and of a very considerable size; both the vessels and

1. Membranous Pterygium

2. Common triangular Pterygium



3. Fleshy Pterygium



the membrane are of a dull crimson colour. The inferior *tarsus* of this eye is also diseased, the edge being of an irregular form, and the natural figure of the cartilage destroyed. Almost all the *ciliæ* have dropped out, and in several places the edge of the tarsus is of a bright crimson tint. The gentleman, from whose eye this drawing was taken, had been, during a course of many years, repeatedly attacked with acute inflammation in the eye. It was proposed, that the portion of the conjunctiva which was filled with vessels, should be removed close to the circumference of the cornea. In order to do this, a curved needle was introduced underneath them, and they were then elevated, and the elevated portion snipped off with scissors. The part of the membrane, which remained on the cornea after this operation, appeared very loose, and was readily dissected off. A few vessels which were now seen in the substance of the cornea, increased in size for some days, but they gradually diminished, and in a short time the vision began to im-

prove; and, after several months, though the other eye was completely lost, he so much recovered, that he was able to read and write. Two years after the operation, his eye continued well.

Fig. 2.—Is a drawing of the more usual appearance of the *Pterygium*, where the triangular form is well marked. Its base adheres to the semilunar membrane, and its apex extends a little way over the cornea. The vessels, in this case, instead of being of a dull crimson colour, as in Fig. 1., were of a pale scarlet. They are in considerable numbers, all small, and running in nearly straight lines towards the apex of the pterygium. The new formed body appears of considerable thickness, and lies loose, except at its base and apex. I had an opportunity of observing the progress of this case for upwards of eight years. When I first saw the disease, it had the appearance of a small globule of fat near the junction of the cornea and sclerotic coat, and it gradually became

larger, so that its base adhered to the semilunar fold, and its apex passed over the edge of the transparent cornea.

Fig. 3.—This drawing was taken from the eye of a young gentleman, who had the common triangular-shaped Pterygium from early life. Its growth having become rapid, a surgeon employed repeated scarifications; but these, instead of causing it to diminish, made it grow more rapidly. The mass was so large, as to separate the two tarsi, and involve the semilunar membrane and lacrymal caruncle. The surface of this pterygium was very irregular and rough, and some of the most prominent parts were white and hard; the rest of the tumour was of a bright red colour, bordering on vermilion. Round the anterior extremity there was a ring of opaque cornea, more like the *Arcus Senilis* than common speck.

PLATE IV.

Fig. 1.—Represents a tumour of the corneal conjunctiva, described in page 34, which was remarkable for its thickness, as well as its peculiar brown colour. It was first observed after an attack of inflammation. It had grown very slowly; for, after several years, it had covered only one half of the cornea. Its surface was irregular, the mass being composed of several smaller swellings, and it was plentifully supplied with red vessels. I am indebted to Mr Standard of Taunton for the elegant drawing of this dis-

Fleshy excrescence of the Corneal Conjunctiva

Warty Excrescence of the Corneal Conjunctiva

Tumor of the Conjunctiva with Hairs growing from it

ease, as well as for an opportunity of examining the patient.

Fig. 2.—Represents a diseased growth from nearly two-thirds of the corneal conjunctiva, which, from its firm granulated texture, very much resembled some of the warty excrescences which are formed on other mucous surfaces. This tumour, which was of a flesh colour, had grown very slowly on the eye of a patient sixty years of age. *

Fig. 3.—Congenite fleshy excrescence, growing both from the corneal and sclerotic conjunctiva, with a tuft of hair in its centre. This case is described in page 32.

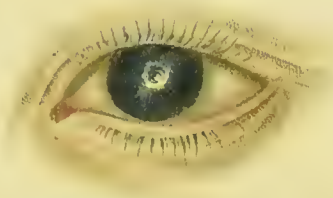
* See page 34.

PLATE V.

The three figures in this Plate are intended to illustrate three of the more remarkable appearances of ulceration of the cornea.

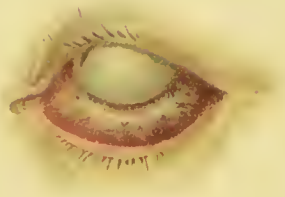
Fig. 1.—Represents a deep conical cavity in the centre of the cornea. There is a degree of muddiness in the cornea, and it is very considerably swelled and thickened. This ulcer was formed in consequence of the suppuration of a pustule in a child's eye. By the continued use of the vinous tincture of opium for some weeks, the cavity of this

Ulcer of the Cornea



Ulcer of the Cornea

Death of the Cornea from Lime



ulcer was filled up, and the transparency of the cornea considerably restored. *

Fig. 2.—Represents a cornea on which there are two ulcers which have an opaque white appearance, their surface resembling a piece of wet chalk, as described page 62.

The edges of these ulcers are rounded, smooth, and considerably elevated above the level of their surfaces. The rest of the cornea is quite transparent. On the nasal side of the albuginea were a considerable number of blood-vessels, terminating in an *Ecchymosis.* The eyelids are a little swelled and turgid. This drawing was taken from a gentleman upwards of fifty years of age, whom I saw along with Dr Monro. The ulcers appeared after a violent attack of inflammation, which was produced by a blow on the eye, and which had lasted four months. The same species of ulcer which has penetrated into the anterior chamber, and allowed the

* See page 54.

iris to protrude, is delineated in Plate X. fig. 1. Vol. II.

Fig. 3.—Shews the appearance of the cornea produced by the application of corrosive substances, as described in page 61.

The patient from whom this drawing was taken was a soldier who had suffered from ophthalmia during the Egyptian campaign, and who had since been subject to weak eyes. A quantity of lime accidentally got within the eye-lids, which gave excruciating pain in the eye and head, produced a great degree of swelling and redness of the whole conjunctiva, and rendered about two-thirds of the cornea so obscure as entirely to destroy his sight. After the violent inflammatory symptoms were abated by bleeding at the temples, scarifying the eye-lids, &c. the process of separation of the dead portion of conjunctiva commenced; and the drawing was taken when the process had a little way advanced. The slough at the junction of the cornea and sclerotic coat be-

gan to separate, and vessels branched out, so that the division between these two coats, which at one period could not be distinguished, now became distinct. The separation of the slough went on from the circumference towards the centre, leaving the portion of the cornea underneath very vascular. When the white slough was touched with a pointed instrument, it appeared as if loose and moveable, and was very hard and brittle.

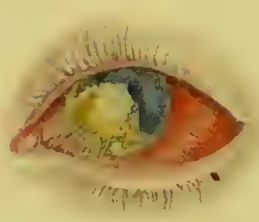
The whole cornea, except a small line at its upper part, is seen covered with the opaque matter; and there is also some remains of it on parts of the sclerotic coat. The sclerotic conjunctiva was a little tumefied, and, instead of lying loose and moveable, it was hard and firm when cut with a scarificator. In some places it is considerably inflamed, and amidst the white portions small ramifications of red vessels may be observed.

Various applications were made use of during the treatment of this patient, but

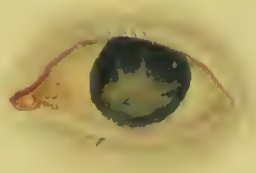
none had such a remarkable effect in abating the inflammatory symptoms and pain, and promoting the separation of the slough, as a solution of the nitrate of quicksilver. I had an opportunity of observing the progress of the case for five months, and, at the end of that period, the whole of the slough had separated, except some small ragged portions towards the centre of the cornea. There was a degree of obscurity, apparently seated deep in the cornea; but the patient's sight was so much recovered, that with this eye he could distinguish large objects.

In one case I saw an appearance of the cornea precisely similar to the above, from some melted tallow falling into the eye; but in a few days the cornea resumed its transparency.

[illegible] of the Cornea with perforation [illegible] between the lamina.



Opacity of the Cornea with Adhesion of the Iris.



Disorganization of the Cornea with Alteration of the anterior chamber.

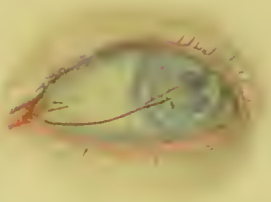


PLATE VI.

Fig. 1.—Represents matter effused between the laminæ of the cornea and in the anterior chamber. There is also an ulceration of the corresponding surface of the cornea, along with a considerable degree of obscurity of that tunic. Both the sclerotic and conjunctiva are much inflamed, and some red vessels may be seen passing over the cornea.

When mining, a piece of coal struck this patient's eye; and the drawing was made twenty-one days after the accident. He

suffered great pain, which increased daily, and became so severe in the forehead and temples, as entirely to deprive him of sleep. The vision of this eye was destroyed, and he could only distinguish very large objects with the other, in consequence of a speck of the cornea which had formed in early life. I made an incision through the cornea similar to that for the extraction of a cataract, and several drops of matter rushed out along with the aqueous humour. The effect of this discharge was almost instantaneous; for, though the operation caused considerable smarting, and the fixing of the eye-ball produced a good deal of uneasiness, yet, as soon as the contents of the anterior chamber were discharged, the deep-seated pain in the eye-ball, and the oppressive pain in the head, vanished. The pain never again returned, and the cornea daily regained its transparency, by scarification of the eye-lids and the application of stimulating ointments, so as to enable him to be again employed as a miner.

Fig. 2.—Represents the appearance of the cornea after it has been ulcerated, and the ulcer penetrated into the anterior chamber. The opaque portion of cornea marks the extent of ulceration. A red vessel is seen ramified through it, and the pupil is obliterated from the extent of the adhesions between the iris and cornea. This is one of the states of the eye in which an artificial pupil may be made with advantage. *

Fig. 3.—Represents the cornea completely disorganized from ulceration, its transparency being destroyed, and throughout converted into an opaque white mass, in which some red vessels are distributed. The anterior chamber is obliterated, and vision irrecoverably destroyed. †

* See page 82.
† See page 127.

PLATE VII.

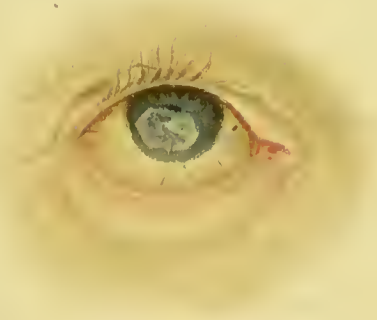
The three figures of this Plate represent the more striking forms of the corneal Speck.

Fig. 1.—Shows the cornea in the *first* form of corneal Speck, where it has become nebulous, or a general cloudiness diffused over it. The degree of opacity is such, that the iris and pupil can be seen through it very indistinctly, and some parts are rather more opaque than others. The obscurity of the cornea was, in this instance, occasioned by that disease of the tarsi called *Entropeon*,

Staphyloma of the Cornea accompanied with Conjunction.

Cicatrized Speck with a Small extra pigmented

and the under Eyelid Everted



Part removed Speck with adhesion of the Iris

an Inverted Eyelid

in which the tarsi are inverted upon the eye-ball. All the ciliæ have dropped out; the cartilages have lost their natural form, and their edges become ragged. In this case, in order to restore the two tarsi to their natural situation, the ingenious operation of Mr Crampton of Dublin was employed, viz. dividing them at their junction, at the temporal angle of the eye, and, after thus liberating the two eye-lids, keeping them in their natural situation, in the manner Mr Crampton points out. *

Fig. 2.—This drawing is intended to represent a corneal Speck, of the *second* form. The Speck is distinctly circumscribed, but not of an equal degree of opacity throughout. It is so situated, as to obscure nearly the whole pupil. Towards its circumference, the iris may be observed shining through it. One small vascular trunk creeps along the

* Vide an Essay on the Entropeon, by Philip Crampton, M. D. London, 1805.

sclerotic coat, passes over the edge of the cornea, and is lost in the speck. The patient had been seized twenty-two months previously with a violent inflammation in his eye, after which the speck was formed, and, at the same time, the inferior eye-lid was inverted.

The tarsus is completely out of view, and is inverted upon the eye-ball; but the integuments of the eye-lids were so loose, that it could be easily put into its natural situation, where it remained till, by a convulsive twitch of the eye-lids, it was again inverted. The integuments of the upper eye-lid are loose and puckered, from the constant winking, and corrugation of the eye-brow, which accompany this disorder.

This and the former Figure show two very different varieties of the Entropeon, and explain also the different modes of treatment necessary to be employed in each.

The tarsus was here restored to its natural situation by removing a portion of the skin of the eye-lid, and keeping the edges of the

wound in close contact, by three ligatures and adhesive plasters. When this was done, the inflammation speedily abated, and the speck diminished in opacity. Thin layers of it were also removed with a knife, so as to destroy the red vessel which passed into it ; and by this treatment it became so small in a few weeks, that the man, from being quite blind, having also lost completely the sight of the other eye, was enabled to walk about the streets, and distinguish objects with considerable accuracy.

Fig. 3.—Shows the appearance of a very thick pearl-coloured Speck, of the *third* form, where, in consequence of an adhesion of the iris to the cornea, the pupil is drawn from the centre of the eye, and contracted to a very small point, so as nearly to destroy vision. The boy, from whom the drawing was taken, had lost also the sight of the other eye, from a violent inflammation after measles. It is one of those few states of disease where an artificial pupil may advan-

tageously be attempted, but, in this instance, the boy was too young to submit to the operation.

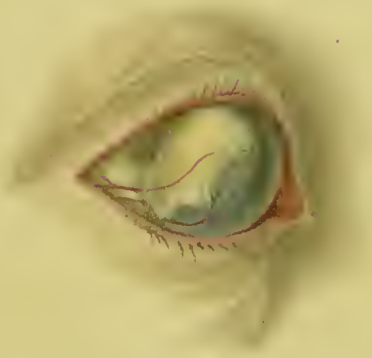


PLATE VIII.

Fig. 1.—Represents a corneal Speck of the most opaque, and, indeed, of the most incurable kind. It occupies the centre of the cornea, and is of a very irregular shape. It is of a pearl-white colour, and is nourished by several red vessels. The cornea has lost its smooth spherical surface, from the cicatrix of an ulcer on the central part of the opacity. The speck is so large and opaque as to allow only a very small portion of the iris to be distinguished through it at its circumference. The cornea and iris also ad-

here to one another, and near the centre of the opacity is a small black spot, which is a fistulous orifice, communicating with the anterior chamber, described in page 112. The woman, from whom the drawing was taken, had suffered repeatedly from violent attacks of inflammation in the eyes during three years.

Fig. 2.—Represents a complete Staphyloma of the cornea in a man twenty-five years of age. It was produced by a violent inflammation, which followed a wound of the eye with a sharp-pointed instrument, two years before. It is of such a bulk as not to be entirely covered by the eye-lids. There still remains a line of division between the cornea and sclerotic coat. The cornea is formed into a tumour, nearly globular, and of an opaque white, and, in some parts, of a bluish, pearl colour. Over several parts of it are seen the ramifications of red vessels. The sclerotic coat has lost its natural whiteness and lustre, and has a greenish hue, an

appearance not unusual after suffering from inflammation. The palpebræ are inflamed, and many of the ciliæ have dropped out.

Fig. 3.—Is an example of what has been called the *Partial Staphyloma*;—only a portion of the cornea being affected. The distinction is a useless one, both in a pathological and practical point of view. In this case, where the disease came on in consequence of the other eye having become staphylomatous from an wound, a portion of the cornea became obscure, and more prominent than natural; and although a part of the cornea immediately opposite the pupil remained transparent, yet the increased sphericity destroyed vision. The speck was of a pearl colour, and nourished by a red vessel. An adhesion had taken place between the cornea and iris.

PLATE IX.

Fig. 1.—Is an outline taken from the eye, described in page 129, when viewed laterally, showing a cornea which has assumed a conical form, whilst, at the same time, it remained transparent.

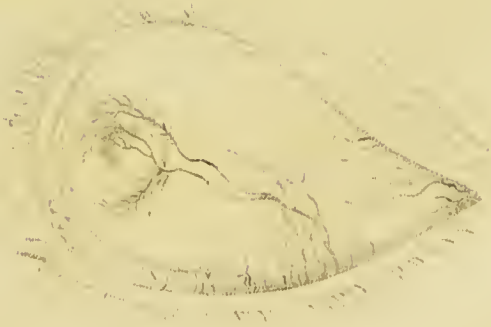
Fig. 2.—This is an outline of the case described by Beer, as quoted in page 135, in which the cornea is very much distended.

Fig. 3.—This is a magnified view of Staphyloma, showing the mode of distribution

Conical formed Cornea

Cornea as seen in Hydrophthalmia

Angle of the Blood-vessels in Staphyloma



of its blood-vessels. The appearances of the two large trunks which advance to the apex of the tumour were very remarkable, from the difference in their colour at different parts. About one half of the trunk was of a pale livid hue; the contiguous portion became suddenly of a deep crimson, and the minute ramifications were of a reddish brown tint. It is difficult to give a satisfactory explanation of this appearance, but to the physiologist the fact appears interesting. The difference in the quantity and in the chemical qualities of the blood in the trunks and extremities of the vessels, and the difference in the thickness of the coats of the vessels in the different parts, may each have a certain share in producing these appearances.

Printed by George Ramsay and Company,
Edinburgh, 1819.

THE MORBID ANATOMY OF THE HUMAN EYE.

BY

JAMES WARDROP,

SURGEON TO THE LATE KING.

ILLUSTRATED BY COLOURED PLATES.

SECOND EDITION.

VOL. II.

LONDON:

JOHN CHURCHILL, PRINCES STREET, SOHO.

1834.

CONTENTS.

CONTENTS.

CONTENTS.

CONTENTS.

CHAP. XV.

GENERAL REMARKS ON THE AQUEOUS HUMOR AND ITS CAPSULE.

When treating of the structure of the Cornea, it was observed, that its internal surface is lined by a polished, transparent, and firm membrane, forming part of that cavity which contains the aqueous humor.* This membrane, which has been called the Capsule of the Aqueous Humor, lines not only the cornea, but the whole of the anterior chamber. On leaving the interior surface of the cornea, it

* See Vol. I. p. 1.

extends over the anterior, and is reflected over the posterior portion of the iris, and uniting with the capsule of the crystalline lens, forms its anterior lamina. A complete bag is thus formed, which in all respects is analogous, both in its natural structure and morbid changes, to serous cavities in other parts of the body.

The Capsule of the Aqueous Humor, like other serous membranes, as the pleura, pericardium, peritonæum, and vaginal coat, forms a circumscribed cavity, which is constantly kept moist by a fluid; and it is extremely probable, that the Aqueous Humor which it contains is exhaled from the surface of that membrane, in the same manner as the fluids of other serous cavities.

Like serous membranes, too, the Capsule of the Aqueous Humor is subject to particular morbid changes. When inflamed, it acquires additional thickness; albumen is effused on its surface; adhe-

sions form between opposite portions of the membrane; and ulceration seldom if ever takes place. It has also been found ossified; and the fluid which it contains is subject to changes in its qualities.

The Aqueous Humor itself performs several important functions. Like the fluids of serous cavities, it lubricates and allows the free motions of the contained parts, readily admitting of the contraction and dilatation of the iris, and yielding to any changes which may take place in the eye, when viewing objects at different distances.

The Aqueous Humor, besides, forms a refracting medium for the rays of light which enter the eye; and it has, perhaps, also, along with the crystalline lens and vitreous humour, an acromatic power.

The Aqueous Humor in the healthy eye does not exceed five drops; but the quantity seems to vary in different eyes.

Both the colour and consistence of the

Aqueous Humor vary at different periods of life. In the fœtus, it is of a rose colour, and during the first month after birth it remains reddish and turbid. In youth it is very thin, clear, and transparent; but it becomes thicker, and less transparent, as we advance in years. In old age it is frequently whitish.* It is somewhat heavier than water, and possesses a small degree of viscidity. It is void of smell, unless when kept for some time, and then it has the odour of putrid white of egg. It is almost insipid, having merely a slight saltishness, which is only perceptible in that of old animals.† According to the analysis of Chenevix it consists of water, holding small quantities of albumen, gelatine, muriate of soda, and phosphate of lime in solution.

The Aqueous Humor possesses a remarkable power of dissolving substances accidentally deposited in it, thus becoming a means of removing extraneous mat-

* See Porterfield on the Eye. † Ibid.

ter, by which vision might be impaired. Instances have been observed, where the point of a knife, accidentally broken while performing operations on the eye, has been rapidly oxidated, and dissolved, when deposited in the anterior chamber. The solvent power of the Aqueous Humor is also strikingly illustrated in those cases, where portions of the lens or its capsule being detached, and left floating in that fluid, are gradually absorbed.

From the view now given of the natural structure and functions of the Capsule of the Aqueous Humor, its pathology becomes extremely simple, as the different morbid changes can be illustrated by comparing them with analogous changes of structure in other serous membranes; the symptoms in the diseases of this Capsule being subject to those modifications only, which arise from the peculiar functions of the eye as the organ of vision.

CHAP. XVI.

OF INFLAMMATION OF THE CAPSULE OF THE AQUEOUS HUMOR, AND ITS CONSEQUENCES.

1.—*Of the Symptoms of Inflammation.*

INFLAMMATION and its consequences are the most remarkable morbid changes observed in the capsule of the aqueous humor. The former, as far as I know, has never been described by any author; and the latter, when noticed, have always been mentioned as distinct diseases.

When describing inflammation of the cornea,* it was remarked, that inflammation sometimes affected the external or

* See Vol. I. p. 5.

mucous covering of that organ ; sometimes its proper substance; and that, in other cases, it was confined to its internal membrane. Since these observations were published, I have been able, distinctly, to discriminate inflammation of the Capsule of the Aqueous Humor from affections of the adjacent structures; the inflammation, in such cases, either extending over the whole surface, or being limited to a particular portion of that capsule.

When the Capsule of the Aqueous Humor becomes inflamed, the disease is characterized, both by changes in the anterior chamber, and by the appearances of the inflamed vessels. The delicate membrane becomes opaque, and more or less of an albuminous deposition takes place on its interior surface, producing a muddiness or turbidity in the anterior chamber, and giving an appearance as if the eye-ball was unusally full and prominent.

Besides the diffused muddiness, there is often one or more spots which distinctly denote an opacity of the substance of the cornea. These do not resemble any of the common forms of speck, but have a mottled appearance; and around the more opaque white central points of these specks, there is a kind of disk, very like what is to be perceived in some agates, and what are commonly called the eyes of pebbles; an appearance, no doubt, produced from the more opaque capusule of the aqueous humour lying behind the opaque portion of cornea.

The effusion of albumen takes place, not only on that portion of the capsule of the aqueous humor which forms the interior surface of the cornea, but also in many instances on the surface of the iris, and in the pupillar opening; so that the pupil, instead of retaining its lustre and circular form, becomes more or less dim, its form irregular, and its motions limited.

The appearances of the blood-vessels are different from those in other species of opthalmia. There is not that general redness of the white of the eye and internal palpebral membrane, accompanied with a puriform discharge, which characrizes the inflamed conjunctiva; nor is there that opacity of the cornea, and increase in the number of blood-vessels at a particular part, which take place, either in inflammation of the substance of the cornea, or of its mucous covering. A red circle of minute vessels appears on that part of the sclerotic coat, corresponding with the attachment of the iris, leaving the sclerotica between the cornea and these vessels nearly of its natural pale colour, whilst the trunks only of the inflamed vessels are seen on the periphery of the eye-ball.

Besides the red circle of inflammation which has been described, and which is probably produced by an increase in the size and number of the anterior ciliary

vessels, some vessels of the conjunctiva are also frequently enlarged. These appear as insulated trunks, and can readily be made to glide from place to place, by moving the flaccid conjunctiva, whilst those of the sclerotica, from being distributed in the substance of that tunic, appear deeply seated, and cannot be elevated with a pointed instrument, like those of the conjunctiva, or subjacent cellular membrane.*

The blood vessels are of a bright red colour during the active stage of the inflammation, and gradually assume a more crimson hue as the inflammatory symptoms subside. A difference, too, may sometimes be detected in the colour of the vessels of the sclerotica and conjunctiva.

The eye-lids participate little in this disease. There is sometimes an increased flow of tears, but the patient suffers very little pain on exposure to light, so that the eye-lids are kept open. The vision

* See Plate X. fig. 1.

is more or less dim ; and what ought particularly to be noticed, is a sensation of distention and fullness in the eye-ball, accompanied with a dull, aching, pain, generally in the forehead, sometimes also in the back part of the head :—symptoms, it may here be remarked, which are instantly and permanently relieved by evacuating the aqueous humor.

The constitutional symptoms accompanying Inflammation of the Capsule of the Aqueous Humor, vary much in the degree of their severity. Sometimes the pulse is very frequent and hard, the skin hot and dry, the tongue loaded, and the functions of the alimentary canal disordered. In other cases the disease almost from its commencement, assumes a chronic form, and, after continuing a certain period, participates in any peculiarity of the patient's constitution. Besides what may be considered as the idiopathic inflammation of the Capsule of the Aqueous Humor, that texture is particularly af-

fected in Syphilitic, Arthritic, and Rheumatic Opthalmiæ.

