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PATHOLOGY OF CATARACT.

By WILLIAM JOB COLLINS,
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SURGEON TO THE ROYAL EYE HOSPITAL, SOUTHWARK; OPHTHALMIC SURGEON TO THE NORTH-WEST LONDON HOSPITAL; SURGEON TO THE LONDON TEMPERANCE HOSPITAL.

An Address delivered to the Abenethian Society of St. Bartholomew's Hospital, London.

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GENTLEMEN,—It was twenty years ago that I entered for the first time as one of the freshest of first-year's-men the sacred precincts of the ancient and royal Hospital of St. Bartholomew. It is ten years since my official connection with your school ceased. It was, therefore, with very cordial sentiment that I received and accepted the invitation of your Honorary Secretaries, that I should again, and for the tenth time, address a society which for two years I served as President, and of which, in spite of manifold associations into which I have since entered, I am still proud to call myself a member.

When I recall the various topics to which on those ten occasions I have presumed to invite the attention of your honourable society, I confess I must regard the collection as extensive and peculiar. If the range over which I have wandered has been unduly wide, and if I have sometimes strayed into by-ways leading to municipal, ethical, or even political turnings, I will endeavour to-night to atone for the sins of the past by keeping rigidly to the time-honoured pathological rut. I devoutly trust, for the sake of my hearers, the in-

evitable result may not be, that I shall be intolerably dull.

I have chosen for my subject one of the most important of those connected with that branch of our profession to which I have specially devoted myself, and in which I received my earliest training within these walls, under the genial direction of Mr. Bowater Vernon. I speak of the pathology of cataract, and especially of certain points to which I have devoted special attention.

Taking cataract to mean some departure from normal transparency in the crystalline or its capsule, we must here, as elsewhere, insist *in limine* on the artificial character of any sharp distinctions between the physiological and what we are pleased to term the pathological. Processes which we call physiological or embryological here, as elsewhere, easily pass by almost imperceptible gradations into the pathological.

The correct recognition of the *rôle* of the lens in vision was antecedently essential to an adequate apprehension of its defects or diseases, and the procedure to be adopted for their cure. Yet here, as in other departments of medicine and surgery, we find treatment anticipating pathology, and empiricism directing a line of practice which a latter pathology has justified and approved. Witness the use of cinchona bark in ague by the natives of Peru, and the practice of inoculation by the tribes of Central Africa. So also it would seem that couching for cataract had become an operation of recognised value before it was known that a cataract was an opaque lens, and not a membrane, or humour. It almost seems either that traditional treatment had survived the knowledge on which it was originally based, or that a pre-established harmony guided the practice of the empiric.

Thus, Albucasis, the Moor, a skilful surgeon of Cordova, who died in 1106, has a chapter on the cure of cataract by depression, and in a fine edition of his works, in Arabic and Latin, done by Channing, at Oxford, in 1778, you will find a neat representation of the instrument he employed. Yet, he speaks of "de cura aquæ quæ descendit in oculo vel cataracta." Pliny and Galen seem to have been acquainted with "couching." The term cataract appears to have been employed by the School of Salerno, derived from the Greek καταρρηγνυμι, but whether used metaphorically as in the quotation I gave from Albucasis, or in the sense of "breaking down" or "confusing" is not clear. The older Greek writers had called it ὑπόχυσις ὑγρου, the Latins "suffusio," and the Arabo-barbarians, "gutta in oculo," all terms borrowed from humoral pathology. How indeed was any rational pathology then possible?

Before the time of Alhazen, who died in 1038, vision was held to be a sort of tactile or tentacular process effected by the emission of something or other from the eyes; the lens, so far from being regarded as a mechanical agent of refraction, was sanctified as the seat of the πνευμα, and accorded the function of seeing. In the phraseology of the vulgar, the lenses are even nowadays spoken of as the "sights." Alhazen having apparently practised dissection surreptitiously, satisfied himself of the absurdity of the current doctrine, and taught the refractive functions of the media of the eye, and that the retina received and transmitted to the brain the impressions formed on it by light from external objects. From the time of Alhazen to the seventeenth century, little was added to our knowledge of the eye and its diseases. Vesalius (1514-1564),

Fallopius (1523-1562), and later, Meibomius (1638-1700), worked out much of the anatomy of the eye as now received, Kepler re-discovered in 1604 the refractive functions of the lens, and with Descartes, Scheiner, and Mariotte founded the science of optics.