An excellent illustration of the disease in the human eye, just described, may be observed in the Horse; the eyes of that animal being subject to a peculiar inflammation, which seems to be entirely confined to the Capsule of the Aqueous humor. It attacks the organ very rapidly, and I have sometimes seen two-thirds of the anterior chamber filled with albumen in less than twenty-four hours from the commencement of the disease. Horses of every description, and of every age, are very subject to this kind of inflammation, though it is most frequent amongst those which are young and high bred, and those in high condition. Most commonly the eyes are affected successively, but sometimes both at the same time. An animal thus affected, is very subject to a relapse; and the returns of the disease are often far distant. The albumen is generally completely and rapidly

absorbed, at least during the first attack; but ultimately the pupil remains covered with a portion of it, the edge of the iris adheres to this matter, and vision is thus destroyed.

2.—*Of the Effusion of Albumen.**

The effusion of Albumen invariably accompanies inflammation of all serous membranes, and more or less of this substance generally remains after the inflammatory symptoms have subsided. It has already been mentioned,† as highly probable, that Specks are produced from an albuminous effusion into the cellular texture of the Cornea; and, when Albumen is deposited in the anterior chamber, it may be considered as one of the characteristic symptoms of the capsule of the aqueous humor having previously been inflamed.

* Cateracta Membraneo-floccosa, or lymphatica.

† See Vol. I. p. 94.

During the continuance of the inflammatory symptoms, there is generally so much muddiness diffused over the whole anterior chamber, that no distinct portions of Albumen can be distinguished, unless they be of a large size; but when this turbid state goes off, flakes will sometimes be perceived loosely attached to the surface of the iris; and, in other instances, the whole surface of the anterior chamber is covered with a thin albuminous layer.

Albumen, when effused into the chamber, assumes a variety of appearances besides that of flakes. In some cases it floats in the aqueous humor, appearing like a thick smoke or cloud;* in others it is deposited in streaks, having a reticulated appearance:† and in others it resembles a purulent fluid,‡ or sometimes in a solid mass which passes to and fro through the pupil.§

* See Plate XII. fig. 1.
† See Plate XII. fig. 3.
‡ See Plate XII. fig. 2.
§ See Wathen, p. 15.

Thus the colour of the albumen being a straw yellow, when combined with the natural colour of the iris, there is produced a remarkable change in the appearance of the eye. If the natural colour of the iris be blue, the addition of the yellow albumen produces a green hue;* and when the iris is brown, the admixture of the lymph gives it a lighter tint: changes which are remarkably striking, when the disease is compared with the sound eye: thus a person who has had an attack of this kind, may have a green and a blue eye.

If the portions of Albumen which have been deposited during an attack of inflammation, be not afterwards absorbed, they become organized; and, in many cases, vessels conveying red blood can be distinguished ramifying through them. This may be particularly observed, when a quantity of albumen is effused into the

* See Plate XII. fig. 2.

aperture of the pupil, as, in such cases, one or more red vessels can sometimes be seen coming off from the edge of the iris and distributed in its substance.*

3.—*Of Adhesions.*

When the capsule of the aqeous humor has been inflamed, the Albumen, effused during the inflammation becomes the medium of permanant Adhesions between different portions of the inflamed membrane. Thus, the edge of the pupil adheres to the capsule of the crystalline lens; opposite points of the pupil adhere to one another; and portions of albumen sometimes form a connection between the iris and adjacent cornea. In this manner are produced an infinite variety in the form of the pupil; and as these changes take place during an attack of inflamma-

* See Plate XII. fig. 3.

tion, the aperture of the pupil is not only irregular, but generally very much contracted.

But, besides the deviation from the natural shape, and the alteration commonly produced in the colour of the iris, by an admixture of albumen, the aperture of the pupil seldom if ever remains transparent. In some cases, thin delicate webs may be distinguished passing across it; and sometimes there is a solid albuminous cake, in which blood-vessels can be traced ramifying.

A mere alteration in the form of the pupil has little effect in diminishing the powers of vision; but a very slight degree of obscurity, produced by the deposition of albumen, materially injures the sight. Thus also vision may become double or multiplied when effusion has taken place in the pupil, from the particular arrangement of the opaque matter, forming two or more apertures.

CHAP XVII.

OF OSSIFICATION OF THE CAPSULE OF THE AQUEOUS HUMOR.

From the morbid changes observed in the pleura, peritonæum, vaginal coat, pia mater, and in all other serous membranes, it might be expected that the Capsule of the Aqueous Humor would occasionally be found ossified. One case has already been noticed,* where a thin shell of bone was formed within the anterior chamber; and I have no doubt but in that instance, part of the capsule which lines the cornea was ossified. A similar case has since

* See Vol. I. p. 73.

come within my observation, where thin laminæ of Bone were several times discharged from the anterior chamber, through ulcers formed in the cornea. I have also had an opportunity of examining a case under Mr. Wishart's care, where that portion of the capsule of the aqueous humor which is reflected over the iris, was almost entirely converted into a bony shell. It will afterwards be noticed, that, in several instances, the Capsule of the Lens has been found converted into bone, and in one case, the hyaloid membrane or Capsule of the Vitreous Humor was also found ossified. These facts make it probable, that in the other cases, the osseous laminæ were formed in the capsule of the aqueous humor, all these membranes belonging to the serous class.

CHAP. XVIII.

OF THE DISEASES OF THE AQUEOUS HUMOR.

THE Aqueous Humor is subject to few morbid changes, and as these are rather to be considered as symptoms of other affections than distinct diseases, only a few general observations will here be necessary.

In some diseases of the eye, the quantity of the Aqueous Humor is increased; in others it is diminished. The former takes place in Staphyloma, and in the disease which has been called Hydroph-

thalmia; but I have never had an opportunity of seeing an instance where there was a preternatural collection of aqueous humor, unaccompanied with some disease in the coats of the eye.*

The quantity of the Aqueous Humor is diminished in old people, as well as in many of those diseases where the form of the anterior chamber is altered or destroyed. Those who have Presbyotic eyes see better as they advance in life, from the diminution of the Aqueous Humor.

It has already been remarked, that an albuminous fluid is sometimes mixed with the aqueous humor. Blood also is sometimes diffused through it;† and it is said that in pregnant women, milk has been seen in the anterior chamber; but such a case has never come within my observation. Woolhouse relates that he saw bladders of air, and it has even been asserted,

* See "Staphyloma," Chap. XI. and "Alterations in the Form of the Cornea," Chap. XII. Vol. I.

† Das Blutaug.

that particles of quicksilver have been observed in the aqueous humor.*

Prochaska mentions a case, where the Aqueous Humor was so acrid, that it tarnished the extracting knife.†

It may not be out of place to mention here, that there is a disease which frequently affects the eyes of Horses in India, occasioned by a Worm, which in size and colour, from the description I have received, may be compared to the common *Ascaris*. It seems to be generated in the anterior chamber, and can be distinguished swimming in the aqueous humor with great vigour. It causes a good deal of irritation and inflammation, the effects of which ultimately destroy the organ. The natives of India cure this disease by making an incision through the cornea, and extracting the worm. Though I have never had an opportunity of examining an eye affected with this sin-

* Sybel in Reil's Archiv. für die Physiologie.

† Voigtel's Handbuch, II. Band. p. 110.

gular complaint, circumstantial accounts from several accurate observers, leave no doubt on my mind of its actual occurrence; and the fact accords with what is known regarding the formation of Worms in many parts of the human body, and still more frequently in the inferior animals. Bonnetus mentions that he found a Worm in the aqueous humor of a horse's eye.*

* Sepulchret, Anatom.

CHAP. XIX.

GENERAL REMARKS ON THE IRIS.

THE functions of the Iris are of considerable importance to vision. Besides regulating the quantity of light which falls upon the retina by changes in the size of the aperture of the pupil, the contraction and dilatation of that opening enables the eye to perceive objects more distinctly at different distances.*

The Iris, as has already been mentioned, is covered on both sides by the capsule of the aqueous humor,† and between these

* Vide Wood's Optics. † Vide Chap. I. Vol. 1.

two serous laminæ there are numerous blood-vessels, which form a net-work, and freely anastomose round the pupil. The Iris is also plentifully supplied with nerves, the connections of which, as shall afterwards be mentioned, explain many phenomena in diseases of the eye.

Motions of the Iris. — Though no muscular fibres can be demonstrated in the Iris of the human eye, yet from the motions it performs, their existence can scarcely be doubted. This opinion is corroborated by some animals, particularly parrots, possessing a voluntary power of contracting and dilating the pupil; and from muscular fibres having been observed in the iris of some of the larger animals.

Perhaps the motions of the Iris may have some analogy to those motions in plants produced by the influence of the sun's rays. Its motions in an eye where there is a complete cataract, or where the aperture of the pupil is drawn aside

from a part of the cornea * which has become opaque till it gets opposite to a transparent portion, makes this opinion probable. The iris, too, in many cases, retains its power of contraction and dilatation, even where the retina is completely insensible, so that it is likely that its motions do not altogether depend upon impressions made on the retina. In other cases of amaurosis, the motions of the iris are completely destroyed.

By observing the motions of the Iris of the sound eye when the diseased one is exposed to different degrees of light, the motions of the Iris of the diseased eye can be accurately determined.

In some cases of amaurosis affecting one eye, the Iris of that eye contracts and dilates, whilst corresponding changes are going on in the iris of the sound eye, from the influence of different degrees of light; but if the sound eye be excluded from light, the iris of the diseased eye remains

* See Vol. I. page 83.

immoveable. The motion, therefore, of which the blind eye is susceptible, must entirely depend on that sympathy which is known to subsist between the two eyes, and between corresponding structures in each of these organs.

Colour of the Iris.—The Iris is of various colours, and is differently variegated in almost every individual. Some irides are of a light, and some of a dark blue shade, others are light brown, hazle brown, or of a very dark shade, variously streaked. In the Albino, the iris is of a rosy red, and when the iris is red, the choroid coat is always of the same colour. The red colour is frequent in the lower animals, particularly in those who seek their prey during the night. In an Albino from Surinam, the iris was observed of a fiery red colour, and variegated with blue and white streaks. The pupil also appeared very red.*

I have seen some people with a dark-

* See Mémoires de l'Académie de Sciences. Paris, 1734.

brown angular spot on the iris of one or both eyes. A gentleman, who had a very distinct mark of this kind, said that there was a similar one on the irides of several branches of his family.*

Sometimes the colour of the Iris is different in the eyes of the same individual. Borelli mentions having known two people, each of whom had a blue and a black iris. Sybel saw a man, the iris of whose right eye was of a dark brown, and that of the left a dark blue colour. This variety in the colour of the iris is sometimes accompanied with a corresponding variety in the colour of the ciliæ and eye-brows.

The difference in the original colour of the iris seems chiefly to depend on the colour and quantity of the pigmentum. Those whose irides are dark have it in greatest quantity, and in the Albino this colouring matter is entirely wanting, the red shade arising from the blood-vessels

* This variation in the colour of the iris produces what is called the "ring-eye" in the Horse.

shining through the delicate and transparent membrane.

Of the Pupil.—In man, the natural figure of the Pupil is circular, and is placed nearly in the centre of the iris, whereas in some animals it is of an oblong form, being so situated as best to enable the individual to extend its sphere of vision in those directions most necessary for its peculiar habits. Thus, in the graminivorous animals it is vertical, and in some beasts of prey, as cats, it is a perpendicular chink.

The Pupil also varies in size in different people; and it may sometimes be observed different in the two eyes of the same individual; probably from a difference in the convexity of the two eyes.

The pupil is generally larger in children than in adults. The pupil is also large in those who have black eyes, and a dark complexion; and in those who are very fair and have light blue eyes, it is commonly a good deal smaller. The reason of this

seems to be, that when the eye-lashes are black, the eyes are better shaded from the light, and little light will be reflected from their inner surface upon the eye; therefore the pupil, which always becomes dilated when the light is faint, will keep wider than in those who, being of a fair complexion, have their eye-lashes white; for white eye-lashes, by reflecting much light into the eye, must make the pupil contract.*

When the anterior chamber is small, the pupil is small also; and when of a full size the pupil is always larger. Hence the variety in the apparent bulk and brillancy of the eye-ball.

In some individuals the pupil scarcely contracts at all in a bright light, whilst, in others, it is excited by the slightest glimmer. In people who live much in dark places, the pupils are more dilated than in those who are exposed to vivid lights, or employed in looking at minute

* See Porterfield on the Eye.

objects. Men who live in countries covered with snow have the pupils constantly contracted, and see clearly; whilst those who inhabit clouded and moist climates, have them much dilated.

The effect of the extracts of *Belladonna* and *Hyoscyamus*, in producing a temporary dilatation of the pupil, is very curious; and it is remarkable, that this effect takes place not only when these substances have been applied to the conjunctiva, but to distant parts. Raius* mentions a case where a dilatation of the pupil took place each time the leaves of the belladonna were applied to a cancerous ulcer underneath the eye; and when an artificial dilatation of the pupil is wanted, it is easily effected by applying the extract of one or other of these plants to the eye-brow. Mr. Lawrence saw a man who swallowed by mistake a quantity of belladonna, and whose pupils became dilated in a remarkable degree, and remained so for several days.

* Historia Plantarum, p. 680.

Diseases.—Besides the Diseases of the serous surface, the other parts which enter into the composition of the Iris are subject to morbid changes; these, however, are not numerous. A variety of changes also take place in the motions and form of the Pupil; but these are chiefly symptoms of other diseases.

CHAP. XX.

OF INFLAMMATION OF THE IRIS.*

INFLAMMATION affects either the serous surface of the iris, or its proper substance; or it may affect both at the same time.†

From what has already been said of inflammation of the capsule of the aqueous humor,‡ it is unnecessary to detail those symptoms and appearances which are produced by inflammation of the portion

* Ophthalmia Uveæ, Iritis.

† In this respect the Iris may be compared to the lungs, inflammation of that organ being either confined to the pleura or to the parenchyma of the lungs, or affecting at the same time both these structures.

‡ See Chap. xvi.

of that membrane which covers the iris: the thickening, the discoloration, and the quantity of albumen effused on the surface of the iris, all take place and vary according to the violence and duration of the inflammatory symptoms.

In those cases where the Inflammation seems confined to the iris, the proper substance of that organ will be found chiefly affected. But although the origin of the complaint be confined to this part of the structure of the iris, yet when the symptoms are severe, its serous surfaces will also, in many cases, be observed to participate.

It has been noticed, when describing the symptoms of inflammation of the capsule of the aqueous humor, that the patient suffers little pain on exposure to light, the more remarkable symptoms being a pain in some part of the head, with a sense of fulness in the eye-ball; whereas, when the proper substance of the iris is inflamed, extreme pain on exposure to light is one

of the most striking characters of the inflammation. It may here be remarked, that the apparent redness of the eye-ball forms no certain criterion of the degree of pain which a patient suffers in any species of ophthalmia; for those parts of the organ, which in their natural state, are most influenced by light, become peculiary sensible to it when inflamed, whilst the exposure to light seems to produce but a slight impression upon other parts, whose functions are not so immediately connected with vision, and which, from being most external, assume the reddest colour. Thus it happens that the iris, whose province is, from the peculiar sensibility with which it is endowed, to regulate the quantity of light falling upon the retina, suffers from exposure to light in a more remarkable manner than most other parts of the eye-ball, when affected with inflammation.

Besides acute pain in the eye, Inflammation of the Iris is usually accompanied

with a deep-seated pain at the bottom of the orbit, which occasionally extends through different parts of the head, and is chiefly seated in the brow. Perhaps this pain may, in a great measure, be produced by the inflammation extending to the choroid coat; the vascular connections between that tunic and the iris being very numerous.

When the Iris is inflamed, the pupil will be found very much contracted, even in a dull light; its edge becomes puckered, loses its acuteness, and appears turned back into the posterior chamber.

From the quantity of pigment which enters into its structure, the Iris does not acquire that red colour which most other parts of the body do when inflamed, the colour produced by the inflammation being such as would arise from a mixture of red blood with the natural colour of the iris, whatever that happens to be. In some cases, however, the red colour appears distinct, the blood-vessels being so

numerous as to shine through the iris. Janin relates a case of violent inflammation of the iris, where it became of a blood-red hue, resembling a piece of raw flesh.* Beer saw it blood-red in a case of nephritis. Conradi also once remarked the iris become of a blood-red colour, after a wound of the eye.†

When the serous membrane of the Iris participates in the Inflammation, besides the symptoms which have now been mentioned, more or less of an albuminous deposition takes place on its surface, producing discoloration with irregularity and opacity of the pupil, and a turbidity in the anterior chamber: appearances which have been particularly described, when treating of inflammation of the capsule of the aqueous humor.‡ The appearances of the blood-vessels in these two species of inflammation are very similar, the peculiar red circle which they form around the

* See Traité des Maladies de l'Oeil.

† Arneman's Magazin, B. I. S. 1. ‡ See Chap. xvi.

eye-ball, at a small distance from the junction of the cornea and sclerotic coat, and the deep situation of these vessels, being very striking in both cases,—a similarity which, no doubt, arises from the blood-vessels which supply the two structures, being both branches of the anterior ciliary arteries.

Inflammation of the Iris is excited by a variety of causes. It is particularly apt to be occasioned by exposure to bright and dazzling lights. It sometimes accompanies phrenitis; and, as far as I have been able to observe, the iris is more liable than any other part of the eye to be affected with venereal inflammation.*

When inflammation is excited in the Iris of one eye, it sometimes happens that the iris of the other eye is in like manner affected. In one instance this was remarkable: the iris of one eye being inflamed in consequence of a punctured wound, when soon afterwards the iris of

* See Venereal Ophthalmia.

the other eye became similarly affected. This sympathy, which subsists not only between the two eyes, but between the similar parts of each of these organs, is illustrated by many other diseases, as well as by those of the iris.*

* See Sympathy of the Eyes, Chap. xvi.

CHAP. XXI.

OF ALTERATIONS IN THE FORM OF THE PUPIL.

NEITHER the size of the Pupil, nor the extent of the motions of the iris, are always equal in both eyes; and in some instances, I have observed this difference to be very considerable, and usually accompanied with a disparity in the vision of the two eyes.

Malconformations.—It sometimes happens that there is an original malconformation in the figure of the human Pupil. In a child a few months old the pupils of

both eyes were observed to be of an irregular form, and they readily altered their size when exposed to different degrees of light. Reil* saw a man in whose right eye the pupil extended downwards to a small sharp point. In the left eye the pupil was round, but its upper edge was so situated in the centre of the iris, that the under-part of the iris was scarcely to be observed. Kühn† saw a young woman born with a pupil of a rectangular shape, which was immoveable, not being lessened by a bright, nor enlarged by a dull light. Himly has observed cases where the pupillar opening was not circular, but indented. In one eye he saw seven indentations, so that the margin of the pupil formed seven small semicircles. The vision of this eye was sound, the motions of the iris natural, and there had been no injury of the eye. This peculiarity in the iris he conceived to

* See Archiv. für die Physiologie.

† See Naturahistorische Bemerkungen.

arise from an irregularity in the disappearance of the pupillary membrane.

Malconformations of the Pupil are sometimes *hereditary*. Block* knew a family in whom the father, with his children, nephews, and nieces, had long-shaped pupils. One of the daughters and one of the nephews had the pupil in one eye oval, and in the other it was circular. Conradi† mentions that he knew a father, daughter, and grand-daughter, in whom the under margin of the pupil was as it were, cut out; the pupil consequently was not round, but oval, and run oblong to a point at the lower part. Hagström‡ saw a whole family, in which each member had such a large oval-shaped pupil, that the under edge of the iris was quite vanished. Acrell§ saw a similar deformity, which was hereditary.

* See Medic. Bemerkungen.
† See ibidem.
‡ Handbuch d. Path. Anat. §. 517.
§ See Med. Bemerkungen.

Sometimes there is more than one opening in the iris, from original malconformation. In the cabinet of Meckel there is a calf's eye preserved, the iris of which has two regular formed pupils close to one another. Sometimes a double Pupil is met with in an eye whose parts are single; and sometimes both lens and pupil have been found double.*

Changes from Disease.—The form of the Pupil undergoes various changes from disease.

In some people the Pupil is not quite circular, from a portion of the iris having lost its power of contraction and dilatation; at least I have observed several cases, in which one part of the edge of the pupil remained immoveable, whilst the others dilated and contracted, no adhesions or any alteration in structure being perceptible. In some cases this want of motion seemed to be only at one point, and in others it extended to a

* See Voigtel's Handbuch.

large portion of the circumference of the pupil. The same loss of power may sometimes be observed in a particular portion of the iris, where it has sustained an injury from the extracting knife.

When the iris has suffered from inflammation, the Pupil is frequently found not exactly in the centre of the iris, and it seldom regains its circular form and natural extent of motion, the edge of the iris forming adhesions either to the capsule of the crystalline lens or to the cornea.

In a number of instances, by the shape and mobility of the Pupil, an opinion may be formed of the sensibility of the retina. It sometimes happens that the pupil is dilated to such a degree, that the iris appears merely as a streak round the circumference of the cornea, this being always the symptom of some other disease. A great dilatation of the pupil may generally be observed where there is a wound of the ciliary ligament; and I have always observed the dilatation

equally great in those cases where vision has been destroyed by a wound of the frontal nerve; an effect which may probably be accounted for from the connection which the frontal branch of the fifth pair of nerves has with the nerves of the iris.

CHAP. XXII.

OF THE PERMANENT PUPILLARY MEMBRANE.*

All the natural openings have been found closed from original malconformations of structure. The meatus of the external ear, the nostrils, the vagina, the rectum, and the urethra, have been found obliterated; and the same thing has been met with, though very rarely, in the pupil.

The membrane which shuts up the pupillary opening in the fœtus, and forms a

* Sinizesis Congenita.

partition between the two chambers, is seldom visible at birth, but may be seen in a child of the sixth or seventh month. It is very vascular, receiving its supply of blood from the iris.

When the Pupillary Membrane is not absorbed before birth, it appears in the form of an opaque web, which is easily distinguished from cataract by being vascular, by the size of the pupil being unalterable, and being on the same plane with the iris.

In one case the Pupillary Membrane remained perfectly apparent until the sixth week after birth, at the end of which period it spontaneously disappeared. Wrisberg* saw a boy four years of age, in whom this membrane was perfectly entire. Cheselden operated on a boy ten years old, who had this membrane imperforated. Borthwick† mentions an obliteration of the pupil in which a complete tunic of a

* See Haller, Nov. Comment. Gott. Tom. II.

† See Med. and Phys. Com. Edin. Vol. I.

hard nature separated the two chambers of the eye, and adhered around the margin of the iris. Wenzel also mentions the case of an adult, where the pupillary membrane of one eye remained unabsorbed.*

* See Manuel de l'Oculiste, p. 416.

CHAP. XXIII.

OF THE UNDULATORY MOTION OF THE IRIS.

In some cases where the operation for cataract has been performed, and where the iris remains apparently uninjured and the pupil of its natural form, the Iris has a very singular undulatory motion, being agitated to and fro like a piece of cloth exposed to a fluctuating wind.

From this state of the Iris, vision does not seem to be injured, but the pupil no longer retains the power of contracting and dilating so freely as usual. This appearance has, in most cases, been observed

soon after the operation, and has continued afterwards during life.

In people born blind with amaurosis, or with cataract, the same singular appearance may often be observed; and I have also remarked it in cases of blindness produced from injuries.

In some cases where the Iris is subject to this undulatory motion, the whole eye-ball also has a peculiar goggling and involuntary action. In some cases of cataract, too, the opaque lens partakes of this tremulous motion of the Iris.*

It may be difficult to give a satisfactory explanation of this curious diseased motion of the Iris, and it may not, in all cases, depend on the same cause. But as in most instances when this tremulous motion occurs, the vitreous humor has become converted into a watery fluid, probably the Iris, from being thus loose and unsupported, partakes of all those undulations of the aqueous humor which

* The "Cataracte Tremblante" of the French.

take place when the form of the eye-ball changes to view objects at different distances. In cases of cataract where the lens is dislocated, and lies loose in the anterior chamber, the motions which the iris then receives, make it probable that its undulatory motions are produced by the fluctuation of the aqueous humor.

CHAP. XXIV.

OF TUMOURS OF THE IRIS.*

SMALL tumours, which have been called Polypi, are sometimes, though rarely, found on the Iris.

In the cabinet of Meckel, there is a preparation where the pupil is shut up by a polypous excrescence.

Beer mentions cases where "fleshy tumours" were found growing from the inner margin of the iris.†

I have seen only one example of a tumour growing from the Iris, and in this

* Hyperauxesis Iridis.

† Lehre der Augenkrankheiten.

instance though of long standing, it had acquired but a small size. It seemed, however, extremely vascular, for frequently without any external cause, it bled profusely, and would in a short time fill the anterior chamber with blood. Tumours of this description are said by Lower to be frequently found growing from the iris of the Horse.

CHAP XXV.

OF THE PROLAPSUS OF THE IRIS.*

A PORTION of iris is occasionally prolapsed through a wound of the cornea. But the most frequent cause of a Prolapsus of the Iris, is when an ulcer erodes the cornea, and penetrates into the anterior chamber. The aqueous humor then escapes, and by the contents of the posterior chamber being pressed forwards, a portion of iris is thrust through the ulcer of the cornea, and forms a small projecting tumor.

* Der Vorfall der Regenbogenhaut—Hernia Iridis, Moceyphalon — Tête de Mouche. — Melon—Hilon—Ptosis Iridis—Staphyloma Iridis.