With the rapid accretion of knowledge, and the pursuit of the inductive method, the humoral or the pellicular theory of cataract, which had been authoritatively taught from the time of Pliny, and had therefore done duty for 1,600 years, was found not to hold water.

M. Brisseau, of Tournai, appears to have been a gentleman who observed and thought for himself, and when a soldier with cataract died in the Tournai Hospital in 1705 he examined the eyes post-mortem ; he thereupon made the startling discovery that a cataract was nothing but an opaque lens, and not a membrane engendered in the aqueous. Much elated, he reported his secret to Duverney, who would not hear of it, and advised Brisseau not to endanger his reputation by publishing so ridiculous a proposition ; moreover, the iconoclastic Brisseau was given to understand that his discovery might occasion offence to some members of the Academy who had written on optics.

Such are the perils that await the reformer, even in matters of science, when authority is at variance with the facts. The sequel is not uninstructive ; poor Brisseau published his thesis, and he was thereupon informed, not that he was wrong, but that it was no discovery after all, in fact, that he had been anticipated by the observations of Messrs. Antoine and Lasnier some forty years before. How true is the observation that the test of Truth is its capacity for re-discovery !

In order to appreciate aright the conditions leading up to lenticular or capsular opacities, which we call

cataract, it is desirable to glance at the evolution and life-history of the lens. Derived from ectoderm, it owns allegiance to cuticular tendencies, even when it enters on an independent career in a new situation. It augments by the overgrowth of its deeper cells, which fibrillate, and later assume a definite pattern betwixt tri-radial axes. Indenting the optic cup, an extension of the hollow central nerve system, derived like itself from epiblast, it gets surrounded by a vascular tunic of mesoblastic origin. It secretes for itself a hyaline capsule, as diaphanous as its own texture is eventually. Reefed into place by a corona of delicate fibres attaching the capsule to the ciliary processes, the scaffolding, in the shape of the capsulo-pupillary membrane, is finally cleared away shortly before the birth of the child.

Chemically, the lens is a bag of globulin and water, with a little alkali-albumen and serum-albumen, and a trace of salts. Its globulin differs from other globulins and resembles vitellin in not being precipitated from dilute brine by saturation.

Physically, the crystalline is a bi-convex lens, with the greater convexity backwards, the radius of anterior curvature being 10 mm., that of the posterior being 6 mm., and the mean refractive index 1·3839 compared with that of water. It is, moreover, very elastic.

Analysis of Cataract.

The lens grows by super-addition at the equator, the antero-posterior diameter hardly increasing after birth, while the equatorial, from 5 mm. in the infant, may be double that in age. From observations I made on the weight and composition of six fresh clear human lenses, I found the weight at 10 years to be ·163 gramme ; at 27, ·188 gr.; at 40, ·217 gr.; at 64, ·247 gr.

This is in harmony with Priestley Smith's investigations, which showed an annual increase in bulk of 1·5 cub. mm. The increase of weight is due to an increase of size, and not to increased density, the specific gravity remaining pretty constant through life. The amount of water I found to be nearly the same at different ages, viz., 71 per cent., the limits of variation in the six clear lenses I analysed being 69 and 73. Kuhne, whom most books copy, gives 68 per cent. of water, Schneyder gives 63, and Jacobsen 70·8. Otto Becker, on the authority of Deutschmann, says the solids of the lens increase with age, and Donders hints at the same view; but I submit that Deutschmann's results may have been vitiated, by the fact that the lenses were transmitted long distances (from Wiesbaden and Breslau to Gottingen, between extraction and analysis. Indeed, upon reflection, the fictitious sclerosis of the lens fibres, which has been alleged, in so far as that term suggests dehydration, is in no sense corollary to its derivation from cuticular epiblast or its homologous relationship with the epidermis. Because the latter exposed to air and pressure tends to cornification and dehydration from its surface, that, I submit, is no reason why the lens excluded from air, nay, bathed with fluid, should exhibit a similar change at its nucleus, which is required to make this fallacious analogy complete. The growth and nutrition of the lens are wlthout parallel in any other tissue of the body.