When a portion of cornea is destroyed by ulceration, or gives way, from the over-distention which takes place during a violent attack of ophthalmia, the prolapsus of the iris is in this case, accompanied with a discharge of the aqueous humor, by which the inflammatory systems are greatly alleviated. But this accident is often succeeded by great pain; for the iris is not only kept preternaturally stretched by being dragged from its natural situation, but it becomes strangulated, and violent inflammation ensues.

If the inflammatory symptoms be not alleviated by proper treatment, and the tumour be left untouched, a complete adhesion is formed between the iris and contiguous cornea. The size of the pupil is thus more or less diminished, its form and situation altered, and, usually, after a tedious process, the prolapsed portion of iris is covered by albumen, which defends it from external agents.

When a portion of Iris comes through

an ulcer of the cornea it sometimes assumes a granular appearance, and resembles a portion of flesh. The same fungous appearance is sometimes produced when the testicle protrudes through the ulcerated scrotum, or the dura mater is exposed from a portion of cranium being removed; these surfaces being of a similar structure.

CHAP. XXVI.

OF WOUNDS AND LACERATIONS OF THE IRIS.

The iris is occasionally wounded both from accidents, and during operations.

Simple wounds of the Iris are not attended with pain, neither do they excite that degree of inflammation which has generally been supposed to follow wounds of this part of the eye. But when they are accompanied with more extensive injury, and when any portion of the iris is displaced, or bruised, the consequences are often alarming.

Wounds of the Iris are always followed by more or less inflammation, accompa-

nied by an effusion of lymph; but, as that membrane is exposed to constant motion, from the dilatations and contractions of the pupil, the edges of the wound seldom adhere.

The Iris is frequently torn from blows and injuries of the eye, and the laceration generally takes place at the union of the Iris with the ciliary ligament. This sometimes happens in such a manner, that a second pupil is formed, whilst, in other instances, the disunion is much more extensive; and I have seen nearly the whole Iris dragged to the centre of the eye, being almost entirely detached from the ciliary ligament. In one case, where a thorn penetrated the eye, after the subsequent inflammation was removed, the whole of the Iris was found to have disappeared, except a very narrow stripe, which extended across the eye-ball.* The vision of this eye remained extremely indistinct, unless assisted with a convex glass,

* See Plate XII. fig. 2 and 3.

or by looking through a small hole made in a card; by either of which means the patient could read a small printed book. Richter saw in a man, who had fallen from a horse on his head, a complete want of the natural pupil; "but there was an opening on the upper part of the iris, which was occasioned by a separation of that tunic from the ciliary ligament." Through this opening the patient could see objects clearly at ten and twelve paces distant; but when he approached near, he saw only the under half.* Beer saw in a young woman, who fell without injury from a second floor, the pupils in both eyes become immediately immoveable, and in one of them the Iris sparated from the ciliary ligament in such a manner as to form two pupils, through which the patient saw only the half of all objects.†

The easy manner by which the Iris can

* See Chirurg. Bib.

† See Lehre der Augenkrankheiten.

be detached from its union with the ciliary ligament, makes this accident by no means unusual, and led Scarpa to think of detaching the iris form the ciliary ligament, in order to from an artificial pupil in those cases where such an operation was required.

After the Iris has been disunited from the ciliary ligament, a permanent opening is formed between the two chambers, and the new pupil does not interfere with the functions of the old one, nor does it in any manner disturb vision, unless when the injury is very extensive.

In those cases which I have had an opportunity of examining, the form of the new opening was unchangeable, neither contracting nor dilating by alterations of light. Wenzel,* however, mentions a case where the contrary was observed. "I have seen an instance of a laceration or the iris which presented a very singular appearance. The laceration had taken

* See Manuel de l'Oculiste.

place at the inferior and nasal part of the iris, and formed a second pupil which was nearly oval. This pupil had existed more than twenty years, and had never affected the sight, and it had been formed without any pain or disease, and without any accident that could be recollected. A beginning opacity could easily be perceived in the crystalline lens of both eyes; but I was much surprised to remark in the right eye, where the disunion of the iris had taken place, a very apparent motion of contraction and dilatation in the new formed pupil."

CHAP. XXVII.

GENERAL REMARKS ON THE CHOROID COAT.

The structure of the Choroid Coat in some respects resembles that of the iris, which has led to the opinion that they were continuations of one another.

Besides having on its interior surface a layer of black pigment, the Choroid Coat is composed of a thin delicate membrane, divisible into two laminæ. The exterior surface is smooth, having no adhesion to the sclerotic coat, but from a few vessels, and like other serous surfaces it is kept constantly moist by an exhaled fluid. The interior surface has no connection with the

retina, a slimy fluid being interposed between the black pigment and the nervous expansion. The Choroid Coat may therefore be considered as a double serous membrane, and forms two distinct serous cavities; for it is not probable that the two cavities communicate in the sound eye, as air blown through a wound of the sclerotic coat readily passes every where between the sclerotic and choroid coats, but never enters into the anterior chamber.

The Choroid Coat is extremely vascular, and is plentifully supplied with Nerves, the principal branches of which pass as far as the ciliary ligament, and are distributed on the iris and perhaps also on the ciliary processes.

There is no reason to suppose that the Choroid Coat has, like the iris, any muscular fibres, nor are the functions of these two membranes at all similar.

From the number and particular disposition of the blood-vessels of the Choroid Coat, it probably performs some

important office. It is generally supposed to be the organ for secreting the black pigment; and, in some cases of disease, where there was an inordinate secretion of this pigment, I have found the choroid coat thickened.* The choroid coat, however, is probably concerned also in some other function, for it is to be found in the Albino, and in those animals in whose eyes the black pigment is entirely wanting.

The diseased changes of the Choroid Coat are not only extremely few, but they have been rarely discriminated. Like other serous membranes, it is subject to inflammation; its vessels are subject to various enlargement; a preternatural quantity of fluid has been found in both its cavities; and it is subject to ossification.

Klinkosch has found the Choroid Coat entirely wanting, from original malconformation. When the eye-ball is affected with Fungus Hæmatodes, the choroid coat

* See Fungus Hæmatodes of the Eye.

appears to be intimately connected with the diseased changes which take place in that formidable complaint; being generally found very much thickened and redder than natural, and sometimes completely blended with the diseased mass.*

The quantity of black pigment varies in some diseased states of the eye. In eyes that have been long disorganized, the choroid coat has been found extemely tender, and of a pale colour, with a very small quantity of black pigment. In one case I found the natural polished exterior surface of the choroid coat destroyed at one spot, having there acquired a granulated appearance.

The total want of the black pigment in man and in animals is always congenital, and is usually connected with a want of the colouring principle of the skin, hair, or feathers. It is hereditary in some animals, as in rabbits, mice, and a race of

* See Fungus Hæmatodes of the Eye.

Hanoverian horses, so as to form a constant breed of white animals.

Portal* says that he has found Hydatids between the Choroid Coat and retina,

* See Anatomie Médicale par Portal.

CHAP. XXVIII.

OF INFLAMMATION OF THE CHOROID COAT.

THE Choroid Coat is occasionally inflamed, the inflammation, in some instances, originating in that tunic, and in others extending to it from some contiguous inflamed part.

Inflammation of the Choroid Coat is attended with great intolerance of light, and pain at the bottom of the orbit, darting through the head. There is little external redness, and the inflamed vessels which appear on the white of the eye are deep-seated, being the posterior ciliary arteries. The pupil is contracted, and the anterior

chamber appears large, from the iris having an inclination backwards. This disease occurs most frequently in strong plethoric people, and is always attended with a considerable degree of symptomatic fever.

In diseased eyes, I have several times found, on dissection, the choroid coat turgid with red vessels. Larrey* found the interior surface of the choroid coat of a brownish colour, subsequent to an attack of inflammation, which was probably produced from effused albumen. In one case, the inflammation of the choroid coat was so violent, that suppuration took place, a puriform fluid being discharged through an opening in the scelerotic coat.

There are some cases of painful and defective vision, which are usually considered as diseases of the retina, but which are probably connected with affections of the vessels of the choroid coat.

* See Mémoires de Chirurgie Militaire et Campagnes par Larrey, Tom. 1. p. 220.

CHAP. XXIX.

OF DROPSY OF THE CHOROID COAT.

It has already been remarked, that the Choroid Coat may be considered as a double serous membrane, forming two distinct cavities, each of which is constantly kept moist by exhalation, in the same manner as similar cavities in other parts of the body. The exhaled fluid being sometimes collected in these cavities in a preternatural quantity, the disease may properly be denominated the Dropsy of the Choroid Coat.

The fluid may be collected in this disease either between the choroid coat and retina, or between the choroid and sclerotic

coats. From this it is probable that the functions of the two laminæ of the choroid coat are independent of each other, and that the one may be diseased whilst the other remains unchanged; an observation which may be made in other organs where there are two surfaces, as in the intestines, lungs, and bladder.

I have had an opportunity of dissecting several eyes where a serous fluid had collected between the Choroid Coat and Retina. In these cases, the retina and vitreous humor were displaced and compressed by the morbid collection of water; the vitreous humor being more or less absorbed, whilst the retina was shrivelled up, and formed a white bundle, extending through the centre of the eyeball, from the entrance of the optic nerve to the posterior part of the crystalline capsule. The choroid coat was unchanged.*

Mr. Ware mentions a case of this disease, where, on dissection, he found "a

* See Plate XVII.

considerable quantity of a yellow-coloured fluid, as thin as water, accumulated between the choroid coat and retina; the retina itself being collapsed, and resembling a cone of a white colour, the apex of which was at the entrance of the optic nerve, and the base surrounded the crystalline humor, the vitreous humor being absorbed." * Verle and Zinn describe similar cases.†

It will be difficult to distinguish this disease in the living body, by any symptoms or appearances of the eye, as these much resemble some other affections of the posterior chamber, and, as there is no change in the form of the eye-ball. When the accumulation of water has taken place slowly, the loss of vision has been gradual, and the accompanying pain and redness have not been great. In other

* See Surgical Observations on the Eye, Vol. I. p. 510.

† See Zinn de Oculo, p. 25. Scarpa also mentions a case of this disease, but he describes it as a dropsy of the vitreous humor.

cases, the water collects quickly, and is accompanied with great pain, particularly in the head; the pupil becomes much dilated, and when the disease has far advanced, there is an appearance of an opaque body behind the lens, from the retina being compressed, which in one instance, was mistaken for cataract, and an attempt made to couch it.

In the disease now described, the water has always been found collected between the choroid coat and retina; but in a few instances, a watery fluid has been observed between the choroid and sclerotic coats; and this has led some authors to suppose that there was a communication between the cavity formed by these two tunics and the anterior chamber.*

Withousen of Copenhagen dissected the eyes of a man born with amaurosis, and found a quantity of glairy fluid, like white of egg, effused between the retina and choroid coat.

* See Zinn de Oculo Humano.

CHAP XXX.

OF OSSIFICATION OF THE CHOROID COAT.

I HAVE met with a few instances where a thin cup of Bone was found between the sclerotic coat and retina.* In all these cases the ossifications were exactly similar. At the bottom of the cup, there was a small round perforation, through which the retina passed to expand on the interior surface of the osseous shell. The retina was in immediate contact with the interior surface of the bone, but between the sclerotic coat and ossification there was a very thin, tender, and pale-coloured membranous expansion, the only vestige

* See Plate XVI. fig. 3.

of the choroid coat. Bichât relates two instances, and similar cases are also mentioned by Haller, Morgagni, Walter, Pellier, Morand, Scarpa, and Günz.

That the ossifications in these cases were a diseased change in the choroid coat, is extremely probable, both from their situation, and from their resemblance to the choroid coat in form. Besides, ossification is a morbid change, to which all other serous membranes are subject. It has been already noticed, that this change has been met with in the capsule of the aqueous humor; and bony matter has also been found deposited in the capsules of the crystalline lens and vitreous humor.*

* See Chap. XLI.

CHAP. XXXI.

GENERAL REMARKS ON THE CILIARY PROCESSES AND THEIR DISEASES.

The Ciliary Processes, like the choroid coat and iris, are covered with a black pigment, and float in a serous cavity, into which they may be considered as forming prolongations. But neither the structure nor the functions of the ciliary processes are fully understood. It is well known, that they are extremely vascular, but whether they are supplied with nerves, and are muscular, or whether they are employed in regulating the position of the crystalline lens, to enable the eye to look at objects at different distances, physiolo-

gists have not yet been able to determine. From their structure, however, it is extremely probable that their functions are important.

Diseases.—The Diseases of the ciliary processes are little known. They probably participate in general inflammation of the internal parts of the eye; and they are involved in many of those diseases to which the adjacent structures are subject.

Wounds of the Ciliary Processes are said by Beer to be always followed by blindness, and an extraordinary dilatation of the pupil. It is a fact well established, that a wound of the frontal branch of the fifth pair of nerves is generally followed by complete blindness, with a great dilatation of the pupil; and from whatever cause the blindness may in such cases be produced, the connection between the ciliary nerves, and the frontal branch of the fifth pair, might lead us to expect that a wound of the ciliary nerves themselves would have a like influence on the retina.

I have observed several cases of wounds which penetrated the sclerotic coat, followed by a complete amaurosis, accompanied with a pupil very much dilated. In such cases, it is probable that the ciliary processes were injured; affording an additional proof of the accuracy of Beer's observations on the danger of such wounds in operations of the eye.

CHAP. XXXII.

GENERAL REMARKS ON THE CRYSTALLINE LENS AND ITS CAPSULE.

THE Crystalline Lens is enveloped in its capsule in the same manner as the aqueous humor is contained within a serous cavity. The crystalline lens cannot, however, be altogether compared to the fluids which other serous membranes exhale, though it is probable that the watery fluid, lying between the lens and capsule,* moistens these surfaces in the same manner as the pericardium or surface of the pleura, are moistened by their respective fluids. But the capsule of the crystalline

* Liquor Morgagni.

lens cannot be considered as a simple serous cavity, for the pupillar portion forms part of the cavity of the aqueous humor, and the neural portion is in a similar manner united with, and derives a covering from, the capsule of the vitreous humor.*

The Capsule of the Lens may be considered as consisting of two portions; a pupillar portion, the exterior lamina of which forms part of the cavity of the aqueous humor; and a neural portion, which, in a similar manner, forms part of the capsule of the vitreous humor. The neural portion of the capsule is much thinner and softer than the pupillar.

Like the capsule of the aqueous humor, the Crystalline Capsule is liable to inflammation, and to that thickening, loss of transparency, and those other changes which inflammation produces in all serous membranes. It is also, like them, some-

* These terms *neural* and *pupillar*, are used by Dr. Barclay as synonymous with posterior and anterior.

times converted into bone; and the fluid which it secretes, if the lens can be so considered, is subject to changes, some of which are probably the effects of disease in the capsule.

The pupillar and neural portions of the Capsule of the Lens will be found to undergo changes in their structure separately; the exterior lamella of the pupillar portion being frequently inflamed along with the other portions of the capsule of the aqueous humor, and the neural portion being chiefly affected in other diseases.

It is extremely probable, that the Crystalline Lens itself is organized, and that it is nourished in the same manner as other parts of the body. Albinus conceived that he had detected vessels running into it; and the changes which disease produces in its structure confirm this opinion. The lens, too, like the aqueous humor, forms part of an optical instrument; and its capsule serves the important purposes of its secretion, of its

nourishment, and of retaining it in its proper position.

The consistence of the Crystalline Lens changes at the different periods of life. In children newly born, it is extremely soft throughout; but grows firmer as they advance in years; the central portion having the greatest degree of consistence. In old age, this firmness is sometimes equal in every part of the lens.

In the same proportion as the Lens increases in density, it diminishes in size.

Zinn has remarked, that the figure of the Lens also varies at the different periods of life, being nearly spherical in the fœtal eye, and becoming gradually more flat till about the age of thirty; after which its form does not appear to alter.*

Sometimes the Crystalline Lens has an unusual degree of convexity; from whence arises one kind of short-sightedness. In other instances, the lens has been found

* Zinn de Oculo Humano.

unusually flat, producing long-sightedness.* The crystalline lens is sometimes entirely wanting. It has also been found double; in which cases the pupils were also double. Its form too, sometimes varies, having been observed of a triangular shape.† Heister found it divided into different portions; and Morgagni saw a lens, part of which was wanting.

Both Lens and Capsule are of a reddish colour in the fœtus, but they become transparent immediately after birth.‡ As people advance in life, the Lens generally loses its perfect transparency, becoming of a yellowish hue; and this sometimes increases to such a degree, that it acquires in old age the colour of amber.

Besides this change of colour, which may be considered as that natural decay to which the lens, like all other parts of

* See Porterfield on the Eye.

† Voigtel's Handbuch.

‡ Dr. Brewster has observed that in those animals born with shut eye-lids, there is a central opacity of the lens, which disappears when the eye-lids open.

the body, is subject, it often becomes completely opaque, forming a Cataract. The Lens is also subject to changes in its consistence, as well as in its colour, sometimes degenerating into a watery fluid, and sometimes being converted into bone. Its volume, too, may be augmented or diminished, being sometimes found small and shrivelled, and in other instances large, and of an irregular form. Disease also produces changes in the lens similar to maceration, by exhibiting the radiated appearance of its laminæ, or dividing its surface into isosceles triangles.

The crystalline fluid, or *Liquor Morgagni*, is sometimes preternaturally abundant; and its consistence and other qualities are also subject to changes from disease. Wenzel says, that he has found this humor resembling the meconium of the primæ viæ of infants.* More of this fluid has always been found in the eyes of animals long dead, than in those newly

* Manuel, de l'Oculiste, Tom. I. p. 148.

killed. Portal on examining a number of eyes of animals immediately after death, could find none of this fluid, which led him to believe " that, like the fluids of other serous cavities, it exists no where in its natural state, but as a kind of vapour which condenses and augments from different causes."*

The crystalline lens is also subject to injury from sharp-pointed instruments puncturing its capsule, and blows on the eye dislodging it from its natural situation.

* Portal, Anatomie Médicale, Tom. IV. p. 440.

CHAP. XXXIII.

OF CATARACT OF THE CRYSTALLINE LENS.

THE word Cataract has been used as a general name for all those diseases of the eye where an opacity is formed behind the pupil; it is, however, employed here to signify only those diseases of the Crystalline Lens and Capsule, in which these organs lose that perfect transparency which they naturally possess. Following the nosological system hitherto adopted, of considering the diseases of each structure separately, the first class of Cataracts are here treated of with the diseases of the

lens; and the second with those of the capsule. Another class of cataracts have been denominated Secondary; but, these being the effects of operations on the eye, will be, with more propriety, described in another place.*

When the crystalline lens becomes opaque, the opacity begins either at the central part, and extends towards the circumference, or a general obscurity pervades the whole lens from the commencement of the disease.† It has been said, that sometimes the liquor Morgagni alone becomes opaque; but in most cases, every part of the lens is diseased. These differences have led to the distinction of two species of cataract; the former having been called Interstitial, and the other Mixed Cataract.‡

The colour of crystalline cataracts, as

* See Treatment of Cataract.

† Glaucosis of Hippocrates — Gutta opaca of the Arabians—Suffusis—Der graue Staar, or Krystall Staar, of the Germans—Cataracta vera Crystallina.

‡ Cataracta Interstitialis et Cataracta Mixta.

they appear in the eye, is very various. Their most usual colour is a bluish white or grey ;* some are of an opaque chalky white ;† sometimes they are clouded in different parts, having the appearance of a flake of snow ; sometimes they have a greenish hue, or a slate colour, and others are of a dull yellow, or amber colour; sometimes the opaque crystalline has a striated or radiated appearance, resembling that division of the sound lens into different segments, which is produced by chemical agents.‡ These differences, which have been observed in the colour of cataracts, have also given rise to several of those trivial distinctions which have been considered sufficient to constitute distinct species of the disease.§

Cataracts are seldom of the same colour

* See Plate XII. Fig. 3.

† See Plate XI. Fig. 1 and 2.

‡ See Plate XI. Fig. 3.

§ Cataracta virgata fibrosa, striata, or viridis. Cataracte Barrée.

when in the eye-ball, as after they are removed. Those lenses which appear white or grey in the eye, are generally dark yellow, or amber-coloured when extracted; and those which have a yellow hue when in the eye, often appear of a dusky white after they are removed.

The consistence of the lens also varies very much in different cases of cataract. Sometimes it retains its natural texture; sometimes it acquires a caseous,* and in other cases a gelatinous consistence; and sometimes almost the whole lens is converted into a milky fluid.† In other instances it becomes firmer and harder than natural,‡ having been found converted into a chalky matter, and also into bone.§

Like the natural, the central portion of the opaque lens is usually firmer and harder than the parts more external.

* Cataractea caseosa.

† Milchstaar—Cataracta lactea or purulenta.

‡ Cataracta crystallina solida.

§ See Ossification of the Lens.

Sometimes the consistence of the crystalline cataract is not the same in both eyes of the same person.

It is of much practical importance to be able to distinguish, in the living eye, these differences in the consistence of the diseased lens; for, according as the cataract is hard or soft, so ought the treatment to be varied. An accurate knowledge of these differences can only be acquired by experience, and habits of attentive discrimination; for there are scarcely any diagnostic marks of a soft and hard cataract which can be altogether depended on. The soft cataract may, however, be in general distinguished, from the large size of the opaque body, its near approach towards the plane of the iris, or edge of the pupil, its white colour, and from having points, streaks, or inequalities, which vary their appearances at different times. The blindness, too, by which soft cataracts is accompanied, is always considerable; for when the whole lens is opaque, the patient can

derive no benefit from the great dilatation of the pupil, which is produced by shading the eyes, or by the influence of belladonna, and can seldom see more than differences in the intensity of light.

When the cataract is hard, the opaque body is neither so large nor so close to the edge of the pupil as when it is soft, so that a sufficient number of rays of light can enter, and the patient is still capable of distinguishing some objects from the side of the eye. The hard cataract has the same shade of colour throughout the whole lens, and its natural smooth surface may be remarked; the motions of the pupil are extremely lively, and it seldom remains much enlarged.* The opacity behind the pupil is, at the commencement of the disease, observed in the middle, and then extends, very slowly, towards the circumference of the lens. The colour of the hard cataract is usually grey, passing more or less to a bluish hue.

* Beer's Lehre der Augenkrankeiten.

It has generally been remarked, that the fluid, or milky cataract, is the most frequent form of the disease in children, and that the solid or concrete cataract is most common in the adult. Soft cataracts, however, are by no means unusually met with in those advanced in life; and I have, in a few instances, also known the lenses of young people converted into a chalky matter, and into bone.

Symptoms.—In cases of simple opacity of the lens the Pupil continues to contract and dilate, according as the quantity of light to which it is exposed be increased or diminished; and the retina continues to retain its sensibility, though its functions become necessarily limited. When the opacity is confined to the central part of the lens, the vision is little impaired, and in some people, who have naturally a large pupil, although a very considerable portion of the lens becomes opaque, yet the sight of the eye continues good. If the opacity of the lens is more general, objects appear to

the patient, from the commencement of the disease, as if seen through a mist or smoke; and in proportion as the opacity increases, vision becomes more obscure, till even the largest objects cannot be distinguished, and the patient can merely perceive a difference in the quantity of light, and in bright colours. An eye affected with cataract never becomes perfectly blind, for the lens does not acquire, even in the most advanced state of the disease, that degree of obscurity which prevents all rays of light passing to the retina.

In most cases, the patient with cataract can distinguish objects better in a dull, than in a bright light. This arises from the pupil being more dilated in a moderate light, and admitting rays to pass through the edge of the lens which still remains transparent. For the same reason, a person with cataract sees most distinctly when he shades his eyes, and exposes the object to a bright light; and it is also on the same principle that the belladonna, by

producing an unnatural dilatation of the pupil, gives a temporary relief, even in those cases of cataract where nearly the whole lens has become opaque.

When the exterior edge of the lens is less obscure than its centre, the patient then sees objects more distinctly which are placed by his side, than when held opposite to him. If, however, the obscurity has not affected the middle of the lens, but some parts of its circumference, any circular body then appears to have its edge imperfect. Near objects can be more distinctly seen than those which are more remote; and thus a person affected with cataract appears short-sighted.

The loss of vision from cataract is seldom uniformly progressive; for, sometimes after remaining a while stationary, it becomes suddenly more imperfect; and, by a succession of rapid alterations, the sight is ultimately destroyed.

The progress of cataract is very different in different examples of the disease.

Sometimes it proceeds so slowly as not to destroy vision for many years; at other times a complete obscurity of the lens takes place very rapidly. Several instances have come within my own observation, where a patient has, in a few hours, become quite blind with this disease. Richter and Eschenbach relate cases where people labouring under gout, which suddenly retroceded, were entirely deprived of their sight in one night, from the formation of cataracts. Beer saw a woman, who incautiously holding a bottle of muriatic acid to the eye, had a cataract formed immediately; which he saw ten days after, and extracted.