In my observations the lens was, in every case, either placed in a corked, dry, glass test-tube, or sealed up in gutta-percha tissue, and was in most cases on the water-bath in my laboratory within an hour of its removal from the eye

The data which I ascertained in each case were—

1. The weight of the lens.

2. The amount of total solids.
3. The amount of water.
4. The amount of ash.

TABLE OF COMPARATIVE ANALYSES OF SIX CLEAR HUMAN LENSES AND TEN HUMAN CATARACTOUS LENSES.

	Age	Weight.	Water.	Solids.	Ash.	Per Cent. Water.	Per Cent. Solids
Clear.	10	·163	·113	050	·001	69	31
	26	·215	123	062	·002	71	29
	27	·188	·136	·052	001	72	28
	28	·1915	·132	·0595	·002	69	31
	40	·2175	·1575	·060	001	72	28
	64	·247	·176	·071	·001	71	29
		·2036	·1446	·059	·0013	71	29
Cataracts.	46	·13625	·10150	·03475	·00175	74 5	25·5
	47	·1 6	·081	·035	·002	70	30
	53	·1351	·0926	·0425	·001	68·5	31·5
	59	·0830	042	·041	002	52	48
	60	·128	095	·033	0015	74	26
	61	·100	·070	030	·001	70	30
	63	·110	0725	·0375	·002	66	34
	64	·101	·0575	0435	001	57	43
	77	·110	·071	·039	001	64·5	35·5
	87	·110	·0445	0655	001	40·5	59·5
		·113	073	·040	·0014	64	36

What are the chemical and physical changes which occur in the common so-called senile or hard cataract? I maintain they are not merely exaggerated degrees of the changes which age alone brings. Indeed, it is incorrect to assert that a lens is likely to be hard, if by

that we mean denser in the sense of being less fluid, because it is an old one. In one respect a cataractous lens exhibits a change, the inverse of that which age produces ; it is lighter in weight and smaller in size than a clear lens of corresponding age. I found, however, that it is a fact that cataractous lenses contain a larger proportion of solids and a smaller proportion of water than clear lenses. My analyses of 10 cataracts averaged 36 per cent. of solids, against 29 per cent. in the normal series. There was, however, much greater variation in individual cases, from 26 per cent. to 59·5 per cent.

In order to eliminate errors based upon the smallness of the material employed, I secured four cataracts, all nearly intact and quite fresh, from persons, æt. 60, 67, 73, and 77, and estimated the water, solids, and ash in the combined lens matter.

The results were 62·14 per cent. of water, 37·86 of solids, and ·83 per cent. of ash.

None of these were what could be termed *cataracta reducta*, and the conclusion to which I am irresistibly led from this and other observations is that, while allowing individual exceptions, *cataractous lenses, as a general rule, contain relatively less water and more solids than non-cataractous lenses, and that this dehydration, associated with opacification, is in no sense a change dependent upon age, and has no parallel in the ordinary changes which age brings with it in the clear lens.*

As to the salts of the lenses, these are mostly Na Cl, the amounts in individual lenses are so small as hardly to permit of any reliable inferences therefrom, though it would seem that the relative proportion of salts and ash is greater in cataractous lenses than in clear. Berzelius regarded the cataractous change, chemically

as the coagulation of albumenoids. Cahn's analyses show a proportional excess of salts, cholesterin, lecithin, fat, and extractives in cataract, and a relative deficiency of albuminous material. Dextrose has been alleged to have been found in diabetic cataracts by some observers, though others have failed to do so.