Cataract of the lens commonly affects only one eye, and after the disease has advanced to a greater or less degree, then the other eye is attacked. In other cases, both eyes are simultaneously affected. I have generally observed, that when cataract takes place in young people, and affects only one eye, the other eye continues,

during life, free from disease. This is also the case in those cataracts which arise from an injury, particularly when no affection of the sound eye takes place soon afterwards. Richter mentions the case of a man who received a wound of the eye, which was followed by a cataract, and soon afterwards a cataract formed in the other eye. A similar sympathy has been observed with regard to the iris,* and it may be remarked in all the corresponding structures of these organs.

When there is a Cataract in both eyes, the disease is not always of the same kind in each. Sometimes the lens is affected in one eye, and in the other the capsule is opaque; sometimes both the capsule and lens are opaque in one eye, whilst in the other there is only a crystalline cataract; and sometimes one eye is affected with cataract, whilst the vision of the other is destroyed by amaurosis.

Both sexes are equally subject to cata-

* See Chap. XX. page 36.

ract, and no age is exempt from the disease; but it is more common in infants, and those advanced in years, than at the middle period of life.

In most cases, the crystalline cataract appears to be merely a *local* disease, though, in many instances, an opacity of the lens accompanies or succeeds other diseases of the eye. Cataract is frequently observed in gouty and rheumatic persons; and in such, there is generally reason to suspect that the opacity of the lens is more or less connected with the constitutional affection.

Hereditary Cataract.—In some cases, cataract appears to be Heriditary.* Many examples of hereditary cataract are recorded by different authors, and a considerable number have fallen under my own observation. I have several times known brothers and sisters, and in one instance, twins, affected with cataract. I have also known a father, son, and grandfather,

* Cataracta hereditaria.

affected with it. Richter extracted a cataract from a man, whose father and grandfather were both blind from that complaint.* Maitre-Jean and Janin have both met with similar cases. Richter also saw three children born of the same parents, all of whom had cataracts at three years of age; and Janin saw a family of six persons blind from this disease.

In some cases, where the cataract is Hereditary, the opacity is confined to the lens; in others, both the lens and capsule are opaque. The hereditary disposition is observed both in the infant and adult, and is equally common in both sexes. The same kind of cataract generally prevails in the same family, when different branches are afflicted with the disease.

Congenital Cataract.—In some instances, cataract is Congenital. It is by no means unusual to see infants born with cataracts; and these consist either of opacity of the crystalline lens, or of its

* Observations on the Cataract.

capsule;* or both are at the same time affected.

In the Congenite Crystalline Cataract, the whole lens is either found converted into a milky fluid, or soft substance, or into a structure firmer than natural, which is generally confined to the central part of the lens, leaving the edges quite transparent.† In the latter case, the opaque portion is generally of a chalk-white colour, there is usually a distinct line of demarcation between the opaque and transparent portions, and the shape of the opacity is irregular. In those cases where I have had an opportunity of examining lenses thus diseased, the opaque part was found to consist of a substance exactly resembling moistened chalk in colour and consistence. In other instances, where the disease affected the central part of the lens alone, the opaque portion was of a pale grey colour.

* See Capsular Congenite Cataract.

† See Plate XIII. Fig. 1 and 2.

The Congenite Crystalline Cataract commonly affects both eyes; but sometimes only the crystalline of one eye, whilst in the other, the capsule of the lens is opaque; and sometimes both the capsule and crystalline of one eye are opaque, and in the other only one of these is affected. The disease is never observed to make any progress after birth, neither does it suffer any amendment unless in some cases, where, from an accidental blow or injury, the capsule of the lens is lacerated, and then the lens undergoes a gradual process of solution, leaving behind the opaque capsule.*

In some cases, the Congenital Cataract is dissolved with great rapidity, and in two cases I have observed it nearly altogether disappear even in a few minutes after being mixed with the aqueous humor.

Vision varies in this species of cataract, as in the Centicular, the patient being sometimes able to distinguish only different

* See Scarpa, Traité de Maladies de l'Oeil.

degrees of light, whilst others see with considerable distinctness.

In some cases of Congenite cataract, the eye-ball has a peculiar involuntary rolling or goggling motion, and sometimes the cataract itself has, at the same time, a tremulous motion.*

Cataract of the lens is not unfrequently combined with other diseases. It is by no means unusual for a cataract to affect an eye that has previously been amaurotic. In most cases, where Amaurosis accompanies this disease, there is a preternatural dilatation and immobility of the pupil, and the opaque lens appears behind it of a large size, and generally of an equal shade of opacity.† In some cases, where these two diseases are combined, the pupil remains of its natural size, and continues to be influenced by light; but the presence of disease in the nerve is always pointed out by the loss of vision being

* Cataracte Branlante of the French. See Chap. XXIII.

† See Plate XIV. Fig. 2.

antecedent to the opacity of the lens, by the blindness being to a greater degree than would take place in simple cataract, and by sparks of fire, and spots appearing before the eyes, pains of the brow and head, with other symptoms of a diseased retina.

Cataract of the lens is often accompanied with opacities, both of the cornea and crystalline capsule ; and there are also many derangements of the eye, where, along with other diseased changes, the lens becomes opaque.

The changes which take place in the structure of the crystalline lens, and the various appearances which it assumes in cataract, have not been well explained. The dimness and amber hue which have been mentioned* as common in those advanced in life, probably arise from a want of that balance in the secreting and absorbent systems, which is necessary to preserve the different parts of the body

* See Chap. XXXII. page 77.

perfect and entire; and an unusual degree of that decay may, in some cases, produce a complete cataract. In those cases of cataract, which are the immediate result of a wound or injury of the lens, it is not improbable that the obscurity is produced in the same manner as a piece of glass or transparent crystal becomes opaque when it is struck or bruised; and a cataract of this description may be imitated by penetrating the lens with a needle, after it has been removed from the eye. Whatever, too, is capable of causing a coagulation of the albumen or gelatine, of which the sound lens is composed, will destroy its transparency, a change probably produced whenever, from any cause, its organization is destroyed, or when it comes in contact with the aqueous humor. An opacity of the lens may also be produced by Inflammation. Walther* has given a minute description of inflammation of the lens;

* Abhandlungen aus dem Gebiete der Practischen Medicin, &c. von P. F. Walther, Landshut, 1810.

and it is by no means improbable that the lens, like other parts of the body, is liable to inflammation, and that, like all transparent parts, it becomes opaque when inflamed.

CHAP. XXXIV.

OF OSSIFICATION OF THE CRYSTALLINE LENS.

It is not unusual to meet with cases where the crystalline lens has been supposed to have been converted into Bone; but in all those which I have had an opportunity of examining, excepting in one instance,* the lens itself was found inclosed in an osseous shell, which, in all probability, was the capsule of the lens ossified. In this case, the eye had been preserved for some time in spirits, and was sent to me for dissection by the late Mr. Allan Burns of Glasgow, a man no less remark-

* See Ossification of the Capsule of the Lens.

able for his eagerness and liberality in diffusing knowledge, than for his industrious professional zeal. On removing the sclerotic, a greyish spot was observed on the choroid coat. On dissecting back the choroid coat, the pupillar portion of the posterior chamber was filled with a white pulpy mass; and, on dividing the crystalline lens, its central portion was found converted into hard bone.* The external laminæ of the lens were soft, but those nearer the centre were more consolidated, the central portion itself being of a deep brown colour, perfectly osseous, and exhibiting a laminated structure.

It has already been noticed,† that the crystalline lens has been found converted into a substance resembling moistened chalk in colour and consistence.‡

* See Plate XV. Fig. 5.

† See Chap. XXXIII. and Plate XXV. Fig. 1 and 2.

CHAP. XXXV.

OF WOUNDS AND DISPLACEMENTS OF THE LENS.

THE lens sometimes becomes obscure, both from blows on the eye-ball, and from sharp-pointed instruments penetrating the capsule.

When a blow produces an obscurity of the lens, the change will generally be found to arise from the capsule having burst, and the lens thus exposed to the action of the aqueous humor. A diminution of transparency of the lens may also be produced by the mechanical changes occasioned by the puncture of a hard body on a substance possessing the tenacity and

transparency of the lens. Mr. George Young saw several soldiers, who in order to procure a pension, had produced a cataract, by introducing a needle through the cornea and pupil, so as to wound the lens and capsule.

When the lens is wounded by an instrument penetrating the anterior chamber, generally more or less of the lens escapes, through the wound of the capsule, forming an opaque cloud, which passes through the pupil, and extends into the anterior chamber.* In some accidents of this kind, I have seen the whole opaque crystalline pass, by degrees, through the wound of the capsule, into the anterior chamber, and be gradually and completely dissolved. This process has been imitated with great success in order to produce the solution of some kinds of cataract.

In some cases, cataracts arising from an injury of the lens, remain unaltered during life; but, in those instances the

* See Plate XI. Fig. 1.

wound of the capsule had healed ; and thus no communication was formed between the anterior chamber and cavity of the capsule of the lens. It sometimes happens, that, in consequence of a blow on the eye, the crystalline lens is thrown out of its capsule, and passes through the pupil into the anterior chamber, in which case, it always becomes rapidly opaque.*

In most cases where the lens is "luxated" from disease of the internal parts of the eye-ball, it comes forwards into the anterior chamber inclosed in its capsule,† and when in this situation, no solution or absorption takes place.

* See Maladies de l'Oeil, par Maitre-Jean, p. 271.

† See Cataract of the Capsule of the Lens.—Cat. Luxata.

CHAP. XXXVI.

OF INFLAMMATION OF THE CAPSULE OF THE LENS.

It has already been noticed, that the Capsule of the Lens is composed of two portions, which, in some respects, differ in structure; the neural portion being much thinner, softer, and weaker than the pupillar.* From what I have been able to observe, it appears extremely probable, that, not only each portion, but that each lamina of the two portions may be separately diseased; in the same manner as was mentioned, when treating of the diseases of the choroid coat, a membrane

* See Chap. XXXII.

having also two distinct serous surfaces; each of which is subject to diseased changes, unconnected and distinct from one another.*

Inflammation affects either the pupillar or the neural portion of the Capsule of the lens, or it affects the whole interior lamina of the capsule at the same time.

It has already been observed, that, when Inflammation has extended over the capsule of the aqueous humor, that portion which forms the exterior lamina of the pupillar portion of the capsule of the crystalline lens also participates in the disease.† The affection of this portion of the capsule is distinguished by the effusion of albumen on its surface obliterating the pupil, and rendering it irregular, contracted, and unchangeable; and by adhesions taking place between the edges of the iris and the effused albumen. These changes may sometimes be observed when the iris and adjacent

* See Chap. XXIX.
† See Chap. XVI.

parts are little affected. At other times, albumen is effused over the whole surface of the iris, and anterior chamber.*

The adhesions formed between the iris and Capsule of the lens are, in some instances, very partial, being easily destroyed by the application of *Belladonna* to the eye; but, in others, they are firmer, and extend round the whole edge of the pupil, a partition being thus formed between the two parts of the anterior chamber. Hence the iris is pressed forwards towards the cornea, from the aqueous humor not having a free communication through the opening of the pupil.

When the Capsule of the Lens is extracted in this state, it will be found to have sometimes acquired a most extraordinary degree of thickness and toughness; but these changes are alone confined to the pupillar portion, the neural portion of the capsule retaining its natural pellucidity.†

* See Chap. XVI.

† See Plate XV. Fig. 4.

It is this state of the eye that has been described by Mr. Wathen as a species of spurious cataract, and called by him the "*Adventitious*" cataract.*

Inflammation of the neural portion of the capsule, and of the proper capsule of the lens, can only be known from its effects in destroying the transparency and delicate structure of these parts.

When the Capsule of the Lens is wounded, the whole interior lamina usually becomes opaque; but the exterior lamina of the pupillar portion seldom becomes affected. This is known from there being no appearances of albuminous deposition in the pupil or on the iris;—no adhesions of the iris to the capsule;—whilst the colour of the opaque capsule, instead of having the buffy hue produced by albumen, appears like an opaque white and thin floating membrane.

Inflammation and opacity of the neural portion of the capsule are only to be

* See Wathen on Cataract, page 143.

distinguished, as far as I have been able to observe, in "*Secondary*" cataract,* or in that variety of cataract which succeeds the removal of the lens by an operation.

* See Plate XV. Fig. 5.

CHAP. XXXVII.

OF CATARACT OF THE CAPSULE OF THE LENS.*

FROM the general observations which have already been made on the structure and functions of the Capsule of the Lens,† it may readily be perceived how it should frequently be the seat of opacities. Indeed there is, perhaps, no disease of that membrane which is not either accompanied or followed by a diminution in its transparency. These opacities, of which there are

* Cataracta capsularis vel membranacea. Der Kapselstaar.

† See Chap. XXXII.

several varieties, have been, by most authors denominated Capsular Cataracts.

Sometimes the whole capsule of the lens becomes opaque; and, in other instances, the opacity is confined to one portion of it. This is either the pupillar or neural portion; and the former of these, which, in its natural state, is much thicker than the other, sometimes exhibits a still greater inequality when diseased. That the two portions of this capsule should present different diseased appearances, may have been suspected from the difference in their connections, for the pupillar portion being covered by a portion of the reflected capsule of the aqueous humor, naturally participates in its diseases, whilst the neural portion is, in a similar manner, connected with the capsule of the vitreous humor.*

The appearances of Capsular Cataracts are very various. Some of them are of a pearl white colour, and glistening;† others

* See Plate XIII. Fig. 1.

† See Plate XV.

are of a dull, milky whiteness ;—others are mottled with small white spots upon a more opaque ground,* — or they have a reticulated appearance. Sometimes they have large white spots, and sometimes they appear like a delicate white web or flake of snow.† Their texture, too, is very various, being sometimes soft, and very pulpy; sometimes brittle, and easily ruptured; and sometimes very tough and elastic. In two or three instances, this membrane has been found in adults of considerable thickness, very much resembling cornea when long immersed in water.‡

I have observed several examples of capsular cataract where the opacity was confined to the central portion of the cap-

* Plate XV. Fig. 2.

† See Practical Observations on the Formation of an Artificial Pupil in several deranged States of the Eye. To which are annexed, Remarks on the Extraction of Soft Cataracts, and those of the Membraneous kind, through a Puncture in the Cornea. By Benjamin Gibson, Surgeon to the Manchester Infirmary, &c. &c. London, 1811.

‡ Ibid.

sule, an opaque white point appearing in the centre of the pupil, with several shades or degrees of opacity around it, forming circles, so that the diseased capsule resembled the section of a calculous concretion composed of concentric laminæ.* When a cataract of this kind is extracted, the pupillar portion of the capsule is found very much thickened, whilst the lens is sometimes quite transparent.

Though the neural portion of the capsule of the lens cannot be separated by dissection from the vitreous humor, the connection between these two capsules is sometimes completely destroyed by disease; and the lens inclosed in its capsule can be easily separated,† or is altogether detached, and allowed to float in the cavity of the aqueous humor, passing and repassing through the pupil, according to the position of the head.‡ In almost all

* See Plate XIV. Fig. 4.

† Cataracta cystica,—elastica. Balgstaar.

‡ Cataracta luxata.

the cases of this kind which I have had an opportunity of examining, the capsule of the lens had become detached only after a considerable change had taken place in the structure of the parts contained in the posterior chamber; the vitreous humor being changed in colour and consistence, and the functions of the retina destroyed.

In most cases, where the lens is found in the anterior chamber, it is extremely probable that it remains inclosed in its capsule, otherwise it would be dissolved by the action of the aqueous humor.

In some cases of cataract, where the lens, as well as the capsule, is opaque, and where the iris has an undulatory motion, the cataract is also moveable, the motion appearing to be communicated to it from adhesions between the capsule and iris.* In some cases this variety of cataract is accompanied with a change in the structure of the vitreous humor and its cap-

* Cataracta tremulans.— Cataracte branlante — Zitterstaar.

sule, the humor losing its natural transparency and consistence, and the connection between the capsule and the ciliary processes being more or less destroyed. This disorganization of the eye is generally the consequence of violent inflammation, and is always attended with total blindness.

Most frequently the capsular cataract is Congenital. Though it is generally accompanied by an opacity of the crystalline lens, yet in many cases the capsule is found alone in the eye, the lens having been dissolved.* This change in the congenital cataract is not unfrequent; for, in some cases, the capsule, without any evident cause, gives way, and allows the lens, which is usually in children degenerated into a milky fluid, to pass through the pupil, and mix with the aqueous humor, where it is dissolved. In other cases, this change is the effect of a blow on the eye. Mr. Gibson gives an account of a child born blind, who received a blow on the eye,

* Cataracta membranacea primitiva of Scárpa.

which was immediately followed " by a muddy white appearance, so as entirely to obscure the iris. On examining the other eye, I found a cataract, which, from its appearances, and being congenital, I concluded was of a milky kind. On inspecting the eye two or three days afterwards, a rent could be seen in the capsule, where the fluid had been discharged." * In several instances of congenital cataract, where, from the appearances of the eye, there was reason to suspect the lens was dissolved, the parents of the child have been able to recollect a period when a particular change took place in the cataract; a change produced by the escape of part of the soft lens into the anterior chamber. In some cases, the whole lens is, in this manner, dissolved, except a very small portion, which is usually what was the central portion; that being naturally the hardest.

* Practical Observations by Benjamin Gibson, Manchester, 1812.

When the lens undergoes this natural process of solution, the pupillar portion of the capsule comes in contact with the neural, so that there appears only one membrane, more or less opaque, at some distance from the plane of the iris.

In one instance, I observed a child, with Congenite cataracts, the appearances of which were very remarkable. A substance of a regular *Pyramidal* form, and of an opaque white colour, occupied two thirds of the pupil of each eye. The base of the pyramid rested on the capsule of the crystalline lens, and the apex passed through the pupillar opening, advancing forwards till it came apparently in contact with the transparent cornea. The rest of the pupil was quite transparent, the iris had its natural motions; and the child appeared to see so well, that no operation, in order to remove the opaque bodies, was thought advisable.*

A case, in many respects similar to that

* See Plate XIV. Fig. 6.

now mentioned, is narrated by M. Wenzel. "The capsules of both eyes of a girl born blind were very opaque, and each formed a Pyramid, which projected through the pupil, and extended as far as the cornea, but did not touch it." *

* See Manuel de l'Oculiste, par M. Wenzel. Paris, 1808.

CHAP. XXXVIII.

OF OSSIFICATION OF THE CAPSULE OF THE LENS.

It has already been observed, that Ossification is a diseased change to which all serous membranes are subject. It takes place in the pia mater, in the pleura, in the peritoneum, and in the vaginal coat. I have found the capsule of the aqueous humor converted into bone; and also several examples of complete ossification of the Capsule of the Crystalline Lens. But the Capsule of the lens, like other serous membranes, acquires all degrees of hardening, from simple thickening to

cartilaginous conversion. When the Capsule of the crystalline lens becomes ossified, the Ossification generally takes place in its pupillar portion, and in some cases the whole capsule is converted into a shell of bone. The ossification commonly retains the natural form of the capsule, and contains the lens, the transparency of which is generally destroyed.* In some cases, where the capsule is ossified, the lens itself has been previously dissolved or diminished in bulk, so that the ossification is of a more irregular form; the capsule having been shrivelled previous to its conversion into bone. The ossified capsule is sometimes extremely thin and brittle;† in other cases, the ossification is thicker, and its texture firmer.‡

Ossification of the capsule of the lens is usually met with in people advanced in life. It is a change of structure which

* See Chap. XXXII.
† See Plate XIII. fig. 6.
‡ See Plate XVI. fig. 1 and 2.

always takes place very slowly, and is usually accompanied with diseased changes in other parts of the eye. I have met with it in eyes where there was also ossification of the choroid coat;—in eyes where the hyaloid membrane was converted into bone;—in some cases of fungus hæmatodes,—and in staphyloma.*

Examples of Ossification, where the diseased change seems to have taken place in the capsule, and not in the lens itself, as has been supposed, are mentioned by different authors. Morgagni met with a case where "there was nothing in the eye which could have been certainly known to be the crystalline or vitreous humor, but only a few drops of turbid and brown water. Not far, however, from the natural situation of the lens, I found a hard little body, in the size and form of its circumference, not much differing from the crystalline, but a little larger and convex on its anterior

* I have frequently found ossification of the capsule of the lens in diseased eyes of Horses.

surface; and on its posterior, it was concave, so that it represented a little shield."*

Morand,† Janin,‡ and others, mention cases, in all of which the ossification appeared to have taken place in the capsule, and not in the lens itself. Mr. Gibson has also related a case where the capsule of the lens was partially ossified. "It felt gritty to the couching needle, and produced a noise as if the instrument passed over a piece of dry parchment." §

* Epist. xiii. Art 10.

† Mémoires de l'Acad. R. anno 1730.

‡ Traité de Maladies de l'Oeil, page 228.

§ See Practical Observations, &c. page 121, by Benjamin Gibson, Manchester, 1812.

CHAP. XXXIX.

GENERAL REMARKS ON THE VITREOUS HUMOR AND ITS CAPSULE.

THE capsule of the vitreous humor, or Hyaloid Membrane, is a serous cavity, and may justly be compared to the capsules of the aqueous humor and crystalline lens, from its structure, functions, and diseases.

The Hyaloid Membrane, in the adult, has the most perfect pellucidity, and is so extremely thin, that, in the natural state, it is scarcely visible. In the fœtus it is tinged of a rosy colour.*

The anterior portion of the Hyaloid

* Angely.

Membrane has been described as composed of two laminæ;* the one uniting with the pupillar portion of the capsule of the lens, and the other forming the neural portion of that capsule. After these two laminæ separate, they again unite, a cavity being thus formed, called the canal of Petit, which has no communication with any of the contiguous cavities, and the functions of which are not understood; nor has it ever been observed to have any share in diseases.

The interior surface of the hyaloid membrane does not altogether resemble the capsules of the other humors, for, instead of consisting of a simple cavity, numerous prolongations pass from it, which form cells communicating with one another, and in which is contained a fluid perfectly transparent, in many respects resembling the aqueous humor. This cellular structure is probably intended for giving the vitreous humor a consistence, elasticity, and form;

* See Chap. XXXII.

to keep the lens in its proper situation, and to permit of a certain degree of motion. It may also assist in preserving the shape of the eyeball, when its cavity is penetrated.

Like the aqueous humor, it is somewhat thicker, heavier, and more viscid than water, and, though it may appear to have more consistence, this deception arises from the globules being contained in small cells communicating with each other, so that, when one is torn, the contents of those contiguous are but slowly discharged.

The chemical qualities of the vitreous humor are nearly the same as those of the aqueous humor, and its refracting power is also similar.

The vitreous humor is penetrated by an artery which arises from the central artery of the retina, and passes through its middle in a serpentine direction, giving off branches which communicate with one another; whilst the principal trunk terminates in the capsule of the lens.

Though the vitreous humor resembles, in many respects, the aqueous, it does not seem to possess the same solvent powers. This is strikingly illustrated by comparing the difference in the rapidity by which crystalline and capsular cataracts are dissolved when in contact with these humors.

It is extremely probable that the fluid contained within the cells of the hyaloid membrane, is exhaled from the arteries in the same manner as the aqueous humor and fluid of the crystalline lens are exhaled from the vessels of their respective capsules.

The capsule of the vitreous humor is subject to morbid changes similar to those of other serous membranes, and the fluid itself is sometimes altered in its quantity, colour, and other qualities.

The vitreous humor does not lose its pellucidity like the crystalline lens, but retains, even in advanced age, a perfect transparency.

When a part of the vitreous humor is

evacuated, it is replaced by an aqueous fluid, which seems to answer all the purposes of vision. This regeneration takes place even when the quantity discharged has been very considerable; and, in experiments on animals, the whole has been taken out, and replaced by a watery fluid, the sight being perfectly restored.

CHAP. XL.

OF THE DISEASES OF THE VITREOUS HUMOR AND ITS CAPSULE.

THE Diseases of the Vitreous Humor and its capsule, like those of the aqueous humor, are few, occur seldom, and generally accompany other diseases.

The vitreous humor is sometimes perceived to be much thinner in its consistence than natural.* When this takes place, the hyaloid membrane, with its various prolongations, are absorbed, so that the bulb of the eye resembles one bag filled with water; the sclerotic coat yielding to the

* Synchysis, Dissolutio humoris vitrei, Atraphie de l'Oeil.

slightest touch, and the cornea losing its convexity. This sometimes happens in eyes which have suffered from severe internal inflammation, and it is always accompanied by other diseased changes.

A portion of the vitreous humor generally degenerates into a watery fluid after the use of the couching needle. On puncturing the cornea to remove an opaque capsule from a boy's eye, the posterior chamber of which had twice been punctured by the needle, the eye nearly altogether sunk, from the whole vitreous humor being converted into an aqueous fluid; but it was completely regenerated.

Morgagni dissected an eye, "which was smaller than natural, and the pupil appeared white. Having cut into the back part of the sclerotica, a quantity of limpid water flowed out, into which water a great part of the vitreous humor seemed to have degenerated, the remaining part appearing natural." *

* Epist. lviii. Art. 16.

The vitreous humor also becomes, in some instances, thicker than natural. Morgagni mentions having dissected the eyes of a man whose vision had been very imperfect for some time previous to his death, "in one of which the vitreous humor adhered to the finger, and formed itself into long threads, following the fingers as they were drawn asunder. This was not the case with the vitreous humor of the other eye, but in both eyes the lens was diseased." *

The vitreous humor is sometimes more or less diminished in quantity. An absorption of it sometimes takes place after the eye has suffered from violent attacks of inflammation, more particularly when the inflammation has affected the choroid coat and iris. In dropsy of the choroid coat,† the vitreous humor is absorbed in proportion as the morbid accumulation of water takes place between the choroid coat and

* Epist. xiii. Art. 15.