In the etherial extract of the dry residue of senile cataracts, I have found under the microscope, fine acicular crystals, some single, some in bundles, but I have not, as yet, determined their exact nature.

Black Cataract.

A certain amount of pigment is noticeable in most hard cataracts, varying from a pale amber to dark brown and even black, but black cataract is a *Rara avis in terris, nigroque simillima cygno.* Its pathology appears to have been somewhat obscurely treated by most English authors. I find no reference to such variety in Nettleship's "Diseases of the Eye" (1887), a passing allusion merely in Juler's Handbook, while Berry observes "often the lens is very darkly coloured, when the cataract is said to be black." If this statement means that black cataracts are often met with, it is at variance with the experience of most oculists: thus Galezowski says, "Quant a ce qui me concerne, j'en ai rencontré jusqu'a present 9 cas." (*a*)

The "Transactions" of the Ophthalmological Society contain reports of two cases, one by Mr. MacHardy in 1882, and one by Mr. Power in 1885. The latter, in commenting on his case, remarked on "the rarity of this variety of cataract in England. This was the first example he himself had met with."

Dr. Swanzy "had seen a good many cases in Dublin and in Von Graefe's practice. He was under the

(*a*) "Des Cataractes," p. 57.

impression the prognosis was not good." Mackenzie, in his comprehensive treatise (1854), has an apposite observation on the difficulty of diagnosis of such cataracts; he says (p. 751): "I have seen a few cases of lenticular cataract in which the opacity was so very dark that, without close examination, the disease might have passed without detection. On concentrating the light on the pupil the opacity appeared striated, such cases have been called black cataracts. I have not seen the lens after it has beeu extracted in any of these cases." Prior to the invention of the ophthalmoscope in 1859, accounts of black cataracts must be received with reservation, as there is ground for believing that cases of glaucoma, or "amaurosis," or hæmorrhage into the vitreous were sometimes so-called. Dupuytren had never seen it, and did not believe in its existence, and Delpech, in his great "Dictionnaire" in 1813, doubted the assertion of the ancients that such a form of cataract existed. Janin, of Lyons, in 1772, records the successful extraction of black cataract, the first he had met with in 500 operations. He noted that after extraction the capsule became opaque and olive-tinted. J. Scott removed one in 1843, which he says was as black as pitch. Graefe, the elder, diagnosed black cataract in the case of the Duke of Cumberland after other surgeons had diagnosed amaurosis. J. Z. Lawrence had a case, the first in 2 100 patients. Nunneley met with one case in 1 200 extractions. A few other scattered references occur, mostly in foreign authors, the earliest I have come across being that of Rolfink, of Jena, in his "Dissertatio de Cataracta" in 1664.

Two cases have come under my own observation, in both of which I performed extraction. The first was in a swarthy woman with raven black hair. Her

vision was reduced to counting fingers, but the pupils looked quite black ; though the fundus could not be illuminated, it was only by minute examination with oblique illumination that I could convince myself, by observing fine striæ and nacreous lustre, that the defective vision was due to lenticular opacity. I extracted the more mature lens. The operation was uncomplicated, but some weeks afterwards there was a little iritis, though when this cleared up she could read small Jaeger type with a plus 15 D. During the iritis I noticed a very interesting appearance ; there were some deposits on the back of the cornea as in serous iritis ; with a strong lens I observed that *many of these dots were deeply pigmented.*

What is the pathology of black cataract? What is the nature of the pigment? Macnamara and Hartridge state that it is due to "infiltration of hæmatin into the opaque lens." I do not think that explanation is correct ; it certainly will not hold for all cases. I tried soaking extracted cataracts and clear lenses in fresh blood, but found they absorbed hæmoglobin with difficulty. Moreover, the spectroscopic examination in one of my cases, kindly made for me by Mr. Lyle, of King's College, failed to give any evidence of blood pigment. This confirms a similar observation made in Mr. MacHardy's case. In a case recorded by Hulme, Dr. Harley found that, with H Cl and K C N S under the microscope, a red colour was obtained, and that it was to be inferred that iron was present. Hulke examined the lens in Windsor's case, but confessed himself unable to determine the nature of the pigment.