† See Dropsy of the Choroid Coat, Chap. XXIX.

retina; and, in those cases where the retina was found so compressed as to form a cone, no remains of vitreous humor could be observed *

In some instances there is an increase in the quantity of the vitreous humor. This happens not unfrequently in staphyloma; for, in this disease, the increase in the bulk of the eyeball will generally be found to arise more from an increase in the quantity of the vitreous, than aqueous humor. An increase in the quantity of the vitreous or aqueous humor has generally been treated of as a distinct disease, and denominated *Hydrophthalmia;* but I have never seen a dropsy of the eye without an accompanying disease of the sclerotic coat or cornea; and it seems to me that it is an example of staphyloma which Scarpa has described, in order to illustrate the pathology of Hydrophthalmia.†

* See Maitre-Jan, p. 241.

† Treatise on the Diseases of the Eye.

A change is sometimes to be observed in the colour of the vitreous humor. Morgagni* saw it converted into a few drops of turbid brown water; and Scarpa found in its place "a few drops of a glutinous, bloody water."

In the living eye, the colour of the posterior chamber sometimes appears changed; but it is difficult to discriminate, in many instances, whether this change of colour arises from a change in the colour of the vitreous humor, or from some coloured body shining behind it. In the commencement of fungus hæmatodes, the buff-coloured substance formed at the bottom of the eye produces an appearance as if the colour of the vitreous humor was changed; and I have remarked a similar appearance from the effusion of albumen in the posterior chamber.

In some cases the vitreous humor acquires a dull greenish colour, accompanied

* Letter xiii. 9.

with insensibility of the retina, a species of amaurosis which has generally been called *Glaucoma.**

The capsule of the vitreous humor, like that of the aqeous humor and crystalline lens, sometimes becomes opaque.† Maitre-Jan saw it in the eye of a horse, like a beautiful net-work. I have observed the same appearance in a few instances, where the lens had been imprudently extracted, and where violent inflammation followed the operation.‡

The capsule of the vitreous humor is sometimes found Ossified. In one case, besides the capsule of the lens being ossified, I found several large, but thin, scales of bony matter, dispersed in an irregular manner throughout the vitreous humor, which, in all probability, were ossifications of the hyaloid membrane.§ A prepara-

* See Amaurosis. Chap. XL.
† Cataracta Hyaloidea.
‡ Cataracta secundaria Arachnoidea.
§ See Plate XVI. fig. 2.

tion of the same kind is in Dr. Baillie's collection.

On examining an eye, the natural form of which was destroyed, the cornea having become quite opaque, and the anterior chamber almost entirely obliterated, I found, on dissecting back the sclerotic coat, the posterior chamber occupied by a hard irregular-shaped mass, with the choroid coat and iris adhering to it. On removing the choroid coat, no remains of the retina could be detected. The bony mass was composed of two distinct portions, slightly connected with one another.* One portion was in the situation of the crystalline lens, exactly resembled it in form, and being composed of a thin hollow shell of bone, appeared to be the capsule of the lens ossified.† The other portion occupied the site of the vitreous humor; and, from the inequality of its surface, being

* See Plate XVI. fig. 1.

† See Ossification of the Capsule of the Lens, Chap. XXXVIII.

composed of numerous osseous laminæ irregularly disposed, I conceived it to be portions of the hyaloid membrane ossified. A similar case is related by Morgagni, and another by Scarpa.

CHAP. XLI.

GENERAL REMARKS ON THE OPTIC NERVES AND RETINA.

THE structure of the different Nerves is various, being, in this respect, unlike the arteries and veins, which throughout the system are the same, whatever be their size, their course, or functions. Thus, the nerves of the organs of sense have a structure calculated to receive impressions of external objects, according to the particular office which each organ performs. The auditory nerve is distributed in a fluid, which is agitated by every undulation of the external air; the olfactory nerves, and nerves of touch, are spread underneath

a delicate skin; the gustatory nerves terminate in numerous papillæ; whilst the retina is expanded around a transparent and refracting cavity, to receive the impressions of the rays of light.

The Optic Nerves are remarkable for being the only nerves, besides the olfactory, which arise from the cerebrum; and which, except the auditory and olfactory, pass to the organ they are intended to supply, without forming any communication with other nerves.

The optic nerves are larger, and the medullary matter is in much greater proportion in them than in any of the other nerves.

The optic nerves are also softer than any of the nerves within the cranium. Between their origin and place of union, they are as pulpy as the medullary substance from which they emanate, but their consistence is a little increased from their union to the optic foramina.*

* Bichât, Anat. Des. Tom. III. p. 155.

Until the Optic Nerves unite, they derive no covering from the pia mater; but at the place of their union, canals are formed by this membrane, which are filled with pulp, and which are prolonged to the retina. When they pass through the optic foramina, they receive an additional tunic; the dura mater dividing at this place into two laminæ, one of these uniting with the periosteum, which lines the orbit, whilst the other forms a very dense and strong *neurilema*, which envelopes the nerve as far as the sclerotic coat. The pia mater, which forms the canals in which the pulp is contained, passes within the globe, forming the vascular lamina of the retina. Hence the sympathies observed in the diseases of these parts, from the connection of the coverings of the optic nerves. How often does pain in the head and in the different sinuses accompany affections of the eyes; and morbid feelings in the eyes, diseases of the membranes of the brain?

The optic nerves, besides being remarkable for having their origin in the cerebrum,—for containing a greater quantity of medullary matter than other nerves,—for having no anastomoses,—from being enveloped in one general covering, instead of being composed of bundles of filaments,—are also singular in their structure, from having an artery* passing through their axis, in place of being supplied from the surrounding vascular trunks.†

The Optic Nerves, at the place of their union in the sella turcica, were long believed to cross each other; that going to the left eye, being supposed to come from the right thalamus; and that from the left thalamus, to go to the right eye. Vesalius, Aquapendente, and others, had observed that the optic nerves in some instances, remained separate from one another during their whole course; and the man in whom Vesalius saw this formation had strong

* *Arteria centralis retinæ.*

† Bichât, Anat. Gen. Tom. III. p. 154.

vision. The same thing was observed in animals;* and it was also found, that, in dissecting diseased eyes, the disease always extended along the side corresponding with the affected eye.† But, though the optic nerves do not seem to cross each other, there is little doubt of an intermixture of some of their medullary fibres; for it is much more probable that the remarkable sympathy existing between the two eyes rather arises from this intermixture of the medullary fibres at the union of the nerves in the sella turcica, than from any intermixture of other nerves in the brain.‡

The Retina.—The Retina is composed of two laminæ which present distinct structures. The one which is vascular is in contact with the capsule of the vitreous humor; and the other which is medullary is contiguous to the choroid coat.

* See Briggs's Ophthalmographia. Lugd. Batavor. 1686.

† See Diseases of the Optic Nerve, Chap. XLIV.

‡ Anatomie Medicale, par A. Portal.

The first of these laminæ is a very delicate membrane, of a fine cellular structure; adhering slightly to the capsule of the vitreous humor. Injections shew that it is very vascular; and it is supplied with nerves from the ophthalmic ganglion, in like manner as the *neurilema* of the optic nerve is supplied with branches from the same ganglion. The other lamina of the retina, which seems to be entirely composed of medullary matter, is so intermingled with the vascular membrane, that the two have never been distinctly separated.

There is a part of the retina called the *Macula Lutea*, discovered by Sömmering, which has hitherto been observed only in the human eye, and the functions of which have not been even conjectured.* The macula lutea, which is found near the centre of the retina, appears as a yellow spot, contiguous to which is a fold and a small hole. From the observations of

* See Icones Oculi Humani.

Michaelis, it is extremely probable that this part of the retina has an important share in some diseases. In eyes which had become opaque, the spot could not be detected; in a Staphylomatous eye it was scarcely visible;—in an Amaurotic eye this spot was black;*—and Beer has observed it changed in Glaucoma.

Membrana Jacobi.—But besides these two laminæ of which the retina has usually been supposed to be formed, there is a membrane lately described by Dr. Jacob, of Dublin, which seems to belong to the retina. This membrane is found between the choroid coat and medullary lamina.† "It covers the retina from the Optic Nerve to the ciliary processes. In the fœtus of nine months it is exceedingly delicate and with difficulty displayed. In

* Mémoires de la Société Médicale d'Emulation, anno 1798.

† An Account of a Membrane of the Eye, now first described by Arthur Jacob, &c. &c. Phil. Trans. for 1819, Part II.

youth it is transparent, and slightly tinged by the black pigment. In the adult it is firmer and more deeply stained by the pigment which sometimes adheres to it so closely as to colour it as deeply as the choroid coat itself. In a young subject it was found partially separated from the retina by an effused fluid." It is not improbable that pathological researches will prove that its functions are analogous to those of the pia mater.

Diseases.—In most diseases of nerves, there is merely an alteration in their sensibility; seldom can any change be detected in their structure. And as the natural structure of the optic nerves and retina cannot be compared to that of any other organ; pathological researches will receive little advancement from that analogy which I have so frequently employed in investigating the morbid changes of other parts of the eye. The morbid alterations in the structure of the nervous system have hitherto been less successfully

investigated than those of any of the other textures which compose the human body. These researches are also attended with peculiar difficulties, more especially in the retina; not only because the parts are extremely minute, and cannot be seen, like many of the other diseases in the living eye, but as very small deviations from the natural structure, which materially derange its functions, might escape even an attentive observer. Important, therefore, as the diseases of the nerve of vision undoubtedly are, much remains to be done by future observers in this part of pathology; and it is only by the collection of accurate histories and dissections that we can expect to be able to refer the various combinations of symptoms which are observed in affections of this nerve to their respective morbid changes.

CHAP. XLII.

OF THE SYMPATHIES OF THE EYES.

THE eyes, like the ears, the mammæ, the testes, and all organs which are in pairs, have a sympathy with each other, both in health and disease; and this is, perhaps, more remarkable between the Eyes than any of the other organs, from the two optic nerves being intimately interwoven. Diseases which were originally confined to one eye are transmitted to the second eye; and even when an eye sustains a slight injury, the other frequently becomes weak and irritable.

This sympathy between the Eyes has

not escaped common observation; and there is a disease, frequent in the eye of the *horse*, having the appearance of a specific inflammation, which usually first affects one eye and then the other, almost always sooner or later destroying vision. It is known among some Farriers, that, if the eye first affected with this disease suppurate and sink in the orbit, the disease does not attack the other eye, or subsides if it had commenced in it. Thus they have adopted a practice of destroying altogether the diseased eye, in order to save the other; which is rudely done by putting lime between the eyelids, or thrusting a nail into the cavity of the eye-ball, so as to excite violent inflammation and suppuration. I have frequently succeeded in saving one eye of the horse by adopting this practice; but I destroyed the eye by simply making an incision in the cornea, and discharging through it the lens and vitreous humor. In some diseases of the human eye, where the disease makes a similar progress, first

affecting one eye and then the other with complete blindness, the practice so successful in animals might, by judicious discrimination, be beneficially adopted.

But, besides this general consent between the two eyes, there is a striking sympathy between the corresponding textures of each organ. This is well exemplified in diseases. If the lens be opaque in one eye, it is probable that, sooner or later, the lens of the other will become similarly affected. St. Ives mentions the case of a man who received an injury of his eye, which produced a cataract, and some time after the lens of the sound eye became obscure; and what is curious, when the cataract of the wounded eye was extracted, the cataract in the other disappeared. The same thing is observed in the other textures. A young man received a wound in the eye, which produced violent inflammation of the iris; and in three weeks the iris of the other eye became inflamed. When treating of staphy-

loma,* a case is mentioned where a large staphyloma came on after a punctured wound of the eyeball, and some time afterwards the other eye also became staphylomatous.

Thus it usually happens, that not only both eyes are apt to suffer when one is injured or diseased, but that, when both are diseased, either at the same time or at different periods, they are generally affected with similar diseases.

Besides this remarkable sympathy between the two eyes, depending, no doubt, on the intermixture of some of the fibres of the optic nerves at the place of their union, the eyes have a great sympathy with other parts, from the nervous connection of the retina through the medium of the ophthalmic ganglion. This connection explains many of the phenomena that take place in diseases of the eye, which, in a pathological point of view are extremely interesting, and a knowledge of

* See Volume I. Chap. XII.

which may lead to important improvements in the treatment of diseases.

The distribution of the first branch of the fifth pair, or ophthalmic branch, explains how sudden exposure to a bright light, or looking at the sun, produces sneezing; how strong odors increase the flow of tears; how, during certain headachs affecting the scalp, the eyes become red and painful, the tears flow, light cannot be tolerated, and the eye-lids have involuntary twitches; how contusions about the internal and upper part of the orbit so frequently inflame and irritate the eye; and how wounds of the frontal, infra-orbital, and other branches of nerves, which form anastomoses with the ophthalmic ganglion, are sometimes followed by amaurosis.

The communication between the sixth pair with the great sympathetic, explains the connection between the eyes and the abdominal viscera, and this connection makes it probable that these nerves send

branches to the globe of the eye, an opinion some have denied. Petit found, that, when the par vagum was divided in animals, the eye of that side lost its lustre, and the pupil enlarged. Hence wounds and compression of the great sympathetic nerve, whether in the neck, chest, or abdomen, occasion convulsions of the eyes, and even blindness; and children who have worms, have often dilated pupils, and other amaurotic symptoms. Besides, how often are diseases of the eyes sympathetic of affections of the chylopoetic viscera?

The nerves of the eye have also a great influence on those of the stomach. If an instrument be turned rapidly before the eyes, it sometimes produces vomiting, and injuries of the eye often have a similar effect.* On introducing the couching-needle into a woman's eye, at the moment it pierced the coats she shrieked loudly, and was in a short time afterwards attacked with violent vomiting.

* Portal, Anatomie Medicale.

CHAP. XLIII.

OF INFLAMMATION OF THE RETINA, AND ITS CONSEQUENCES.

It has already been observed, that the Retina, besides being composed of medullary pulp, has an interior cellular lamina interwoven with numerous blood-vessels. Changes in the structure and functions of these vessels produce a variety of the morbid phenomena incident to vision.

Inflammation rarely occurs in parts most supplied with nerves; the brain, the tongue, and the retina, being seldom inflamed.*

When the retina is affected with inflam-

* Bichât.

mation, the disease is marked by painful vision; intolerance of light; sparks of fire, or drops of a red colour falling before the eyes; little external redness; pain darting through the head; with more or less constitutional derangement.

The disease is generally brought on by excessive use, or by much exposure of the eyes to bright and dazzling lights; or it accompanies or participates in inflammatory affections of the brain and its meninges.

In some instances, the inflammation appears to be confined to the retina; whilst in others, the choroid coat or iris seem to be also affected.

Inflammation of the retina usually attacks both eyes.

Besides this active inflammation, to which the retina is subject, its exquisite sensibility and the delicacy of its functions, render the slightest deviations from the healthy state perceptible. Hence it is, that some people cannot expose their eyes to the common ight of day without inconve-

nience; that sparks of fire appear before the eyes of some people; that strange images, which have been compared to flies, tadpoles, and such like, float before the eyes of others; and that vision becomes impaired in a variety of different ways. In all these affections of the retina, it is extremely probable that each arises from some particular change in the state of the vessels of the vascular lamina; but what the changes are which produce the different morbid symptoms, has not been at all satisfactorily ascertained. They have a strong analogy to those diseases of the brain, which are generally considered as arising from plethora; and it is possible they may arise from a similar condition of vessels.

In most cases of Ophthalmia, in whatever texture of the eye inflammation commences, the retina generally participates; the degree being always indicated by the increase of the sensibility of the eye to light.

CHAP. XLIV.

OF THE MORBID SENSIBILITY OF THE RETINA.*

In some people the eyes acquire a morbid sensibility to light, where there is no reason to suppose that the retina is actually inflamed. This is very remarkable in those people who have long been confined in dark places, the eyes not being able to endure the ordinary light of day; whilst, at the same time, they can distinguish objects in an almost inconceivable obscurity.

* Nyctalopia —Visus nocturnus — Cœcitas diurna—Amblyopia meridiana—Vespertina acies—Dysopia luminis—Photophobia.

Buffon relates a remarkable instance of an officer who was thrown into a dungeon, where the light never entered, there being no opening but a hole at the top, which was always kept closed, except when opened by the keeper to put down provisions. After remaining in it some weeks, the unfortunate man began to think he saw some little glimmering of light. This internal dawn seemed to increase from time to time, so that he not only began to discover the parts of his bed and other large objects, but at length could perceive the mice that frequented his cell. After some months confinement, he was set free ; but such was the effect of the darkness upon his eyes, that he could not, for some days, venture to leave his dungeon, and was obliged to accustom himself by degrees, to endure the light of day.*

Instances have also been narrated, and with every probability of truth, of prisoners

* Goldsmith's Animated Nature, Vol. II. page 161.

who had for many years been confined in dungeons, having been found altogether blind when they were exposed to the light of day. This calamity was said to have happened to some of those who were released from the Bastile, when that awful prison was destroyed.

This morbid sensibility to light is, in a lesser degree, exemplified by the improper use of shades and coverings to the eyes. It often happens that people wear a shade to relieve diseases of the eye, which are not attended with increased sensibility to light; but this finally takes place, and can be relieved by gradually exposing the eye to the ordinary light of day.

In like manner, as vision becomes impaired by the exclusion of the eyes from light, so any inordinate exposure produces an increased sensibility in these organs. Hence the inhabitants of those Northern regions, which are constantly covered with snow, keep their eyelids nearly closed, and do not see distinctly during the day. To

prevent their eyes from being injured, and to enable them to see more distinctly, these people wear an instrument consisting of a thin and light piece of wood, which covers both eyes, and in which there is a long, but narrow, horizontal slit or chink opposite to each eye. By this ingenious contrivance, the eyes are guarded from all lateral and dazzling light, whilst the chink is sufficiently wide to allow of a pretty extensive range of vision on the surface of the earth.

Travellers on the hot and sandy plains of Africa find their vision equally injured, as those who live in countries covered with snow; and they are in the habit of wearing a piece of black crape before their eyes, to diminish the quantity of light, as well as to prevent the particles of sand falling into the eyes.

The inhabitants likewise of some of the Eastern countries, where the sun shines with dazzling splendour, have a practice which enables them to see more clearly, whilst, at the same time, it beautifies the

countenance, by giving brilliancy to the eyeball. A black pigment, composed of finely levigated oxide of antimony, mixed with oil, is spread over the edge of the eyelids and roots of the ciliæ, and renewed as occasion requires. A nation called Iaggas, living in the Northern parts of Abyssinia, shew only the white of the eye, hiding the pupil in the day time beneath the Palpebra, least the eye should be hurt by the dazzling sun's rays.

Various other causes render the eyes susceptible of distinguishing minute objects in an obscure light. Boerhaave mentions the case of a man who could read during the night when he had drank too freely.* Richter saw a man who had an inflammation in the eye, in consequence of a blow, who could read in a dark night.† A woman who had suppressed menses, was blind during the day: the pupils becoming so contracted in a clear light, that they

* De morbis Oculorum.

† Wundartzneikunst, 3 Band. p. 478.

almost disappeared. As soon as the menstrual discharge returned, the disease subsided.*

It has been told of Tiberius Cæsar, that if he awoke in the night-time, he could see all objects as clearly as if they had been illuminated with a bright light; but that, in a short time, the objects grew fainter and fainter, till at last they vanished. The same thing is also told of Alexander. Asclepiodorus is said to have read books in the night-time, without the assistance of any kind of light; and Hieronimus Cardanus assures us, that, when he was young, he needed not the assistance of a candle to read in the dark.† Similar cases are mentioned by Willis, Briggs, and other writers; the affection being denominated Nyctalopia, or night-vision.

* Pellier.

† Porterfield on the Eye.

CHAP. XLV.

OF THE DISEASED CHANGES OF THE RETINA AND OPTIC NERVES.

1.—*Of the Diseased Changes of the Retina.*

The retina has seldom been found changed in structure. The morbid changes are observed to take place either in the vascular membrane of the retina, or in its medullary lamina, or both these may be at the same time affected.

When Inflammation has taken place, I have seen the retina assume a buff colour, which was probably produced by the effusion of albumen. In a lady who had

suffered from arthritic amaurosis, I found one large spot of the retina quite opaque and considerably thickened.

Magendie found the retina converted into a fibrous membrane. "All the posterior chamber was lined by a membrane which was white, fibrous, very firm, and in every respect resembling an apaneurosis. This membrane, which was evidently the retina, covered an osseous shell, to which it adhered throughout by a firm cellular texture, forming nearly a complete envelope to the retina. Behind the bone was the choroid coat in every respect natural."*

Morgagni found the retina quite indurated and white, adhering firmly to the capsule of the vitreous humor.†

The retina has been thickened, and changed in its structure, in eyes that have become disorganized.‡

Beer has observed, in some cases of

* Voyez Mem. Fibreux Dic. de Sci. Med.
† Ep. xiii. Art. 9.
‡ Morgagni, Ep. lii. Art. 30.

amaurosis, the vessels of the vascular membrane of the retina varicose. This is a change which very probably takes place in those cases of amaurosis where there are symptoms of congestion in the head, and where the disease is relieved by depletion. When the vitreous humor was evacuated from a lady's eye affected with amaurosis, a profuse hæmorrhage came on soon after the operation, which probably arose from a varicose state of the vessels of the retina, as well as those of the choroid coat. In this instance, the vitreous humor had degenerated into an aqueous fluid; and varicose vessels were observed on the sclerotic coat towards its posterior part.

It is not improbable, that, in many cases of impaired vision, where figures of various forms appear before the eyes, these symptoms arise from a change in the vessels of the retina.

The medullary portion of the retina has been found entirely wanting in persons who have long been affected with amaurosis.

It has already been observed, that Michaelis found the *macula lutea* in an amaurotic eye converted into a black spot.

Beer has made several dissections of that species of amaurosis which has been called Glaucoma, in all of which he found, that the obscurity in the vitreous humor commenced at the *macula lutea*, extending from it throughout the whole humor.

Walter found the retina altered in its appearance, and become tough.

Guerin found in a man who had been blind ten years, "the retina thin, and scarcely observable, but very tough."*

In Fungus Hæmatodes, the structure of the retina and optic nerve is changed in a remarkable manner, the whole cavity of the eyeball becoming filled with a substance resembling medullary matter, and the optic nerve changed in its form, colour, and structure.†

* Malad. des Yeux.

† See Fungus Hæmatodes of the eye.

2—*Of the Diseased Changes of the Optic Nerves.*

The Optic Nerves have frequently been found diseased, changes having been observed both in the neurilema and in the medullary portion of these nerves.

Cheselden and Kaltschmidt found the optic nerves very small in children who died of Hydrocephalus.*

The optic nerve is sometimes very much elongated, from tumours pressing the eyeball out of its natural situation ; and, in several instances where this took place in a considerable degree, the functions of the retina continued unimpaired.

Morgagni found the " optic nerve of a perfectly sound eye discoloured, and flattened like a piece of tape."†

In a man who had never been blind, Morgagni found the optic nerve had los

* Voigtel's Handbuch.

† Epist. lxvii. Art. 21.

its natural colour, and had become thin, from the orbit to its union.*

Paw found in the optic nerve a large Hydatid, which had produced amaurosis.†

In Mr. Heaviside's Museum, there is a preparation of the optic nerve of an amaurotic eye, where a Tumor of considerable bulk has grown from the neurilema.‡

Wandeler found, in a young man who had amaurosis, "a hard swelling in the optic nerve."

Calculous Concretions have sometimes been found in the optic nerve. Walter found in the left optic nerve of a maniac, just before it passes through the optic foramen, a calculous concretion, of a rounded and flattened shape, and of two lines in diameter.§

Morgagni found on opening the head of

* Epist. lxiii. Art. 8.
† Obser. Anat. Rarior. Ob. ii.
‡ See Plate XV. fig. 1.
§ Museum Anatom.

a woman who had been blind, and who complained of excruciating pain in her head, "a stone the bulk of a pea, in the very substance of the optic nerve."

Morgagni found a large scrofulous tumour at the origin of the optic nerves.*

Ferro found the optic nerves surrounded and covered with albumen, in a case of amaurosis, which he considered as the effect of gout.†

Matter resembling Chalk has been observed surrounding the optic nerve.‡

Lallereux found in the middle of the substance of the Optic Nerve, a small tubercle of a hard consistence. This patient had been quite blind for two months, but the Iris was moveable, and no change of appearance had taken place in the Eyeball.§

Lallereux found on opening the neurilema of an Optic Nerve, that nearly one

* Ep. xiii. Art. 6.
† Voigtel's Handbuch.
‡ Voigtel's Handbuch.
§ Journal de la Société de Médecin, 1814.

half of its length was converted into a liquid matter. This eye had been amaurotic, and no apparent change was observed in it during life, except a greenish tinge at the bottom of the globe, the iris remaining moveable. From the iris of this eye, and also that of the foregoing case, retaining its mobility, M. Lallereux drew the general conclusion, that in those cases of amaurosis where the pupil remains moveable, the disease exists in the Optic Nerve, whereas when the pupil is permanently dilated, this structure of the retina itself has become changed.