Now I do not think any essential distinction can be drawn between the amber tint of an ordinary cataract when seen by transmitted light, and the "black" cataract ; indeed, intermediate examples, running

through all the shades of a London fog could be found. Now the lens is of cuticular ancestry, and tissues are apt, under certain conditions, which we call pathological, to revert to ancestral habits. The pigment of the Negro's skin resides in, and is elaborated by, the deepest layers of the cuticle. The lens, therefore, contains the progeny of cells whose homologues produce pigment cells, *A priori* it would appear not improbable that the pigment is the same in each case. In the outer layer of the optic cup, also derived from epiblast, we have evidence of the pigment-forming capacities of cuticular cells when withdrawn from the surface. Indeed, is not the abundant presence of a form of keratin in the brain a curious chemical testimony to its epiblastic derivation? When these reflections are supported by the fact of the spectroscopic and chemical analyses of the lens-pigment differing markedly from those of pigment directly derived from blood, the conclusion may appear to be strengthened that the colour of brown and black cataracts is analogous to that in the rete mucosum, the so-called melanin. Of course, it must not be forgotten that the lens may, in rare cases, be stained by pigment proximately derived from adjacent blood effusion, or that a melanotic sarcoma of the ciliary body may even invade the lens, not to speak of the common attachment of uveal pigment to the anterior capsule consecutive on iritis. That the pigment in question is not any proximate derivative of hæmoglobin, but that it is, the product of cell-activity like the pigment of hair or of the skin is, I think, pretty clear. But whence is it derived? Is it formed by the lens-cells? Or is the lens merely stained by pigment contained in minute quantities, in the circumambient fluid? The fact of the nucleus habitually having a deeper tint than the cortex might, perhaps, suggest the

formation of pigment there, on the other hand, it is hardly conceivable that from colourless fluid supplied to it a lens should elaborate colouring matter. There is some ground for thinking that the endosmotic and exosmotic currents on which the nutrition of the lens depends, may permit, in swarthy eyes the filtration and intra-lenticular accumulation of melanin washed in microscopic molecules from deeply pigmented ciliary processes. Given a cataractous change in the lens of such, it is possible that the retentive power of the lens filter may be augmented, and especially in the older fibres of the nucleus. At present, it is scarcely possible to speak with greater precision as to the ultimate origin of the pigment which produces what we call black cataract, though the considerations I have alluded to, are suggestive of its real nature, and may contribute to a final solution.

"Spontaneous Cure."

If asked whether cataract can disappear without operation, the orthodox answer would be in the negative, and would not be far wrong in the vast majority of cases. The spontaneous or medical cure of cataract should, no doubt, be taken *cum grano salis*, it savours of the 'dispersing" of tumours by the advertising cancer-curer. When one is informed of such a case "on the best authority," one is inclined to regard one's informant with compassionate scepticism, and to retort "I will believe it because you tell me so, but I would not believe it if I saw it myself." While associating oneself with this position, and so holding a candle to the shrine of a wholesome orthodoxy, one may proceed to remark on the logical difficulties of maintaining a universal negative in general, and pass on to consider certain rare and exceptional cases in particular. There is evidence to show that the cure of cataract has

been effected by dislocation of the lens, a sort of spontaneous couching. Traumatism, without perforation has, presumably by capsular rupture, eventuated in solution of cataract, and there is less satisfactory evidence of solution without obvious cause, and accordingly accounted idiopathic. Such cases are dependent on displacement of an opaque lens or its dissolution. Can opacity appear and disappear in a lens leaving the lens in normal position and appearance? Such occurrence has been alleged to have been observed in diabetes; though I have not witnessed it myself. I have the notes of a remarkable case I watched with great interest when I was Ophthalmic House Surgeon here :—