Bonnetus relates the case of a gentleman who had been blind from his childhood, and after whose death it was found that "both optic nerves were not obstructed and contracted, but contorted."*

In a man who had been blind in the right eye, the optic nerve was found of a brownish colour, and thin for about one finger's breadth from the eye. It con-

* Sepulchretum Anatom.

tained no pulp, but a fluid of a viscid consistence, and of a muddy grey colour. When this fluid was squeezed out, the neurilema remained in the form of a tube, the sides of which were thicker than natural. Beyond this portion, the pulp was firmer but discoloured, and the nerve thinner as far as the union of the two nerves.*

Cesalpinus found, in dissecting the body of a man who had the sight of one eye very feeble, "one of the optic nerves attenuated, and the other of its natural form. The vision was weak in that eye which had the nerve diseased, the patient having received a wound on that part of the head.†

A boy nine years of age fell on his head, which was followed by a pain in the head, continued fever, and blindness. "The optic nerves were found on dissection, very much wasted, and so fragile, that

* Voigtel's Handbuch. Erster Band.

† Sepulchretum Anatom.

they dissolved by touching them with the hand."*

The optic nerves undergo great changes in Fungus Hæmatodes, and these changes are usually to be observed in the medullary portion of the nerve.†

Malacarne saw an instance where, besides the whole eye, the optic nerves, with the thalami and striated bodies, were wanting. In a child born with one eye, there was only one optic nerve. There were two at the origin, but in a short way they contracted, and formed into one trunk.‡

A case of Amaurosis is related by Morgagni, where, " a remarkable bladder, full of the most limpid watery matter occupied the optic nerve at the place of their crossing."§

* Voigtel's Handbuch.
† See Fungus Hæmatodes of the Eye.
‡ Voigtel's Handbuch.
§ Ep. xiii. Art. vi.

3.—*Of Changes in the Structure of the Optic Nerve, when the Eye has been destroyed.*

Changes from the healthy structure take place in organs when their functions are not performed. If the motion of a joint be destroyed, the muscles diminish in size, and their fibres become more delicate and of a paler colour; and, if the circulation through an artery be interrupted, the canal of the vessel becomes obliterated. Thus, also, when the retina can no longer receive the impressions of external objects, in consequence of the eye-ball being destroyed, the Optic nerve loses its natural appearance. The bulk of the nerve generally diminishes. Instead of being round and firm, it becomes thin and flaccid. It loses, too, its natural opaque white colour, becoming of a pale yellow, and appearing more or less transparent.

These changes have usually been observed

to extend only as far upwards as the union of the two nerves.

Mr. Allan Burns dissected the head of a woman who had been blind from infancy, from the cornea of both eyes being quite opaque. The Optic nerve of one side was small and pellucid from the eye-ball to where it joins its fellow. On the other side the nerve was quite healthy from the eye to the place of union, but beyond this it was small and disorganized. The preparation is now in my possession.

Bichât examined two cases where one of the eyes had sunk; the Optic nerves of the diseased eyes were sensibly shrunk as far as the place of union, but beyond this both nerves were of the same size.*

Morgagni found the optic nerve of an eye that had been disorganized, more slender than that of the sound eye, of a more compact structure, and of a brownish colour. "This change of structure and colour extended to the place where the two nerves

* Anat. Descrip. Vol. III. p. 153.

unite, but at this point, and above it, nothing but soundness could be seen on both sides.*

Vesalius dissected a woman where one eye was destroyed, and the other remained perfect. The optic nerve of the diseased eye, from its origin in the brain to its insertion in the eye, appeared much shrunk on being compared with the nerve of the sound eye.†

Morgagni found, on dissecting the Optic nerve of an eye which was shrunk, and which had probably been long blind, the nerve "extenuated to a very great degree, and cineritious. For about a finger's breadth from the eye, it contained no medullary matter, but only a cineritious, turbid, glutinous humour. This being squeezed out by a slight compression, the cavity was left empty, so that the coat of the nerve seemed to be more like the coats of some canal. The coat was thicker than usual near to

* Epist. xiii. Art. 29.

† Bonnetus, Sepulch. Anatom.

that place where the two nerves unite; but here all difference disappeared, and both seemed perfectly sound at their union, and up to their origin.*

When an organ of sense is totally destroyed, the ideas which were received by that organ seem to perish along with it, as well as the power of perception.†

* Epist. xiii. Art. 8.
† Darwin's Zoonomia, Vol. I.

CHAP. XLV.

OF AMAUROSIS.*

THE term Amaurosis has had a very extensive application in nosology, having been employed to denote all those diseases of the eye, in which the functions of the Retina become imperfect or destroyed; the eye appearing in other respects sound. Amaurosis, therefore, in its usual acceptation, signifies a symptom of disease, as well as a distinct affection.

It has already been noticed, that Amaurosis accompanies almost all those changes of structure which have been met with in

* Gutta Serena.—Black Cataract.—Palsy of the Retina.—Suffusio nigra.—Der Schwarze Staar.

the retina and optic nerves ;* and amaurotic symptoms also accompany some of the diseases of the choroid coat,† and other internal parts of the eye-ball. The variety of morbid changes of these parts is sufficient to account for the number of the symptoms of amaurosis which authors have enumerated; and so seldom has this disease become the subject of pathological research, that scarcely any attempt has ever been made to refer a particular assemblage, or combination of symptoms, to the concomitant diseased change.

Besides those cases of Amaurosis, where the paralytic state of the retina accompanies a change of structure in some of the parts within the orbit, amaurotic symptoms also arise from affections of the Brain and Nerves, and from Sympathy with other diseased organs, more especially the alimentary canal.

* See Chap. XLIV.

† See Chap. XXIX. and Chap. XXX.

1.—*Amaurosis from Diseases of the Brain.*

Amaurosis accompanies many affections of the Brain.

In all those diseases where the quantity of blood in the encephalon is increased, or the actions of the arteries changed, the functions of the retina are more or less affected, and, in some cases, a complete Amaurosis is produced. From the course of the ophthalmic arteries, the situation of the *circulus arteriosus*, and the peculiar distribution of these arteries in the different tribes of animals, there can be no doubt that an equal and uniform current of blood in the internal parts of the eye is essential to vision. It is, therefore, easy to conceive how any disturbance in that circulation should interfere with the functions of the retina.*

Thus persons of a plethoric habit, when

* Ware's Works, Vol. 1. p. 428.

they hang down the head, or by any means increase the circulation of the blood, frequently excite the appearance of Spots before their eyes, and sometimes complete blindness.

It was observed by Sauvages,* that the pulsations of the optic artery might be perceived by looking attentively on a white wall, well illuminated. A kind of net-work, darker than the other parts of the wall, appears, and vanishes alternately with every pulsation. This change of colour of the wall he ascribed to the compression of the retina, by the diastole of the artery. The various colours produced in the eye by the pressure of the finger, or by a stroke on it, as mentioned by Sir Isaac Newton, seem likewise to originate from unequal pressure on various parts of the retina. Richter mentions the case of a plethoric person, who, when he held his breath, and looked at a white wall, perceived a kind of net-work, which alternately appeared and

* Nosol. Meth. Class VIII. Ord. I.

disappeared with the diastole and systole of the arteries; a phenomenon probably occasioned by the plethoric state of the vessels of the retina.* In a staphylomatous eye, on the cornea of which was distributed two large red vessels, the patient could distinctly perceive a vermicular motion. Mr. George Young saw a cadet at Woolwich, who, from being obliged to wear a very tight neckcloth, and collar of the coat tightly clasped, had his sight much impaired; the sphere of vision was diminished, the pupils were dilated, and he had the appearance of flies constantly floating before his eyes.

Amaurosis is frequently brought on by keeping the eyes with great attention, and for a long time, fixed on minute objects, more particularly if the objects are not diversified; for a frequent change in the objects has a material effect in refreshing the eye.

Tailors and milliners, who are employed

* Richter's Anfangsgründe.

at very minute needlework, and who, when at night, have the objects brightly illuminated, frequently become Amaurotic.

Vision is also particularly injured, when the objects are looked at with one eye. I have seen several officers of the navy, who had lost the sight of the eye with which they had been in the habit of looking through the telescope.

I have also known several instances of soldiers and sailors who had become blind after having undergone great fatigue. Richter relates a case of a man who became suddenly blind while carrying a heavy burden up stairs. Another man, who worked very hard for three successive days, became blind at the end of the third day.*

The effects of intoxicating liquors on the brain and retina are well known; vision becoming obscure and often double. Boërhaave relates the case of a man, who, whenever he was intoxicated, laboured under a complete Amaurosis. The disease came

* Anfangsgründe, 3. Band.

on by degrees, increasing with the quantity of wine; and, after the intoxication went off, vision returned.*

Amaurosis has also been known to arise from other causes which increase the quantity of blood in the encephalon. Thus the cessation of any accustomed hæmorrhage, such as that from the nose or rectum, has been observed to produce Amaurosis. Pechilini saw a young woman who had Amaurosis during a suppression of the menstrual discharge, which was removed the moment menstruation returned.† Rolfini mentions examples of women, who, as often as they became pregnant, were blind to the time of their delivery.‡ Beer saw a woman who was amaurotic during three successive Pregnancies. The disease commenced immediately after each impregnation, and between the third and fourth months she became quite blind. After the two first

* De Morbis Oculorum.
† Ob. Med.
‡ Disputatio de Gutta Serena.

confinements vision was restored; but after the third, it never returned.* Portal saw a woman who became amaurotic after the delivery of her first child; after her second, she became deaf; and, after the third, almost dumb. She had not lost any blood during either of these pregnancies, but was bled during the next, and she had no new affection, the former, at the same time, diminishing.†

Amaurosis has also been known to come on after the healing up of ulcers, or drying up of eruptions.

Beer says he has frequently seen Amaurosis produced among the Polish Jews, from cutting off the Plica Polonica.

Amaurosis is sometimes produced from a sudden cessation of the secretion of milk.

Amaurosis has likewise been known to be occasioned by a sudden fright, and other violent mental emotions.

Amaurotic symptoms frequently come

* Lehre der Augenkrankheiten, II. Band. Wien, 1817.
† Anatomie Medicale.

on before or after a fit of apoplexy. Bonnetus, in a young man who died paralytic, and who, besides losing the use of one side of the body, lost the sight of the eye of the same side, found "the anterior cavity of the cerebrum filled with blood, and a quantity of serum."*

Amaurosis often remains after Fevers, which have been accompanied by inflammatory affections of the brain. In a gentleman who had a severe attack of fever at the Isle of France, accompanied with a very marked determination of blood to the head, not only a complete and permanent Amaurosis took place, but for many months he was also deprived of the senses of Taste and Smell.

Instances have been observed, where a complete amaurosis has come on from a stroke of Lightning. I have seen one case of this kind, in which the sight was restored by the repeated application of small blisters over the frontal nerve.

* Sepulchretum Anatomicum.

I have known two instances where Amaurosis came on after a *coup-de-soleil.*

Injuries of the Brain are sometimes followed by amaurosis. I have seen several cases where vision was suddenly destroyed from a blow on the head. In other cases the loss of sight has been gradual. Beer knew an instance of a person becoming quite blind by another person coming behind him and squeezing forcibly his hands on both eyes. Richter saw a man who received a smart blow on the ear, and immediately lost his sight.

A young man got a smart blow on the eye, which was immediately followed by a complete amaurosis. Richter mentions a person who lost his sight during a violent fit of Vomiting.

Hildanus saw an amaurosis arise from Sneezing.

Amaurosis is a common symptom of internal Hydrocephalus, both eyes being generally affected; the accumulation of

water in the ventricles probably compressing the two optic thalami.

Tumours of the brain frequently produce Amaurosis. Ford found the optic thalamus, in a case of amaurosis, enlarged to the size of a hen's egg. In a young woman who had lost the sight first of the left and then of the right eye, subsequent to a violent fever and severe pain in the head, Plater found a tumour in which the optic nerves were involved at that part where they emerge from the brain. Dr. Kühl of Leipsic detailed to me a case of Amaurosis, in a young man of healthy appearance, who died after being blind a few months. A tumour, as large as a hen's egg, was found where the optic nerves decussate, part of which was firm, and part filled with a fluid. Bonnetus relates a case where an abscess of the mammillary process, which proved fatal, was accompanied with amaurosis. Bonnetus also found "a steatomatous tumour, the bulk

of a fist between the cerebrum and the cerebellum, producing amaurosis."*

Exostosis has been sometimes observed growing from that part of the sphenoid bone, forming the sella turcica, and on which the conjoined optic nerves lie. In the Josephine Academy, there is a preparation of these parts taken from a boy who had been affected with Amaurosis; and where a spicula of bone was found growing up from the spot just mentioned, transfixing the conjunction of the optic nerves.

2.—*Amaurosis from Poisons and Narcotics.*

Many of those substances which act directly on the nervous system, have an influence upon the Retina, and produce amaurotic symptoms.

Bosman narrates a case, where Amaurosis came on from the Saliva of a Serpent getting on the face.

A young healthy man, when lying awake

* Sepulchretum Anatomicum.

early in the morning, perceived a large Spider on the corner of his bed. When the animal was immediately over his head, his wife seized it, and it emitted a drop of liquid which fell directly on his eye. He rubbed the eye, and immediately found, that he could see nothing, at the same time there did not appear any external change.*

In one case, an amaurosis proceeded from the bite of a Mad Dog.†

Scarpa has observed, that when the infusion of Digitalis, Strammonium, Tobacco, and several other medicines of the same class, are taken into the stomach, they sometimes produce an amaurotic blindness.

A case is mentioned by Conradi, where Amaurosis was produced by the daily application of the water of the *Lauro-cerasus*. A quantity being put into the eye to remove a speck on the cornea, in a short time the pupil became dilated, and the

* Boerhaave de Morbis Oculorum.
† London Med. Obs. Vol. III.

iris paralytic, with a complete loss of vision. The eye recovered by the frequent application of blisters.

An Amaurosis was in one case produced by the injection of the juice of Belladonna, and cured by the use of volatile remedies.*

Beer himself had a complete Amaurosis, which lasted only a few hours, in consequence of a mistake in the quantity of Laudanum, given as a glyster.

In the Malacca Islands, there is an amaurosis well known to strangers, which is attributed to eating hot barley. In this state, the barley is supposed to throw out a narcotic vapour.

Beer has known Amaurosis produced from Lead, both when used as a cosmetic, and taken internally.

Beer mentions that he had seen a woman, who was attacked with violent vomiting as often as she drank Chocolate, and for several hours afterwards remained quite

* Observations on the effect of the Belladonna, &c. &c. by Mr. Wishart, in the Edinburgh Medical and Surgical Journal, Vol. III.

blind. He considered this occurrence as the consequence of the exertion of vomiting; but having had occasion to see her affected with vomiting, from a different cause, without the blindness being produced, he prohibited the chocolate, and she had no return of the blindness.

3.—*Amaurosis from Wounds of the Frontal Nerve.*

Wounds of the eye-brow, which injure the Frontal nerve, have frequently been known to produce Amaurosis; the amaurotic symptoms coming on, in some cases, instantaneously, and in others long after the wound has been healed.

Morgagni mentions having seen a case of Amaurosis produced by a wound above the eye-brow, which, he observes, explains a passage of Hippocrates. "The sight," says the Father of Medicine, "is obscured in wounds which are inflicted on the eye-

brow or a little higher."* This curious fact I have seen illustrated in several instances, and is an example of the sympathy which exists between parts whose nerves have a direct communication; the ophthalmic branch of the fifth pair sending off the frontal nerve, and also a twig to join the third pair to form the lenticular ganglion.

It is only when the Frontal nerve is wounded or injured, and not divided, that Amaurosis takes place; for, as shall afterwards be observed, amaurosis following a wound of this nerve, may sometimes be cured by making a complete division of the trunk nearest its origin. Portal saw a child, who received a slight puncture on the forehead, with the point of a knife, which was followed by a considerable convulsion of the upper eye-lid. This ceased when a small incision was made at the place of the puncture.†

* Letter xiii. Art 5.

† Anatomie Medicale, Tom. iv. p. 167.

A gentleman received an oblique cut in the forehead, which, from its direction and depth, must have injured the Frontal nerve. The wound was not accompanied by any severe symptoms, and soon healed. But afterwards the vision of this eye began to fail, and in a few months was completely destroyed; the pupil was much dilated, the iris was not influenced by variations of light, and had slight tremulous motions. A sailor got a blow on the edge of the orbit from a ram-rod, at the place where the Frontal nerve passes on the brow. The vision of that eye was instantly destroyed, and when I saw him several years after the accident, the eye remained amaurotic, with a dilated and immoveable pupil. A cataract had formed in the other eye.

An officer at the siege of Badajos, received a deep wound on the eye-brow by the piece of a shell, which from its direction must have injured the frontal nerve. Great inflammation and pain succeeded the wound, the vision of the eye became

gradually imperfect, and, after a few months, was entirely lost. The pupil was very much dilated and immoveable, and the crystalline lens opaque.

Wounds of the Infraorbitary nerve, and *portio dura*, are sometimes followed by amaurotic symptoms. Beer mentions an instance of the former, and I saw an officer in whom a ball wounded some branches of the latter nerve, which was followed by Amaurosis.

This connection between the branches of the fifth pair of nerves and retina affords an useful channel for applying remedies in diseases of the retina.

4.—*Of Amaurosis from Disorders of the Primæ Viæ.*

The sympathy which exists between the Chylopoetic viscera, and various parts of the nervous system, particularly the brain, and organs of sense, has long been well known to physiologists. The headachs produced by improper food, and the

vomiting brought on by injuries of the brain, are sufficient proofs of the reciprocal sympathy of these organs.

The senses of hearing, taste, and smell, are also affected in many of the diseases of the digestive organs; and very frequently these affections influence the functions of the Retina. These diseases ought strictly to be considered as sympathetic, or symptomatic, forming a class very different from those where the amaurotic symptoms arise from a change of structure in any of the parts which compose the organ of vision.

Amaurotic symptoms frequently accompany Worms in the intestines. A child who had worms, besides amaurotic symptoms, had nearly lost altogether the sense of hearing, but recovered both senses as soon as the disease of the bowels was removed. Vandermonde relates the case of a girl, who, from worms, and disordered *primæ viæ*, lost her Vision and Speech.*

* Journal de Médecine, Tom. x.

Beer remarks, that he has never seen Amaurosis, with complete blindness, from disorders of the *primæ viæ*, except from worms.

Amaurotic symptoms frequently affect those who are subject to Biliary complaints. A lady who was subject to violent headachs, and vomiting of bile, sometimes became perfectly blind for several hours. Richter mentions a man who lost his sight a few hours after being in a violent passion, and recovered it again the next day, by taking an emetic. Those who are afflicted with bilious headachs, have sometimes amaurotic symptoms. In the common Megrim, when the pain affects the frontal branch of the fifth pair of nerves, the retina is very liable to be influenced.

This sympathy is strikingly illustrated in wounds of the frontal nerve, and it is probable, that the same nervous connection between the frontal branch of the fifth pair, and the alimentary canal, and between that canal and the retina, depends

on the distribution and connections of the fifth pair of nerves.* A gentleman who had long been subject to headachs, affecting chiefly the frontal nerve of one side, and whose digestive organs were always imperfectly performing their functions, became amaurotic in the corresponding eye, the pains in the frontal nerve at the same time ceasing.

A woman became blind whenever she was troubled with what are termed Acidities in the stomach.

A dropsical woman became blind on the water being discharged from her abdomen.†

Bartholin ‡ relates the case of a monk who lost his sight as often as he shaved his beard, and recovered it again when the beard began to grow. With permission of his superiors, he gave up shaving!

* Angfangsgrunde.

† See Sympathies of the Eyes, Chap. XLIV.

‡ Epist. Med. Cent. 3, Epist. 67, n m. 27.

5.—*Symptoms of Amaurosis.*

I have already remarked how varied and multiplied are the symptoms of Amaurosis, and how deficient our knowledge is when an attempt is made to refer particular assemblages of symptoms to the morbid changes which accompany them.

It may in general be said, that in amaurotic eyes are observed all varieties of change in the size, form, position, and motions of the Pupil. That opening is sometimes so much enlarged, that the iris can scarcely be seen, and at other times it is unnaturally contracted.

Sometimes the Iris is perfectly immoveable; at other times it retains its natural sensibility. In some instances, that sensibility is increased; the motions of the iris pointing out how far the ciliary nerves are affected, a circumstance of importance to be known.*

* See Wenzel on Cataract.

The pupil is sometimes regular, sometimes irregular, in its form. Sometimes the pupil is removed from its natural position, upwards, downwards, inwards, or outwards, but most frequently in a diagonal direction between upwards and inwards.*

The colour behind the pupil is sometimes black, clouded, greenish, a muddy amber, or a horny colour.

Sometimes Amaurosis comes on suddenly, and at other times very slowly.

Amaurosis is sometimes periodical, but most frequently permanent. Beer says that he has had several patients who, in the course of three to four years, have had complete Amaurosis from four to six times.

Vision is sometimes altogether destroyed in Amaurosis, the patient not being able to distinguish between sunshine and complete darkness. In some instances it is only imperfect. The imperfections of vision

* Beer. Lehre der Augenkrankheiten.

consist sometimes in a diminution of the power to distinguish small objects, these appearing to be concealed by a mist or smoke;* or a diminution in the sphere of vision,† so that the person only sees a part of any object. Sometimes the upper half alone remains distinct, sometimes the inferior, and sometimes either of the lateral portions. A lady saw perfectly except in the central part of the field of vision. Sometimes objects become distorted;‡ and a variety of images and colours appear before the eyes of those afflicted with Amaurosis.§

A person with Amaurosis sometimes becomes short-sighted, and at other times long-sighted.

Amaurotic patients, when they wish to look at a small object, frequently require to have it brightly illuminated.‖

* Visus Nebulosus.
† Hæmyopia—Visus interruptus vel dimidiatus.
‡ Visus Defiguratus.
§ See Ocular Spectra, Chap. L.
‖ Lighthunger.

Amaurosis is, in some instances, accompanied with double vision.

Sometimes the disease is accompanied with, and sometimes it is without, pain.

In some cases of Amaurosis there is an involuntary rolling motion of the eye-ball, accompanied with a peculiar gaze, as if the eye was in search of light.

> " But thou
> Revisitest not these eyes, that roll in vain
> To find thy piercing ray, and find no dawn,
> So thick a drop serene hath quench'd their orbs !"

There is one symptom which has been considered as always accompanying Amaurosis,—a peculiar cast, or a confirmed Squint of the diseased eye. Richter has observed, that this is the only symptom to be depended on when the veracity of the patient cannot be trusted.

In some cases of Amaurosis, where the blood-vessels of the retina and choroid coat seem to be in a varicose state, a corresponding change may be observed in the vessels of the white of the eye.

It is not unusual for a Cataract to be formed in an amaurotic eye; and sometimes the vitreous humor is also disorganized.*

Amaurosis affects people at all periods of life.

Sometimes Amaurosis is Congenital, and, when this is the case, it is usually accompanied both with cataract and involuntary motions of the eye-ball.

Amaurosis affects eyes of all colours, but is generally supposed to be most prevalent in black.

Amaurosis is sometimes hereditary. I have known several instances of this kind, and similar cases have been recorded.† Beer knew a family, in the third generation of which, all the females became amaurotic at the cessation of the catamenia, except those branches who had children. The male branches shewed a dis-

* Glaucoma.

† Edinburgh Medical and Surgical Journal, Vol. XII.

position to the disease, but none became blind.

Sometimes only one eye is affected with Amaurosis, and sometimes both become blind at the same time. I think it may be remarked, as a general observation, that, when only one eye becomes at first amaurotic from a sympathetic affection, there is little danger of the other eye becoming blind; but that, when Amaurosis is produced by any organic change in one eye, the other is in danger of being sympathetically affected. This observation coincides with what has already been said of the sympathy which exists between the corresponding textures of each organ.*

* See page 140, Chap. XLII.

CHAP. XLVI.

OF NIGHT-BLINDNESS.*

THOSE afflicted with Night-blindness, have their sight impaired from the time when the sun sets till it rises the following morning, vision being perfect during the day.

I have never observed this disease in Britain, but it occurs frequently on the continent of Europe, and in the more southern latitudes. In some countries it is

* Hæmeralopia—Disopia tenebrarum—Ambliopia crepuscularis—Visus diurnus—Cæcitas nocturna—Aveuglement de Nuit—Nachtblindheit.

endemic, and in others it appears as an epidemic at certain seasons of the year.*

In this disease no changes can be observed in the appearance of the eyes, except some slight alteration in the motions of the iris. In some instances the pupil is a little dilated, and loses its natural mobility during the day, whilst, in others, the functions of the iris are perfectly natural, except during the night, when the pupil is always more or less enlarged.

This disease always attacks both eyes simultaneously.

The progress of Hæmeralopia is sometimes slow, at other times sudden. In the beginning of this affection the person may be able to distinguish objects a short time after sunset, or he may see a little by clear moonlight; but as the disease advances, vision becomes more imperfect, and he is finally unable to discover even large

* Recueil périodique de la Société de Médecine, Tom. II. Journal de Médecine pour l'année 1756.