Emily W., æt. 28, was walking along Newgate Street when a beam of wood fell from a window above and hit her left eye. She fell down insensible, and on recovering and coming to the hospital was found to be suffering from great pain, bruising of lids, some injection of sclera and, one-tenth of anterior chamber containing blood. The pupil was oval and eccentric, the iris looked green, tension was normal, aud fundus returned a red reflex in all directions. Atropine drops and ice-cold applications were ordered. The hyperæmia decreased the conjunctiva becoming "sallow," and the anterior chamber appeared deeper than the other. Four days later, I observed that the lens fibres were preternaturally distinct, and by oblique illumination radial striæ could be detected. With the ophthalmoscope I observed a well-defined nuclear crescentic nebula, which I demonstrated to others. A week after the injury the pupil was regular and central and the lenticular opacity was fading away, vision with correcting glasses being six-ninths in each eye.

This case I hold to have been one of transient

nebulosity of the lens, probably due to temporarily disturbed nutrition from slight capsular rupture or slight sub-luxation.

Maturation.

"Never prophecy unless you know," is advice especially applicable to the speculations as to the rate at which cataracts will mature. Experience may, however, help approximations to accuracy, especially by the careful observation of collateral signs and symptoms. Thus cataracts associated with myopia are prone to slow ripening. Here is a note of an interesting case in illustration. When I was clinical assistant to Mr. George Lawson, at Moorfields, I saw a man, æt. 85, who, contrary to the habit of out-patients, had preserved and brought with him an old out-patient letter bearing Sir Wm. Bowman's name, and the date 24th of July, 1862. The note of that date was "Left eye, cataract mature, fingers within 6 inches; right eye, words of No. 2, myopic." On September 21st, 1886, I noted that the cataracts were partial, in the left there was a very dense white nucleus and cortical striæ, occupying all except the uppermost part; likewise in the right the upper part is alone clear. Through these gaps the fundus of each eye could be seen, and indeed large posterior staphylomata. Here then was a case in which 24 years had witnessed scarcely any ripening.

Cataracts beginning at the posterior pole, or by striæ, with anterior concavity stretching thence to the equator, are often slow in maturing. There may be some fallacy in this statement, by reason of our estimation of maturity by the amount of clear cortex, through which the iris shadow is cast on the deeper opacity. But allowing for such mere verbal fallacy, I

believe that the opacification spreads less quickly through a lens under such circumstances than when the first departure from pellucidity is nuclear or is anteriorly placed. As an illustration of what I mean, and of the rapid influence of iridectomy in accelerating maturation, I may cite the case of a gentleman who was the secretary of a well-known microscopical society. He was 51 in 1886, when he consulted me about his eyes, his sight had then been failing for twelve years. His vision was reduced in the left eye to 6/60, and with the right eye he could count fingers at three feet ; he was unable to use his microscope, which was to him a great deprivation. His lenses exhibited posterior opacities at the pole, and concave striæ proceeding arc-wise therefrom, there was apparently some axial myopia. The cataracts were in a condition, then accounted too unripe for extraction, but ripe enough to excommunicate their unfortunate possessor from most of the pleasures of his life. On October 8th, 1886, I did a preliminary iridectomy on the right eye, and on January 7th, 1887, the cataract to all appearances being perfectly ripe, I extracted it, with a resulting vision of J. 1, and 6/9, with glasses. I had occasion to see the patient again some eight years afterwards, and found the other eye practically *in statu quo*, red reflex could still be obtained, and the anterior hemisphere of the lens was for the most part pellucid. He had resumed his favourite investigations of diatoms with the microscope with the operated eye, and was so well satisfied with it that he would not yield to my suggestion to deal similarly with the other.

This case enforces the slow maturation of cataracts of this class, and their rapid ripening by iridectomy, and indicates the mode of escape from the intolerable

dilemma, wherein the lenses are opaque enough to frustate useful vision, and clear enough to preclude extraction with a clear conscience.

Non-Pathological Cataracts.

There are a group of opacities found in or about the crystalline and its capsule, to which I have on several occasions called attention, and to which I have applied the term "non-pathological cataracts." I refer to cases in which negative history, as regards antecedent inflammation and collateral evidence arising from the normal appearance of neighbouring structures, compel inquiry for some physiological or embryological explanation.

That such explanation is sometimes forthcoming in the shape of abnormalities arising out of the events consequent upon the formation of the parts adjacent to the lens I suggested in a paper upon the capsulo-pupillary membrane which I contributed to the Moorfields Hospital Reports some eight years ago.

I then pointed out how by failure of removal of the scaffolding employed in constructing the *entourage* of the lens, which we are pleased to recognise as normal, the following abnormalities might result :—

1. A persistent hyaloid artery or patent canal of Stilling.

2. Opacities in the hyaloid fossa occasionally seen in children, not improbably due to the retention of, or opacification of, or failure to clarify of, some portion of the posterior part of the capsulo-pupillary tunic.

3. Opaque *plaques* on the anterior surface of the lens, either with or without connecting threads with the iris ; also certain anomalous juvenile cataracts, and otherwise inexplicable anterior polar cataracts refer-

able to persistent and more or less altered portions of the capsulo-pupillary membrane.

Most English writers have accepted the usual explanation of anterior or capsular cataracts by way of corneal perforation, and its consequences to an extent which would seem to exclude an embryological explanation of any opacities in that region.

Since my paper of 1888 was published, in which I figured examples of cataract due to capsulo-pupillary remains, there has been an increasing disposition to allow a fœtal origin for central capsular opacities. I have seen several cases of ex-central, some meridional, and some equatorial opacities, in which I believe a similar causation must be accepted.

Classification.

The ordinary classifications of cataract are hopelessly illogical, it is to be hoped the practical man, who scorns logic, finds them proportionately "practical." They lack a common *basis divisionis*. Age, consistence, situation, cause, &c., are invoked as basis in the same classification, with a bewildering effect. No mere dichotomous division as into Hard and Soft, Senile and Juvenile, is satisfactory. Still less is there any special value in distinguishing between nuclear and cortical cataract, and the existence of laminar cataract makes such division non-exhaustive.

Ætiology is doubtless the best basis for classification, but while the pathology remains in part obscure, no complete and satisfactory classification is possible.

As an approximation to such an arrangement, I would submit the following :—

Cataract—Opacity of lens or capsule attributable to—

1. Developmental causes : (1) Congenital, *e.g.*, dot

cataract, remains of capsulo-pupillary membrane. (2) Infantile, *e.g.*, Laminar.

2. Cachectic causes, *e.g.*, toxæmia : (1) From without, *e.g.*, Ergotism. (2) From within, *e.g.*, Diabetes.

3. Secondary results of ocular disease, *e.g.*, some anterior pyramidal cataracts ; myopic cataracts ; glaucomatous cataracts.

4. Vascular disease (extra-ocular) *e.g.*, atheroma of carotids—aneurism.

5. Nervous disease, *e.g.*, disease of fifth or of the Gasserian ganglion.

6. Traumatism.

In reference to the toxæmic group, I would associate myself with those who think the influence of diabetes as a cause of cataract has been over-estimated. Von Graefe put 25 per cent. down to this cause. Probably less than 1 per cent. is nearer the truth, and the co-existence of the two conditions does not prove their causal relationship. Atheroma of the cervical arteries is, I believe, a true cause, I remember de Wecker demonstrating the fact in his clinique when I was there some six years ago. I once extracted successfully two cataracts from a woman who had a large aortic and innominate aneurism. Ergotism as an alleged cause is interesting in view of its recognised vaso-constrictive action.

Here I must conclude my fragmentary observations, which make no claim to completeness, and I fear, from their casual composing, can scarcely be deemed consecutive.

There is much work yet to be done even in this apparently limited field for pathological inquiry. The chemist, embryologist, physicist, physiologist, can each give his quota towards an adequate pathology. We may not to-day fear the reception that was meted out

to poor Brisseau when he hazarded the heretical view that a cataract was an opaque lens, but we may do well to cultivate a mental receptivity towards new ideas on well-worn subjects, to press all methods of research into our service, and while we laugh at the follies of the schoolmen, ourselves avoid an obsequious adhesion to the doctrines of yesterday or to-day.