† Boyer, Maladies Chirurgicales, Tom.V. Paris, 1816.

objects, being only able to distinguish light from darkness. In some instances the person becomes blind at twilight, and on the following morning at sun-rise he perfectly recovers his sight.

It is a circumstance very remarkable, that those affected with this disease see distinctly in an obscure day, whilst the sun is above the horizon; but, whenever the sun sets, however bright may be its reflected light, such patients see objects very imperfectly. Thus many of them, in a cloudy moment, know the precise time of the sun's setting, though that period cannot be distinguished by other people.*

This disease has generally been observed to continue from three weeks to eight months, when no remedies have been used.

Sometimes Hæmeralopia gets well spontaneously; in other instances, vision becomes more or less impaired; and it has been known to terminate in permanent blindness.

* Boyer, Maladies Chirurgicales, Tom. V.

Those who have had one attack of this complaint are very apt to have a relapse every year, and always at the same season. Boyer relates the case of a man, forty-three years of age, who had been attacked with it every spring from the age of twenty-three.

People of all ages, and eyes of all colours and forms, are equally subject to this disease.

Hæmeralopia is accompanied with pain and weight in the head, which almost always increase towards the evening.

Symptoms of plethora frequently accompany this disease, the patients complaining of giddiness, particularly when the head is bent downwards, or they are occasionally affected with a dimness of sight during the day.*

Night-blindness seems, in most instances, to be connected with derangement of the *primæ viæ*.

It is said to affect those labouring under

* Essay on Hæmeralopia by Mr. Bamfield. Medico-chirurgical Transactions, Vol. V.

Scurvy, and not to yield until the scorbutic affection is removed.

Night-blindness has been supposed to arise from a mere inability of the retina, to be excited by the slighter stimulus of the evening light, the difference between the splendour of the sun's light, and that of the moon or candles being immense.* In like manner, it is observed, that some animals, as owls, cats, &c. see only in a very moderate light; whilst there are other tribes, as fowls, which become very blind at twilight.

* The strength of moonlight is computed to be $\frac{1}{300000}$th part of that of daylight.

CHAP. XLVII.

OF COLOURED VISION.*

THERE is a remarkable peculiarity in vision, which may rather be considered a congenital imperfection, than a disease. It has been denominated Coloured Vision, the person affected with it having no perception, or at least a very faint one, of some of the principal colours.

When a number of objects of different colours are placed together before a person whose vision is imperfect in this respect, he can distinguish differences between

* Suffusio colorans.—Visus coloratus.—Crupsia.—Farbenschen.

most of the colours, without knowing exactly in what that difference consists; and, in general, if the colours are presented to him separately, he is unable to give them names, or to say to what class they belong.

He has a distinct perception of colours purely yellow or blue, such as gamboge or Prussian blue. These colours he never mistakes, either when seen separately, or when lying amongst other colours; and all other colours seem to him only modifications of these. The colours which appear in the solar spectrum, for example, are to him only two, viz. blue and yellow, whereas, to a perfect eye, there appears in that image to be seven.

He experiences great difficulty in distinguishing the different kinds of green, most of those modifications of colour called green appearing to him either yellow or blue, in proportion as one or other of these colours predominates. Grass appears to be yellow, generally not so light as gamboge, but near the colour of an orange;

and, if a piece of red cloth, and another of the colour called olive, be presented to him, though he can perceive some difference between them when they are both together, yet, when seen separately, he continually mistakes one for the other. The appearances of green to his eye depend in some measure upon the quantity of light which falls on objects of that colour, some kinds of green cloth, when the sun shines strongly upon them, appearing yellow; but, in a shaded place, and even in common day-light, they appear like an impure blue.

The different kinds of red create in him equal embarrassment; for vermillion, and all the varieties of red which incline to that colour, appear to be yellow, whilst carmine, and all the reds which incline to that colour, appear to him to be blue. An officer's red coat, for example, appears to him to be yellow, and his sash blue. Red ink, when fluid, appears yellow; and, when washed on paper and dried, it appears blue.

These are the appearances of colour to his eye when seen by day-light; when they are viewed by candle-light, the only difference is, that carmine, and all objects of that class of red, appear yellow, like the vermillion reds; the appearances of vermillion reds, and of all other colours, being the same as during the day.

These defects exist in some people to a much greater degree than in others; and those in whom vision is thus defective, are frequently led to make very absurd mistakes with respect to the appearances of objects. A man who was employed in a woollen-draper's shop, made some ridiculous errors in selling the cloths, from having this defect in his vision.

This imperfection of vision is sometimes Hereditary. Several branches of a noble family in this country have been remarkable for having it. A similar example is given in the Philosophical Transactions,*

* Vol. LXIII. Part II.

and another in the Medico-chirurgical Transactions.*

It is not improbable that this defect of vision arises from a greater sensibility of the retina to the impressions of the blue and yellow-making rays, than to those of any of the others. This may depend upon the refractive power of the humors, by which the rays of these two colours are more accurately united on the retina than rays of any other colour, and, consequently, the images formed there of objects reflecting these colours are more distinct than those formed of objects reflecting the other colours. When the colour of a body is compounded of several colours, the superior correctness of the image formed by the blue and yellow rays reflected from it, may cause the sensations which those colours excite to preponderate over the sensations caused by the other colours, and thus may cause in

* Vol. VII. p. 477. See also Manchester Memoirs.

the mind of the observer the perception of that compound colour to be different from the perception of the same colour to another person, whose eye forms images of external objects differently.

The imperfection of vision which has here been described, though it does not occur frequently, yet is by no means unusual, some striking examples having fallen within my own observation. From these, with the able assistance of Mr. Narrien, of the Royal Military College at Sandhurst, the foregoing account of this curious peculiarity of sight has been collected.

When this state of vision is better understood, it is not improbable that it may lead to an explanation of some of the phenomena of light and colours, and explain, more satisfactorily than has hitherto been done, some of the functions of the retina.

CHAP. XLVIII.

OF SQUINTING.*

A PERSON is said to Squint when the axes of the two eyes are not directed to the same point.

The degree of Squint varies in different instances; sometimes the eye having merely a slight cast, whilst in others the eye-ball is very much turned inwards. In one instance, an eye squinted to such a degree, that not only the pupil, but the whole cornea was hid. The other eye being quite blind, the patient could only see by turning the cornea of the squinting eye outwards, which she had acquired the power

* Strabismus — Strabositas — Louche — Luscitas — Visus obliquus—Das Schielen—Les yeux de travers — Distortio oculorum.

of doing by pressing with the point of her forefinger in the internal angle till the cornea was exposed. Whilst with her finger she retained the eye-ball in this position, she could see distinctly, whereas, without this contrivance, she was perfectly blind. The squint was attributed to severe headachs, to which the woman had been subject for many years.

In all cases of squinting, the affected eye is either turned inwards towards the nose, or in the opposite direction, outwards; it has never been observed turned upwards or downwards. When it is considered that the elevation or depression of the globe of the eye is produced by similar muscles in the two eyes, whilst the lateral movements depend on the actions of the adductor of the one eye, and the abductor muscle of the other, we can conceive the frequency of the lateral squint, and why a squint upwards or downwards never exists, or is at least extremely rare.

It has been said by some,* that Squint always arises from a disparity in the vision of the two eyes, or from a change in the structure of one eye. This, however, is not the case, for sometimes both organs squint when there are specks on the cornea, or an alteration in the position of the pupils. Neither does a squint always take place when there is a disparity in the vision of the two eyes; for in many instances when the sight of one eye is diminished, no squint takes place; and, as is observed in another place,† few people see equally well with both eyes. In some cases of Squint, I have not been able to detect any decided difference in the vision of the two eyes.

The derangement in vision, produced by Squint, is seldom considerable. Some people squint without being conscious of it: others have their vision rendered indistinct, and some have double vision; this

* Mémoires de l'Académie, 1745.

† See Chapter LI. On the Disparity of the two Eyes.

being particularly the case when the squint is recent, and not to any great degree. For, as the patient accustoms himself to look at objects only with the sound eye, the sensation transmitted by the other eye being feeble, becomes gradually effaced; and this fault may also be corrected by the sense of touch,—a proof that single vision with two eyes is not produced from the images of an object falling on corresponding points in the two retinæ, but the result of habit. Where the Squint is very considerable, the two eyes cannot see the same object, and, consequently, double vision cannot take place.

Buffon observed some people who squinted, make use of the two eyes alternately, according as the objects were placed more or less distant; with the feeble eye they looked at near objects; and with the stronger, objects at a distance.

In most cases the Squint may be removed from the one eye to the other, by

shutting up, for a certain length of time, the sound eye, and making use only of the eye which squints. When this has been done, and both eyes opened, the eye which originally squinted will now be the one whose axis is directed to the object, whilst that which was sound now squints. This was strikingly illustrated in a young lady, who long had a complete squint in one eye from a corneal speck, and whose other eye was attacked with pustulous ophthalmia. The violence of the symptoms made her keep the inflamed eye covered with a shade, whilst the other, with which she saw but imperfectly, served the common purposes of life. In a few days, to the astonishment of all who knew her, what formerly was the sound eye, now became the squinting one; but, as the inflammation subsided, and she began to make use of that eye, the squint gradually left it, and returned to the one originally affected.

Squinting generally comes on during

infancy. It usually proceeds slowly, but sometimes suddenly.

A squint may arise from various causes. It is sometimes produced from Chylopoetic derangement,—from Worms,--from organic affections of the Encephalon,—from Dentition,--from Imitation or Habit,--from long position of the head in one posture,—from the transparency of some of the parts of the eye-ball being destroyed,—or from a disparity in the vision of the two eyes.

1.—*Squint from Chylopoetic Derangement.*

Besides changes in the sensibility of the retina, which accompany some diseases of the organs of digestion, I have observed well marked cases of Squint which arose from similar causes. In cases of this description, the Squint has usually come on gradually, varying in degree at different times; and in some instances, the state of

the eye forms an accurate measure of the degree of derangement in the alimentary canal.

This cause of Squint is particularly frequent among young people, though it is met with at different periods of life. A lady thirty years of age, who had frequently during several years the *primæ viæ* much deranged, had at last a severe attack of pain in her head, extending to the right eye; the bowels having been at this time unusually confined. The affected eye then squinted, and she had double vision. In proportion as the functions of the bowels were restored, the squint diminished, and before the patient ultimately recovered, every stage of amendment, or occasional change, was distinctly marked by a corresponding diminution or increase in the squint.

2.—*Squint from Worms.*

It is by no means unusual to see children who have Worms squint. In such cases the squint usually comes on gradually, and whilst it continues, the degree varies on different days, and even several times in the same day. Besides the squint, all the symptoms of worms are present in such cases.

When the worms are removed the Squint generally disappears, whilst in other cases it never leaves the patient.

3.—*Squint from Organic Affections of the Head.*

In many organic affections of the Brain and its meninges, the disease at some period or other is often accompanied by a Squint. This is very remarkable in Hy-

drocephalus, and in diseases which affect parts contiguous to the thalami and tracti optici. Abscesses, and the various kinds of tumours which are formed about these parts, are generally accompanied with a squint; and so are also many affections of the adjacent bone. Indeed, Squint is one of the symptoms which often points out the seat of disease to be in the encephalon.

A blow on the head has in many instances produced a squint; the squint, in such cases, probably arising from the effects of the blow on the optic thalamus. In some cases, the squint is one of the immediate effects of the injury; but in others, it does not take place till some time after the accident. In Squints arising from injuries of the head, the distortion sometimes goes off along with the other effects of the accident; but in some cases it has been permanent.

A squint has also been known to arise from a wound of the Frontal nerve. The

nervous anastomosis, which has already been noticed, between the frontal branch of the fifth pair, and other nerves distributed within the orbit,* affords a satisfactory explanation of the peculiar effects of such an accident.

A Squint often accompanies amaurosis.

4.—*Squint from Teething.*

During the process of Teething, there are a variety of nervous affections occasionally produced, and one of these is a squint.

The Squint in such cases is sometimes slight, and goes away when the teething process is completed. In other instances the squint is to a greater extent, and is permanent.

5.—*Squint from Imitation and Habit.*

Some children have been known to acquire a habit of squinting; and there are

* See Chap. XLII.

also many instances of squinting being produced from imitation. A child two years of age acquired a complete Squint, from living for a few weeks in a house where there was a young lady who squinted. In another instance, a child got a squint whilst teething, and her sister, by frequently imitating her, at last acquired the same habit. A child who suffered from a violent fit of hooping-cough during the night, was observed to squint the following morning. In a short time one of her sisters acquired a squint. I have also known instances of children squinting, whose mothers or nurses squinted.

6.—*Squint from unusual Position of the Head.*

It sometimes happens, that when a person is long confined in one posture, and the head in such a position, that only one of the eyes can see the window, or can be

chiefly employed in looking at objects, the other eye acquires a Squint. But this squint is usually temporary, disappearing by a change in the position of the head, or when both eyes are again used to look at objects. A young lady was confined for several weeks to bed, with a disease of the hip-joint, in a room lighted by a window on one side. She was in the habit of turning her eyes constantly to the light, and thus contracted a squint; which was easily cured by simply changing her position in the room.

Another young person, from remaining ten days on one side, acquired a squint, which lasted seven years; it was afterwards removed by looking a great deal in the opposite direction.

7.—*Squint from Disparity in the two Eyes.*

In those who have a great disparity in the vision of the two eyes, it sometimes, though rarely happens, that the person squints. In most instances, where the vision of the two eyes is unequal, there is only a peculiar cast of the eye, as it is usually termed.

There is nothing more remarkable in the history of squinting, and it is the same with regard to double vision, than that, as far as the pathologist can discover, the same disease in the eye does not always produce a squint. Many have a considerable disparity in the vision of the two eyes, who have no squint, whether this disparity arises from a speck on the cornea,—from any particular species of cataract,—from differences in the sphericity of the cornea,—or from a difference in the sensibility of the two retinæ.

I have known a few instances of people, advanced in life, suddenly acquiring a squint, generally accompanied with double vision, when no cause for the disease could be detected.

8.—*Squint from Opacities.*

When there is a partial obstruction to the passage of the rays of light through the pupil, the disease sometimes produces a squint. This generally happens either from corneal Speck, or from Cataract.

In cases of corneal speck, accompanied by a Squint, the speck is so situated on the nasal portion of the cornea, that unless the eye-ball is rolled very much inwards, the rays of light coming from an object cannot pass through any part of the pupil to reach the retina. The eye-ball, therefore, being kept constantly inwards, acquires a Squint. In one case where the nasal portion of each cornea

had become obscure, the person had a most inveterate Squint in both eyes.

It is chiefly those who have cataracts from birth who Squint. In that disease, it often happens, that only a portion of the pupil is obscure; and when this is the nasal part, the eye, in order to look at objects, is always rolled inwards.

CHAP. XLIX.

OF DOUBLE VISION.*

It has been demonstrated by writers on Optics, that when an object is situated at the concourse of the optic axes of the two eyes, it is seen by both eyes in one and the same direction, and hence single vision is obtained: But if, from disease, the axis of one eye be so distorted that it cannot be directed to an object at the same time with the axis of the other eye, there is then produced a double image of that object. Thus has arisen the opinion of there being

* Dyplopia.—Suffusio multiplicans.—Visus duplicatus.—Bèvue.—Doppelsichtichkeit.

corresponding points in the two retinæ. The phenomena of diseases of the eye, however, refute this doctrine, and afford striking illustrations of the powers of habit in teaching us to see single with two eyes. It is by no means unusual for a person to acquire a squint suddenly,* which is at first accompanied with double vision, and to find by degrees objects appear single. A person had one of his eyes distorted by a blow, and for some time every object appeared to him double; but by degrees those most familiar became single, and in time all objects appeared so, though the distortion continued. In like manner, it sometimes happens, that the pupil of one eye is deformed, and its position altered, so that the person sees double; but after a while vision, even under these circumstances, becomes single.

Double vision arises either from some organic change in the eye, or from some

* See Chap. XLVIII.

derangement in the functions of the retina.*

It has already been noticed, that those who squint often have double vision, when the squint is recent; it has also been observed, that when a change takes place in the position of the pupil of one eye, or when there is more than one aperture in the iris, vision becomes multiplied. The same thing takes place from alterations in the form of the cornea and lens. In the first of these cases of double vision, the patient sees double only when he looks with two eyes, whilst in the others he sees all objects double with the diseased eye.

A person affected with double vision seldom sees the two objects equally distinct. Commonly the most distinct image is the real one; consequently, the person who has this defect in vision does not often commit mistakes in discriminating the real

* May not the sensation of two bodies, which is produced by the presence of one between two fingers when crossed, be explained on the same principle?

from the false image. This, however, is not always the case.

Some people only see objects double which are at a distance, and sometimes objects appear double only when looked at in certain directions.

Double vision sometimes takes place when a person has strained his eyes by looking at minute objects in candle-light; but this disappears when he shuts his eyes for a moment.

Double vision sometimes affects those who make frequent use only of one eye. I have known several instances of officers of the navy who became affected with double vision from fatigue caused by looking through telescopes.

A Catholic Clergyman experienced a kind of double vision whilst he held down his eyes to read, the letters appearing to cross each other. This confusion ceased when he shut one eye, or when he elevated the book to the same height, or higher up than his eyes. He found, however, some

difficulty if the book was placed at the same time to the left. Morgagni conceived that this arose from a weakness in the abductor and depressor muscles of the right eye.*

A young man was frightened and dazzled by lightning when looking at the clouds. An hour afterwards he saw double. On examining his eyes he was observed to squint.†

Double Vision is frequently a sympathetic affection accompanying diseases of the primæ viæ, or encephalon. A gentleman eat a small piece of pastry between meals, and had immediately uneasy feelings about the stomach. On walking in the open air his sight became dim, and he had double vision, accompanied with severe headache, all which went off the following day.

A young gentleman had double vision which came on three weeks after receiving

* Letter xiii. a. 20

† Leich. de visu duplicato.

a blow on the forehead. In order to remove a portion of bone which afterwards became carious, I made an incision through that portion of the integuments traversed by the Frontal nerve, which was also divided. In a few days he saw single, and the eye which was turned outwards resumed its natural position.

CHAP. L.

OF OCULAR SPECTRA.*

A PERSON affected with this disease sees one or more bodies floating before his eyes, apparently, situated between the eye and the surrounding objects.

These Spectra assume various forms; sometimes resembling black spots, flies, or insects, pieces of net-work, or streaks. Sometimes they are of a red colour, and resemble flowers with numerous petals, or falling stars.†

The Spectra are either fixed or move-

* Muscæ Volitantes—Images before the eyes—Hypochyma—Suffusio—La Berlue.

† Visus Lucidus—Photopsia.

able, and their appearance is either temporary or permanent.

Sometimes the disease is so slight, and of so short duration, as to be little remarked by the patient; whereas, in other instances, it continues many years, and is a great hindrance and inconvenience to vision.

The Spectra that are fixed are so called, because they always keep the same position, in respect to the axis of vision. If a person with these spots keeps his eyes unmoved, by looking steadily at the corner of a cloud, at the same time that he observes the spectra, he will be convinced that they have no motion but what is given to them by the eye in pursuit of them.

Those Spectra which are moveable float about even when the eye is stationary, and are sometimes above, below, or at the side of the axis of vision; but they are never in it. These are sometimes seen when the eye-lids are closed.

Spectra appear either in one or in both eyes.

Short-sighted people are least liable to this affection.

Spectra are most troublesome when the sky is clear and serene, or when the person looks at a resplendent object. They are also most distinct when the person looks directly up towards the sky, or at distant objects; and in proportion as the object looked at is near, the less distinct the spectra are, and when at the nearest point, they entirely disappear.

These ocular Spectra arise from different causes, and depend either on a morbid condition of the retina, or an opacity of some of the parts of the eye which are naturally transparent. In the latter case, the opacity must be in the posterior part of the vitreous humour, because experiments, and the principles of optics, prove that no opacity of the aqueous, crystalline, or anterior part of the vitreous humour, can throw a partial shadow on the retina.

It has already been observed,* that,

* See Chap. XLV.

under certain circumstances, the pulsations of the arteries of the retina may be seen; and that various colours produced by pressure of the finger, or by a stroke on the Eye, seem to arise from unequal pressure on different parts of the retina. It is, therefore, extremely probable, that one and by far the most frequent cause of Speetra is a change in the state of the vessels of the retina. In some cases, this seems to depend on an inflamed state of the vascular membrane of the retina;* in some, on a state of plethora; and in others, on a state of what is usually called debility. Hence, in all cases of inflammation, affecting the internal structure of the eyeball, various spectra appear, as sparks of fire or drops of blood. Spectra almost constantly appear before the eyes of those who have plethoric symptoms, and they generally precede a fit of apoplexy. Black spots are often perceived on the bed-clothes by patients with fevers, or inflammation of

* See Chap. XLIII.

the brain and its membranes. Spectra are also observable when the eyes are weakened by fatigue, or exposed to bright and dazzling lights; and it frequently happens, that persons of delicate constitutions are affected with them, more particularly those whose digestive organs are deranged. The influence of diseases in the *primæ viæ* on the functions of the Retina has already been noticed,* and a variety of curious appearances, affecting vision from particular kinds of food, or from whatever disturbs the digestive process, may frequently be observed.

But there are ocular spectra, as Dr. Darwin observes, which are derived from another source. After looking at any luminous object, as the sun, for a short time, so as not to fatigue the eye very much, part of the retina becomes less sensible to smaller quantities of light. Hence, when the eye is turned on less luminous parts of the sky, a dark spot is seen resembling the

* See Chap. XLV.—4.

shape of the sun. It must, therefore, be from habit and want of attention, that we do not see such spots in all objects every hour of the day.*

* Zoonomia.

CHAP. LI.

OF THE DISPARITY IN THE VISION OF THE TWO EYES.

It seldom happens that any of those organs of the body which are in pairs are both equally perfect. The two kidneys and the two testes generally differ in size; and there is often an unequal secretion of milk from the two mammæ There is frequently a disparity between the two nostrils; and few people hear equally acute with both ears.

Besides this inequality in those organs

of which there are pairs in the system, the two sides of the body differ from one another. In all animals, as well as in man, a distinct difference may be observed in the two sides of the countenance; the food is usually masticated by the teeth of one side of the mouth; and there is generally a remarkable difference in the strength and vigour of the limbs of the right compared with those of the left side of the body. These observations are exemplified in the Eyes, for the vision of the two eyes will seldom be found equally perfect, and in most people the right is stronger than the left eye.

Throughout the animal kingdom, those animals who have two or more eyes employ them to extend their sphere of vision, but man makes use of both eyes chiefly as one organ, little advantage being probably derived from being endowed with a pair, except that of diminishing the risk of injuries and disease.

Few are aware of the disparity that often

exists between their eyes until, from some accident, they are led to make the comparison; and it is by no means unusual to meet with instances of people who, in making this experiment, have discovered that one eye was entirely blind.

It will generally be found, that not only the right is more perfect than the left eye, but when a person is apparently looking at an object with both eyes, generally only one of the eyes, and that usually the right one, is directed to the object. To demonstrate this, let a spot be covered with the point of a finger when looking at it with both eyes. If the left eye be closed, the point of the finger will continue to appear to cover the spot, and to preserve the same relative situation; but if the right eye be closed and the left opened, then the relative situation of the point of the finger and spot appear altered, the spot being uncovered; proving that, in directing the finger to cover the spot, the right eye had alone been employed.

It might be expected, that a difference in the vision of the two eyes would produce a confusion in the image. This, however, is not the case, as appears both by the foregoing experiment, and from the effects of disease. If the lens be extracted from one eye, the vision of the other eye being unimpaired, the imperfect sight of the one eye does not usually interfere with the perfect vision of the other; and, as has already been mentioned, when treating of double vision, the inconvenience arising from that imperfect sight is soon cured by habit, even when it has arisen from some organic change.

The disparity of the two eyes depends on different causes. In some instances it is produced from a difference in the convexity of the cornea, some people having both a long and a short-sighted eye. In other instances, the difference appears to arise from some imperfection in the retina.

I once saw a child in whom there was

a distinct difference in the size of the two eyes, which the parents remarked at birth.

Congenital differences in the two eyes are sometimes hereditary.

CHAP. LII.

OF THE INVOLUNTARY MOTION OF THE EYE-BALL.

In some people the eye-ball has a constant tremulous motion, which is usually congenital; but, in some instances, it comes on at a later period of life, when it is usually connected with disease of the retina.

I have already mentioned,* that the iris is liable to a kind of undulatory or tremulous motion. This is often accompanied with an involuntary rolling motion of the eye-ball, but each of these affections in some cases exists separately.

* See Chap. XXIII.

The involuntary motion of the eye-ball often accompanies amaurotic affections and congenital cataract; and, as far as I have been able to observe, this state of the eye-ball always indicates, to a greater or less degree, some disease of the retina.

The involuntary rolling of the eye-ball varies in the rapidity of the motions in different instances. Sometimes it is a mere trembling, whilst in others the movements are both rapid and extensive. Buffon saw it to such a degree, that it was impossible to know the point to which the person wished to direct his eyes.* I have seen a boy, about ten years of age, who has this involuntary motion of both eyes, accompanied with no other disease, and who, when an infant, his eyes were discerned to move with such rapidity that the cornea could never be distinguished, nor the state of the anterior chamber ascertained. Since his birth, the rapidity as well as the extent of the motions have

* Boyer, Oeuvres Chirurgicales.

gradually diminished, and the disease now exists only in a slight degree.

The involuntary motion of the eye-ball is generally much increased by mental agitation.

This disease usually affects both eyes, though in some cases only one eye is affected.

In the Albino the eyes have a trembling motion. Two sisters, who had hair of a remarkably white colour, and whose eyes seemed tender to ordinary light, had their eyes constantly agitated.

Those who have this affection have usually some imperfection in their vision, but this varies according to the nature of the accompanying disease. In general, they require to hold the object very close to the eye, and knit the eye-lids.

A child, on whom I had operated for congenital cataracts, and whose eyes had this involuntary rolling motion, when he looked at an object minutely, he brought it near the nose, and pressed the eye-ball

with the point of the finger; by which contrivance alone he could distinguish small bodies. This appeared to me to improve his vision, more by keeping the eye steady, than altering the length of the axis of the eye-ball. A lady, however, who had not this motion in her eye, but could see a small object distinctly, in order to read, was obliged to squeeze, in a similar manner, the eye-ball with the point of her finger.

CHAP. LIII.

GENERAL REMARKS ON THE SCLEROTIC COAT.*

THE Sclerotic coat is a membrane of the fibrous class, resembling very much in structure, and being considered by some anatomists as a continuation of the neurilema of the optic nerve.

The chief use of the Sclerotic coat seems to be, to give that form which it is necessary for the eye to possess as an optical instrument; and, to serve this purpose the more completely, a considerable portion of it is found to be in some animals osseous.

The Sclerotic coat is of considerable thickness, though not equally so through-

* See Chap. XXIII.

out, being stronger posteriorly, and becoming gradually thinner anteriorly.

It is firm and tough, being composed only of one lamina, the fibres of which are firm, white, silvery, and tendinous; irregularly disposed, both in longitudinal and transverse directions.

The Sclerotic coat is pierced by numerous holes for the passage of arteries, veins, and nerves; the posterior ciliary arteries passing through the openings which are formed near the optic nerve, and the anterior ciliary vessels, through those a little behind the cornea. The veins which form the *vasa vorticosa* of the choroid coat and the ciliary nerves, penetrate the sclerotica obliquely about its middle.

The blood-vessels which are distributed in the sclerotic coat itself, are few in number, and they have but few capillary ramifications; a peculiarity of structure belonging to fibrous textures.*

In examining some of the diseases of

* Bichât, Anatomie Descriptive, Tom. ii. p. 430.

the eye, it is of great importance to be able to discriminate the changes which take place in the different sets of vessels of the sclerotic coat, as the appearances of inflammation or turgescence in these are different, when the iris, the choroid coat, the sclerotic coat itself, or the conjunctiva covering it, is affected.

The external surface of the Sclerotic coat is covered by a delicate cellular tissue, which lies between it and the conjunctiva. Its interior surface is smooth and polished, having no connection with the choroid coat but by some vessels and nerves; and it is kept constantly moist by an exhaled fluid.

The Sclerotic coat has little or no sensibility in its natural state, and no nerves have been traced into it.

As it does not seem to be concerned in the performance of any of the peculiar functions of the eye, merely serving as a cup to contain the parts destined for the sense of sight, the sclerotic coat is not liable to many Diseases.

The Sclerotic coat is occasionally affected by Inflammation, and it is subject to Staphyloma.

Sometimes the Sclerotic coat becomes flaccid and yielding when pressed by the finger, so that if the humours be discharged, instead of preserving a globular shape, it collapses. I have never observed this change without its being accompanied by a complete disorganization of the internal parts of the eye.

Sometimes the Sclerotic coat becomes unusually tense, so that the eye-ball feels harder than natural.

The Sclerotic coat is capable of great extension. This appears both in staphyloma and in fungus hematodes.

I have known the Sclerotic coat ruptured from a blow. A woman got a sharp blow with a fist on the eye, and there was a distinct fissure made in the sclerotic coat, at a little distance and parallel with the cornea. The conjunctiva covering this cleft had not given way, so that the transparent parts within the posterior chamber

shone through the fissure. A man struck his eye against a stick, and ruptured the superior part of the sclerotic coat to the extent of half an inch, in nearly a semi-circular direction. A portion of vitreous humor with its capsule protruded through the wound.*

When the Sclerotic coat collapses, it usually becomes very much thickened, and whiter than natural. Morgagni observed, in an eye which was shrunk, the sclerotic coat unusually hard and thick.

When the vitreous humor is absorbed, and the sclerotic coat collapses, it usually becomes puckered at four points, forming the globe into as many segments; which is probably produced by the action of the recti muscles.

The Sclerotic coat, like other fibrous membranes, has been found ossified. Blazius found "a bony scale inherent in the sclerotic coat." †

* See Edinburgh Medical and Surgical Journal, 1816.
† Morgagni, Ep. lii. Art. 30.

Mr. George Young saw a child who was born with no vestige of an eye-ball, except a body like a small pea, which had some resemblance to a shrunk sclerotic coat.

CHAP. LIV.

OF INFLAMMATION OF THE SCLEROTIC COAT.*

THE Sclerotic coat is seldom the primary seat of inflammation, but it frequently participates in inflammation of the adjacent textures. Though what is commonly called the white of the eye often becomes inflamed, it is seldom that the red vessels are seated in the sclerotic coat. The redness usually arises either from the conjunctiva, the choroid coat, or iris being inflamed. In the first case, the vessels are distributed over the whole surface of the

* Sclerophthalmia.

eye, being moveable with the folds of the conjunctiva: In the second, the posterior ciliary arteries and veins are enlarged; and in the third, the anterior ciliary vessels are chiefly affected.

It has already been observed, that the Sclerotic coat is more or less inflamed when the substance of the cornea is affected with inflammation,* and as Rheumatism usually affects fibrous membranes in other parts of the body, it is extremely probable that in the Rheumatic Ophthalmia the disease is chiefly seated in the sclerotic coat; for when rheumatism attacks the eye, I have frequently observed, that the blood-vessels on the white of the eye seemed neither to be those of the conjunctiva, nor the ciliary vessels, but a general redness pervading the whole sclerotic coat. In corroboration of this opinion, it may be remarked, that when the Rheumatic Ophthalmia subsides, the sclerotic coat has generally lost its natural pearl

* See Chap. II. Vol. I.

whiteness, and acquired a dingy yellow hue. The pain, too, in Rheumatic Ophthalmia, is usually seated in the head, and parts of the face surrounding the orbit, probably arising from the similarity, or, as some have supposed, from the continuation of structure between the sclerotic coat, dura mater, and periosteum.

As in other fibrous membranes, there is no subsequent thickening, opacity, or adhesions, when the sclerotic coat has been inflamed ; but it sometimes happens that puriform matter collected in the posterior chamber ulcerates, and forms an opening through the sclerotic coat.

CHAP. LV.

OF STAPHYLOMA OF THE SCLEROTIC COAT.

STAPHYLOMA of the sclerotic coat is a rare disease. Richter says he has seen only a single instance of it, and Scarpa never observed one; several cases, however, have fallen within my observation.*

A young man, who had at a distant period suffered from severe inflammation in his eye, had the anterior chamber much diminished, the pupil irregular, and the vision destroyed. On the sclerotic coat of this eye were several small tumours at a little distance from its union with the

* See Plate XVIII. and Plates of Staphyloma, in Vol. I.

cornea. These tumours were of a dark blue colour; felt soft to the touch; and seemed to contain a fluid within a delicate membrane.

In a few instances where the eye had suffered from internal ophthalmia, I have observed the whole eye-ball enlarge, and the sclerotic coat become distended, acquiring the blue appearance of staphyloma, at that part where it unites with the cornea.

Staphylomatous tumours sometimes form on the sclerotic coat in consequence of injuries. A small tumour of this kind is represented in Plate XII. fig. 3.

There is another disease of the sclerotic coat described by Scarpa, of which I have never seen an example. In two eyes affected with this disease which Scarpa dissected, the eye-ball had assumed an oval shape, and was larger than the other. On the posterior hemisphere, and on the temporal side of the entrance of the optic nerve, the sclerotic coat was elevated in the form

of an oblong tumour the size of a small nut. The humours were changed: the retina was deficient within the staphyloma; and the choroid and sclerotic coats forming the tumour were so thin as to admit the light.

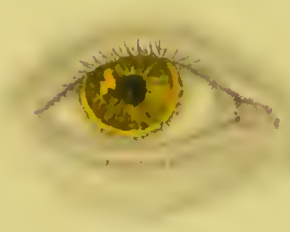
EXPLANATION

OF THE

Plates.

. Inflammation of the Capsule of the aqueous humor

. Albumen effused on the Iris.



. Albumen effused in the Pupil & in which a red vessel is distributed

EXPLANATION

OF THE

PLATES.

PLATE X.

This Plate is intended to illustrate the appearances and effects of Inflammation of the Capsule of the Aqueous Humor.

Fig. 1.— Represents the peculiar appearances which the blood-vessels assume in that affection, as well as the kind of muddinesss and opacity of the anterior chamber. The drawing was made from the eye of a boy thirteen years of age, whilst the inflammation was in its active stage.

The vascular trunks divide into different branches, which do not reach the cornea, but penetrate the sclerotic coat at some distance from its margin, and form a red ring parallel to its circumference. These are probably the anterior ciliary vessels enlarged. The inferior hemisphere of the cornea is clouded and obscure, and the pupillar opening filled with albumen.

The appearances in this drawing may be compared with the other inflammations which have been delineated in Plate I. Volume I.

Fig. 2.—Shows a portion of concreted albumen adhering to the surface of the iris, whilst, at the same time, the whole iris has acquired a greenish colour, from a deposition of albumen throughout its substance, as well as from a thickening of the capsule of the aqueous humor.

In some cases, this albuminous effusion disappears along with the inflammatory symptoms; but in others, particularly

where these have not been speedily subdued, the albumen remains permanent, as in the example here represented.

Fig. 3.—The albuminous effusion is confined to the pupillar opening, which, in this case, is completely filled with a portion of a yellowish coloured substance, to which a red vessel may be seen coming off from the edge of the iris, to be distributed through it. The form of the pupil is also altered from adhesions which have taken place between the albumen and edge of the iris.

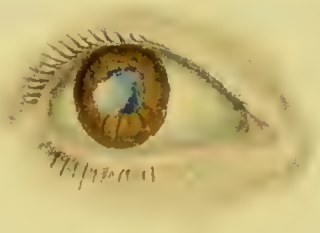
These appearances were the consequence of tedious inflammation, and are to be frequently observed in eyes that have suffered from Gout.

PLATE XI.

THE three figures of this plate are intended to illustrate different effects of Injuries of the anterior chamber of the eye.

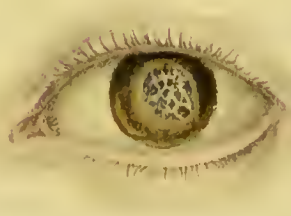
Fig. 1.—This drawing was made from the eye of a boy who, six weeks before, had a hog's bristle thrust into the anterior chamber. An opaque white matter, resembling a flake of snow, extends from the lens, which is also opaque, through the pupil, and comes nearly in contact with the cornea. Some inflammation which

1. Albumen effused from a wound of the Capsule of the lens.



2. Albumen effused in the anterior Chamber after the operation of Couching.

3. Albumen effused in the anterior Chamber after the operation of Extraction.



followed the injury soon abated, and all this opaque matter was ultimately absorbed. It is probable, that, in this case, the bristle had penetrated not only the cornea, but also the capsule of the lens, thus allowing the thinner parts of the lens to come through the wound into the anterior chamber; where they immediately became opaque. This appearance is very different from that produced by inflammation of the capsule of the aqueous humor, and precisely resembles the effects of the operation of *Keratonixis*, where the capsule of the lens is wounded by the point of the needle. I have several times had an opportunity of observing similar effects of injuries to that represented in this drawing; in all of them the opaque matter has been ultimately absorbed.

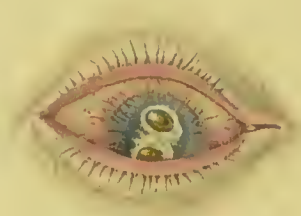
In *Fig.* 2.—The whole anterior chamber is filled with a yellow-coloured matter, whilst the conjunctiva covering the eyeball is so much inflamed, as to produce

what has been called *Chemosis*. The lens of this eye had been couched a few days before the drawing was taken, and though vision was not restored, yet the effused albuminous fluid was finally absorbed.

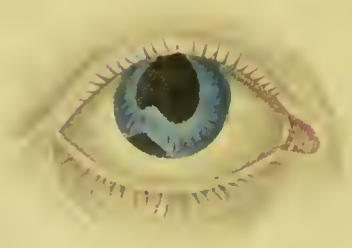
Fig. 3. — This represents the appearances of a net-work of lymph, as referred to in p. 14, after the extraction of a cataract. Towards the inferior edge of the cornea, a white semicircular cicatrix is perceptible; the pupillar opening is of a full size, and throughout the whole anterior chamber may be perceived filaments of coagulated albumen interwoven in various directions, so as to form a sort of net-work. This case is narrated by Beer.

Flakes of coagulated albumen are often found floating in the anterior chamber, or loosely attached to the iris, of the eyes of horses and other animals.

Iris prolapsed through two Ulcers of the Cornea



Excavation of the Iris



Excavation with Absorption of the Iris

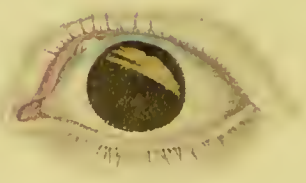


PLATE XII.

Fig. 1.—Is intended to illustrate the appearances of Prolapsus of the Iris, in consequence of ulceration of the cornea.

In this case, two Ulcers, such as have been delineated in Plate V. fig. 2., had penetrated the cornea, given an outlet to the aqueous humor, and portions of the Iris passed through the opening. The whole cornea has become clouded and vascular, and round each portion of iris there is an opaque white circle, produced from a substance resembling wet chalk ;—an appearance rather unusual.

The whole white of the eye is considerably inflamed.

The two next Figures are intended to illustrate the effects of Injuries of the Iris.

Fig. 2.—Represents a small portion of Iris torn from its attachment with the ciliary ligament. In this instance, the laceration was the consequence of a blow with a whip, which did not produce any other injury, and was followed by no defect in vision.

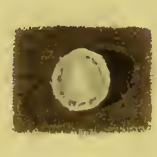
Fig. 3.—In this case, the whole Iris, except a small portion, is destroyed, the person having had his eye wounded by a thorn.

A small Staphylomatous tumor has arisen at that part of the sclerotic coat where the thorn entered the eye.

This man could see so as to be enabled to read, by looking through a small hole made in a card.

N°1.

N°2.



N°3.

N°4.

N°5.

N°6.

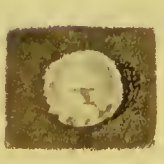


PLATE XIII.

No. 1. and 2.—Are drawings of two Congenital Cataracts, in both of which the central part of the lens is converted into an opaque white or chalky-looking substance.

In No. 1.—The central opacity has a triangular form, and is embedded in the transparent lens.

In No. 2.—The central opacity has a more oval form. Exterior to it there is another opacity, resembling what is met with in the more common kind of cataract,

and the external margins of the lens remains perfectly transparent.

No. 3. — Shows the radiated appearance which the crystalline lens sometimes assumes in Cataract. The rays come from the centre of the lens, but are lost towards its circumference. The central part is of an amber colour, and of a firm consistence, whereas, towards the circumference, the amber hue fades into an opaque leaden grey, the lens becoming much softer, and nearly pulpy.

The drawing was made from a lens recently extracted from a middle-aged patient. Its appearance in the eye was of a pale grey colour.

No. 4.—Shows a Capsular Cataract after being removed from the eye. In this case, the anterior portion of the capsule has become perfectly opaque, and acquired a great degree of thickness, being as thick as a common wafer, whilst the posterior por-

tion, is of its natural thinness and transparency, and is raised on the point of a pair of forceps. This cataract was removed from a young man who had suffered severely from ophthalmia. When the inflammatory symptoms had subsided, a dark yellow opaque body appeared behind the pupil, resembling fig. 3. Plate X. the pupil being immoveable from its adhesions to the opacity. This opaqe substance was the thickened capsule, on extracting which, the vitreous humor was found converted into a watery fluid, and the retina had lost its sensibility.

The two remaining figures show the appearances of Ossification of the Lens and Capsule.

No. 5.—Is a perpendicular section of a lens, showing its appearance when ossified, as described in Chap. XXXIV. The Ossification is seen commencing in the centre of the lens, and extending towards its cir-

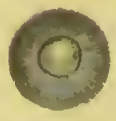
cumference in the form of concentric bony laminæ. The central portion was a dark brown coloured and hard bone; the exterior laminæ were of a paler colour, and more friable.

No. 6.—Represents an Ossification of the Capsule of the lens. In this case, nearly the whole capsule, particularly its anterior portion, was converted into a shell of bone. Where the shell is not complete, the dried lens is seen lying within it. The Ossification was in this case of the thickness of paper, and had all the external characters of bone. The case is particularly described in Chap. XXXVIII.

N.°1.

N.°2.

N.°3.



N.°4.

N.°5.

N.°6.

PLATE XIV.

These figures show several different kinds of Cataract.

No. 1.—Shows the appearances of the more usual form of the Capsular Cataract in the adult, where the anterior portion of the capsule has become much thickened, and of a pearl-white colour.

No. 2.—In this eye may be perceived the usual appearances of *Glaucoma*, or of cataract combined with a dilated and immoveable pupil. The lens has a bluish-

grey colour, but not of an equal degree of opacity, and the shade varied so much when the eye was inspected in different directions, that those who looked at it compared it to a cat's eye.

The pupil was permanently dilated, and at one part a portion of the iris is eroded. The lens was extracted, and found to be soft. The lady from whom the drawing was taken had an incipient cataract and Amaurosis of the other eye.

No. 3.—Exhibits one of the more usual appearances of the Crystalline Cataract. The lens is of an opaque bluish-grey colour, and of an equal shade throughout. The iris is beautifully streaked. The other eye was sound. The drawing was made from a girl three years of age, and the cataract had been perceived several months.

No. 4.—This figure represents the peculiar form of cataract which may be denominated *Laminated*. There is, in the pupil,

a very opaque white central spot, and around it a less opaque ring, the limits of both being accurately defined.

No. 5.—This figure represents a Cataract formed in consequence of an Injury of the lens. A needle had penetrated the anterior chamber of a young lady's eye, torn the edge of the iris, and punctured the lens. The pupil is seen of an irregular oblong form, and is separated into two portions by a slender filament of iris, detached from the edge of the pupil; behind one portion lies the opaque lens, whereas the other remains perfectly transparent.

In cases of this description, the wound which renders the lens opaque, seems to destroy its organization.

The drawing was made three months after the accident.

No. 6.—This represents a lateral view of a conical-shaped opaque body, whose base rests on the capsule of the crystalline lens,

and whose apex reaches the cornea. The pupil was quite moveable, vision was impaired, and both eyes had been affected with the disease from birth. The drawing was taken from a boy four years of age.

This peculiar form of cataract, which I have denominated *Pyramidal*, is described in Chap. XXXVIII.

N.° 1.

N.° 2.

N.° 3.

N.° 4.

N.° 5.

N.° 6.

PLATE XV.

In this Plate are illustrated some of the diseases of the Crystalline Capsule.

No. 1.—This is an example of the anterior portion of the Crystalline Capsule become very much thickened and opaque from inflammation. The pupil has lost its circular form, and is immoveable, whilst the opaque body behind it is of a pale grey colour.

No. 2.—Congenital Cataract in which

both the Lens and its Capsule are opaque. There is a green opacity throughout the lens, and in the capsule there are numerous spots. The pupil being dilated by belladona, the whole opacity is exposed to view. This figure is copied from the work of the late Mr. Saunders, and exhibits very distinctly the appearances of one form of diseased capsule.

No. 3.—In this figure are contrasted the appearances of an opacity of a portion of the Capsule of the lens, and Cornea. The opaque portion of capsule hangs from the upper edge of the pupil, whilst the opacity of the cornea is opposite to the inferior portion of the iris. In this case, the operation of extraction was performed in the usual manner, and no bad affects arose from the incision being carried through the diseased portion of cornea. Whilst making efforts to remove the capsule, the lens escaped. The capsule thus let loose floated upwards behind the iris, and the pupil

afterwards remained transparent, and vision was restored.

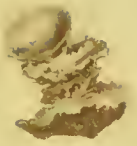
No. 4.—In this instance, the whole edge of the Iris adhered to the Capsule of the lens, and the iris had aquired a convexity, being pressed forwards in its middle part. The capsule has become quite opaque, and a small red vessel passes into it from the edge of the iris. These appearances are very frequent after attacks of Gouty inflammation of the eye.

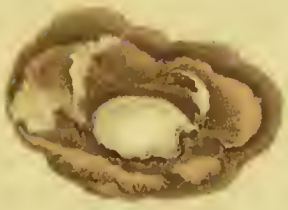
No. 5.—This drawing shows the appearance of the Pupil and Capsule of the lens, after extraction. The irregularity in its form did not proceed from any injury done to the Iris during the operation, but from a portion of the capsule of the lens, which was pushed through it, adhering to the wound of the cornea, and become opaque.

No. 6.—Circumscribed opacity of the Crystalline Capsule, in consequence of a punctured wound.

PLATE XVI.

Fig. 1.—Represents an Ossification found within an eye-ball, which appeared to be completely disorganized. The patient died of phthisis, but no history could be obtained of the diseased eye. The general form and shape of the eye were completely changed ; the cornea was opaque, its margin not distinctly marked, and the anterior chamber almost entirely obliterated. The sclerotic coat was easily separated from the parts within, and upon removing it, the cavity was found occupied by a hard irregular-shaped mass of bone. The ossifica-





tion was covered by the choroid coat and iris, these having lost their natural appearance, and no vestige of retina could be detected. The Ossification consisted of two different portions. The upper one was smooth, and a thin hollow shell, which, from its rounded form and position, must have been the Capsule of the Lens ossified. The inferior portion was a very irregular-shaped mass, and appeared to be the Capsule of the Vitreous humor converted into bone.

Fig. 2.—Ossification of the capsule of the lens, and hyaloid membrane, described in Chap. XL. the drawing having been made from a preparation where the parts had been dried, and kept in turpentine, in the collection of Mr. Blizzard, to whom I am indebted for this representation. The ossified capsule of the lens is seen in the centre of the preparation, and is readily distinguished from the other pieces of bone by its smooth surface, and more opaque white colour.

Fig. 3.—A thin cup of Bone which was found between the sclerotic coat and retina. A few thin and easily torn cellular laminæ were observed on the external surface of this ossification, which seemed to be the only remains of the choroid coat. At the apex is seen a small rounded perforation, through which passed the retina, to be expanded on the interior surface of the ossification. This eye was Amaurotic, but the particular history of the case was not known. The gentleman was also blind of the other eye, but in it there were no appearances of diseased structure.

In these three figures, the Ossifications in the two first resemble one another, that of the third being quite different.

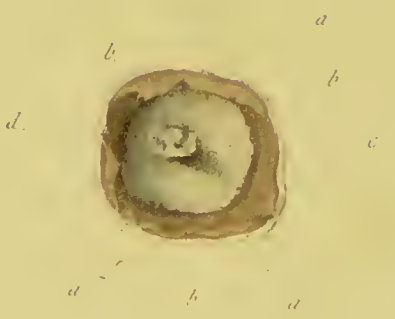


PLATE XVII.

Fig. 1.—Is the drawing of a Tumor on the Optic nerve from Mr. Heaviside's collection, for which I am indebted to Mr. Howship. The tumor appears to have formed in the *Neurilema* of the nerve, and no further history of the patient was known, than that he was Amaurotic of this eye.

Fig. 2.—Represents a vertical section of the eye-ball, described in Chap. XXIX. p. 70, where a watery fluid had collected between the choroid coat and retina, in

such quantity, as to compress the retina, into a chord, and produce a complete absorption of the vitreous humor.

This drawing represents the anterior portion of the eye-ball, so that the compressed retina is distinctly seen terminating at, and closely surrounding the neural portion of the crystalline capsule.

a, *a*, *a*, The outline of the sclerotic coat.

b, *b*, *b*, The choroid coat.

c, The Retina covering the neural portion of the crystalline capsule.

d, Section of the Retina compressed into a chord.

The eye in this instance appeared, on a superficial examination, to be affected with cataract, a white substance being seen behind the pupil. An attempt was made to couch what was conceived to be the opaque lens,—a fruitless operation, which gave great pain.

Staphyloma of the Sclerotic Coat.

PLATE XVIII.

In this plate is delineated a Staphylomatous swelling of the sclerotic coat, the cornea being at the same time quite disorganized; these changes having taken place in an adult in consequence of a severe attack of Puriform Ophthalmia.

END OF VOL. II.

London: Printed by W. Bulmer and W. Nicol,
Cleveland-row, St. James's.